

Troop Leader Resources Amusement Innovator

Are you ready to design your own entertainment company? Juniors begin by learning about classic animation styles and then get to bring their creations to life through stop motion animation. Next, they build prototypes of rollercoasters while learning the science behind the screams. Finally, Juniors make their own 3D glasses and learn how 3D images are created!

Grades 4-5 | Girl Scout Juniors

Badge Program Outcomes

Participants will learn and practice the basic principles of stop motion animation

Participants will build model roller coasters and learn the underlying science

Participants will create their own 3D glasses and discover how the illusion of 3D is created for images and movies

Girl Scout Badge Connections

Juniors Entertainment Technology Badge, *It's Your World – Change it! Agent of Change*

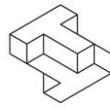
Corresponding badge steps completed in this program

- Step 1: Animate your own artwork
- Step 3: Try the science of amusement park rides
- Step 4: Create your own special effects

Vocabulary

Familiarity with these terms and concepts will enhance students' experience in the activity.

- **Animation:** A set of images displayed in rapid succession in order to create the illusion of motion
- **Persistence of Vision:** The theory that the eye can remember an image for 1/30 of a second after seeing that image, which explains the illusion of motion seen in animations.
- **Thaumatrope:** A device popular in the mid-1800s that uses persistence of vision to combine two images on either side of a disc or card. Spinning the object rapidly makes the two images appear as one.
- **Zoetrope:** A "wheel of life." Used as a toy in the 19th century and made of a spinning cylinder with slits around the wheel and a set of frames placed inside. When spun, the images appear animated to the viewer looking through the slits.
- **Frame:** One image in an animation or film. In America, most animated films show 24 frames in 1 second.
- **Anaglyph:** An image that has been modified to display a 3-D illusion. It contains two filtered versions of the picture that are overlaid and slightly shifted.
- **Gravity:** a force that pulls objects toward the center of the Earth
- **Energy:** The ability to do work. Measured in joules. Appears in many forms, most of which are ultimately derived from the sun or from radioactivity.
- **Force:** an influence on a body or system, causing or tending to cause a change in movement or shape
- **Mechanical Energy:** Energy possessed by an object due to its motion or its stored energy of position. Mechanical energy can be either kinetic energy (energy of motion) or potential energy (stored energy of position).
- **Kinetic Energy (KE):** Energy of motion. $KE = \frac{1}{2} \text{ mass} \times \text{velocity}^2 = \frac{1}{2} mv^2$ Note that small changes in speed can result in large changes of KE (because speed is squared). Net force x distance = KE. Includes heat, sound, and light (motion of molecules)
- **Potential Energy (PE):** Energy of position; energy that is stored and held in readiness. Includes chemical energy, such as fossil fuels, electric batteries, and the food we eat.



Completing the Badge

This lab's activities fulfill the requirements for steps 1, 3, and 4 of the Entertainment Technology Badge. To earn the badge, scouts must complete Steps 2 and 5. There are resources provided in the Girl Scout Entertainment Technology Badge booklet, but we have also provided some resources below for completing those steps:

Step 2: Dig into Video Game Development

Here are a few websites where you can download free or low-cost software for simple game development

- GameSalad: This app features a drag and drop interface that makes game development easy and fun.
 - <https://gamesalad.com/>
- Stencyl: This app has free and paid versions. The free version allows for full game making capability; paid version allows publishing to the iOS and GooglePlay store for profit.
 - <http://www.stencyl.com/>
- GameMaker: Studio: This app is excellent for first time game developers and has an easy to use interface
 - <https://www.yoyogames.com/gamemaker>

Step 5: Surf a Sound Wave

The following instructions are for building a tonoscope – a device that creates a visual representation of sound waves.

1. A tonoscope is a device that visibly demonstrates the energy in a sound wave! Swiss scientist Hans Jenny invented the tonoscope, in an effort to discover more about wave phenomena. The study of wave phenomena is known as cymatics.
2. This interesting video (<http://www.youtube.com/watch?v=GtiSCBxbHAg>) shows a cymatic plate – a metal plate sprinkled with sand that is positioned over a speaker, while the speaker plays a sound of gradually increasing frequency. As the frequency increases, the energy from the sound wave coaxes the sand into varying shapes!
3. To build a Tonoscope, you will need the following materials:
 - (1) 3" x 3" x 2" PVC Elbow joint
 - (1) 2" x 2' PVC pipe
 - (1) Pair of scissors
 - (2) Rubber Bands
 - (1) Balloon or rubber membrane
 - (1) 1.5 oz Solo cup full of sand
 - (1) 1.5 oz Solo cup full of salt
 - (1) Pie plate
4. First, a membrane needs to be stretched over the large upright elbow joint opening. The membrane in this case is a balloon. Cut off the narrow part of the balloon, and then stretch the larger part over the opening. Use the rubber bands to secure the membrane. Once the membrane is secure, you may want to stretch it a bit more for maximum tautness.
5. Next, securely attach the 2" PVC pipe to the 2" diagonal elbow joint opening. Take the 1.5 oz solo cup with your desired material, then sprinkle a substantial amount on the membrane. Use your finger to spread the material evenly across the membrane.
6. Finally it is time to test it out! Place the base of the tonoscope into the pie plate (to collect the sand / salt that spills over) and make some noise into the open end of the PVC pipe! For best results:
 - (1) Do not blow into the tonoscope; this will only inflate the membrane. One needs only hum or sing (like a kazoo).
 - (2) Start with a soft tone and gradually get louder.
 - (3) Start with a low tone and gradually get higher.