# Science of Sounds Teacher Packet

## GRADE LEVELS:
1st through 3rd grade

## CONCEPTS:
- Sound is a form of energy that is produced when an object vibrates.
- Volume, pitch, and tone are the things that make sound different.
- Sound doesn't travel through all matter the same way.

## OBJECTIVES:
Participants will be able to:
- explore different ways sound can be made.
- explore the properties of sound and the ways scientists measure these properties (volume, pitch and tone).
- experiment and observe how sound moves through different materials.

## CONTENT STANDARDS:
- Science: Physical Sciences: 2.1, 2.2
- Science: Scientific Ways of Knowing:1.1, 1.2

## VOCABULARY WORDS:
**Sound** – What our ears hear coming from the energy of vibrating objects.
**Volume** –The loudness or softness of a sound that represents the intensity of the vibrations. It is measured in decibels. (db)
**Pitch** – This is how high or low a sound is, which represents the frequency of the vibrations. The faster the vibrations, the higher the pitch; the slower the vibrations, the lower the pitch.
**Tone** – The quality or character of a sound.
**Matter** – Anything that occupies space.
**Wave** – This describes the way sound moves; in the form of a ridge, swell, or undulating pattern.

## EXTENSIONS AT COSI:
### Life Exhibition Area
- 3D Sound- Put on the headphones and listen to the auditory illusions presented at these stations.

### Progress
- Walk through 1898 and make a list of the sounds you hear. Walk through 1962 and make another list of the sounds you hear. Compare the two lists. Find the similarities and differences.

### Science ala Carte

- Sound - Watch a COSI team member make glasses sing with her finger. Give it a try yourself.

Ocean

- Listen to the literature examples at the Poetry bench. Do any of them include background sounds? How do they change the feeling of the literature examples being read?

ADDITIONAL RESOURCES:

http://www2.scholastic.com/browse/article.jsp?id=3896
http://www.galaxy.net/~k12/sound/
https://www.cdmfun.org/page/family-area/kids-area/experiment-of-the-month/the-science-of-sound

SAMPLE TEST QUESTIONS:

1. Sound is a form of:
   A. Force
   B. Energy
   C. Music
   D. None of the above

2. Jenny yelled. Her mother asked her to be quieter. So, Jenny changed her:
   A. Volume
   B. Pitch
   C. Tone
   D. Hearing

3. Sound travels through a medium as a:
   A. Spiral
   B. Wave
   C. Straight line
   D. Random pattern

# Science of Sounds Pre Visit Activities

## Screaming Balloon

### Objective:
The learner will make a unique sound with a vibrating hex nut.

### Materials (per student or group):
- 1 hex nut
- 1balloon

### Instructions:
1. Squeeze the hex nut through the mouth of the balloon. Make sure that the hex nut goes all the way into the balloon so that there is no danger of it being sucked out while blowing up the balloon.
2. Blow up the balloon, but be careful not to overinflate the balloon, as it will easily burst. Tie off the balloon and you're ready to go.
3. Grip the balloon at the stem end as you would a bowling ball. The neck of the balloon will be in your palm, and your fingers and thumb will extend down the sides of the balloon.
4. While holding the balloon palm down, swirl it in a circular motion. The hex nut may bounce around at first, but it will soon begin to roll around the inside of the balloon. What is that sound? Could the balloon be screaming? As a class, discuss the findings.
5. Once the hex nut begins to spin use your other hand to stabilize the balloon. Your hex nut should continue to spin for 10 seconds or more.

### Further Exploration:
What happens when you change the size of the balloon or the size of the hex nut? Try using a marble instead of a hex nut. Does the marble make the balloon "scream?" Experiment with other objects whose edges may vibrate against the balloon.

### What is Going On?
This is actually a two for one experiment - you're learning about the science of motion and sound. The hex nut circles inside the balloon due to *centripetal* force. Centripetal force is the inward force on a body that causes it to move in a circular path. It is a "center-seeking" force. A hex nut has six sides, and these flat edges cause the hex nut to bounce or vibrate inside the balloon. The screaming sound is made by the sides of the hex nut vibrating against the inside wall of the balloon.

### Academic Content Standards:
- Science: Physical Sciences: 2.1

# Do It Yourself Thunderstorm

## Objective:

Participants will use physical movement to simulate the sounds of an approaching and dissipating thunderstorm.

## Materials:

- Sheet of Metal
- Light Switch *(optional)*

## Instructions:

1. Ask the participants if they have ever seen and heard a thunderstorm. Lead a brief discussion about these experiences and the sounds that a rainstorm makes.
2. Tell the participants that we are going to create the sounds of a rainstorm in the room. Ask the participants how they think we could do this
3. Encourage the group to sit in a semi-circle. Then divide the entire group into three sections. Explain that the activity you are going to do will be done in a "round-like" fashion.
4. The facilitator will lead the activity by having the first section rub their hands together. Then the second section will join them, and then finally the third section. Next, the presenter will revisit the first section and ask them to start snapping their fingers, while the second and third are still rubbing their hands. Then the second section snaps their fingers, and finally the third section joins in. During the next round, the first section will begin by patting their legs, and then the second and third sections will join when it is their turn.
5. For the peak of the thunderstorm, the participants will stomp their feet, section by section. Excite the group with excessive energy, enthusiasm, and encouragement.
6. Lastly, as the thunderstorm subsides, the group will make all the sounds in reverse order, section by section. That is: pat legs, snap fingers, and then rub hands. (Note: A sheet of metal and overhead lighting can fulfill the role of additional "thunder" and the accompanying lightning.)
7. With the arrival of complete silence, begin a discussion regarding the participants' experiences with rainstorms.

## What is Going On?

In the early days of live radio, John Dennis invented a way to create the sound of thunder. His method of rattling a large piece of thin copper sheeting suspended by wires became so popular with others in the field that an irate Dennis accused another producer of "stealing my thunder!"

# Science of Sounds Post Visit Activities

## Hilarious Honker

### Objective:

Students will learn to make different sounds with a paper cup.

### Key Words:

- Vibration
- Resonance
- Sound waves

### Materials:

- Paper cup
- 20 inch piece of string
- Paper towels
- Water
- Paper clip
- Tape
- Coffee can
- Balloon
- Rubber band
- Salt

### Instructions:

1. Poke a hole in the center of the cup bottom.
2. Push one end of the string through the bottom of the cup and tie a paper clip to the end of the string that is inside the cup. Tape the paper clip against the inside bottom of the cup. How can we use this contraption to make noise? Explore various ideas.
3. Sprinkle a little bit of water on a paper towel. Wrap the paper towel around the string and slide it snuggly down the string. What types of sounds can you create? How can you make the sounds louder or softer? Why does wetting the paper towel change the sound created? Can you make sounds with the honker using wet fingers?
4. Cover an open coffee can with a piece of stretched rubber balloon. Fasten the balloon tightly across the opening with a rubber band. Sprinkle some salt on top of the rubber. Direct the sound of the Hilarious Honker toward the salt on the can. What happens?

### Academic Content Standards

- Science: Physical Sciences: 2.1, 2.2, 3.4

# Foley Art

## Description:

Participants will immerse themselves within the role of the Foley Artist by providing the sound effects for a variety of silent video clips, thus obtaining a basic knowledge regarding the purpose and procedures of Foley Art.

## Materials:

- Silent video clips
- Various sound making items
- Computer monitor/projector
- Storyboards

## Instructions:

### Assembling the Magnetic Pendulum:

1. Ask the participants to imagine a movie without sound effects. Provide such thought provoking questions as, "Would you enjoy a movie without sound effects? Do you recall any memorable sound effects from recent movies?"
2. Ask the participants to identify possible methods for creating these sound effects. Guide them toward uncovering the origins of any sounds that stage microphones would typically fail to acquire, and sounds of fantasy (e.g., laser blasts). Ask them, "How would you create a sound for something that has never been heard by humans, such as sounds on a distant planet or a dinosaur egg hatching? How can Foley artists affect the mood or meaning of a film through sound effects?"
3. Invite a small group of participants to provide the sound effects for a silent film. Employ the use of a storyboard to help synchronize the various sound effects with the action "on stage."
4. While the group provides the sounds, take the opportunity to provide some background information regarding the history and reasons for the Foley Artist.

## What's Going On?

In the early days of the motion picture most action was left silent. Doors opened and closed with no sound. Footsteps were ignored. Over the years the demands on the sound editor have increased. "If you see it, you hear it" is the modern credo. This brings us to the problem of how to create the sound of a man taking a wad of money from his pocket, counting five bills out, and returning the wad to his pocket. This sound is made on a **Foley Stage**.

Foley is the process of recording directly to the picture any action that is too minute to cut from a sound library. Examples include quiet movements, handling small items such as money, and unwrapping gifts. In other words, sound effects too specific or exact to come from the sound library should be created on the Foley Stage. More common or general

effects are more easily and cheaply taken from the library. Among the most commonly recorded effects made on the Foley Stage is the sound of footsteps.

As you go through an average day, how many sounds around you do you actually hear? Every time you close a door, do you listen for the click of the lock? Do you hear the clink of a glass as you set it down? Although you may not actively hear these sounds, if they weren't there you'd wonder what was missing. Foley, the process of creating incidental sounds, is the art that completes a film--all by adding sounds for which you never really listen.

Whether they're tearing heads of cabbage for a paper shredder in *The Temp* or "squashing" gelatin in T-shirts for E.T.'s wobbly walk, Foley artists add sounds that make the experience more real for the audience.

The process is named for radio and movie sound pioneer Jack Foley, a technician at Universal Studios in the 1950s that became famous for synchronized sound effects.

Foley artists begin their work by watching the film to determine which sounds need to be replaced, which need to be enhanced, and which just simply need to be added. The sound on the film includes all of the *dialogue* and sound effects created during the actual production of the film. These sounds are recorded on a production track, or guide track.

Later, technicians may add crowd noises (also called *Walla*), the musical *score*, re-recorded dialogue, or ADR (automated dialogue replacement), sound effects, and sound-designed effects. It's not unusual to have 80% of a movie's sound track added and altered in some way after the movie is shot.

Some sound effects are common and can be pulled from prerecorded audio libraries. But many are unique to each movie--footsteps, for instance. As they watch the film, the artists identify which sounds they need to create and start thinking of ways to make them.

In addition to the noises themselves, the Foley artists must consider other factors, such as who makes the sound and in what environment. Some sounds are too complex for one take, so the Foley artists carefully combine different noises to fully represent a single sound. In some cases, Foley editors can digitally alter recorded sounds to fit a scene exactly.

In a Foley studio you'll find different surfaces for walking on, a *splash tank*, *echo chambers*, and a mixing booth where the sound engineers record and mix everything.

Foley artists spend hours huddled around a microphone, reading *cue sheets* and watching a huge screen as they meticulously synchronize their noises to the action.

So the next time you see a movie, listen very carefully. If you don't notice a thing, you've got a Foley artist to thank.