

Patch Program

Worlds of Science

Dive back into the mind-blowing science experiments that made Girl Scouts fall head over heels for STEM! Get ready to unleash your inner genius with activities that let you explore the wonderful worlds of health, humanity, art, and the great outdoors.

Be entered into our featured patch sweepstakes! Patch purchasers will be automatically entered into our sweepstakes, with the chance to win one of three [Young Scientists Club Science Adventures Pack](#). Read the [sweepstakes rules](#) for details.

Grade level requirements:

- **Daisies (grades K-1).** Choose one activity from each category.
- **Brownies (grades 2-3).** Choose two activities from each category.
- **Juniors (grades 4-5).** Choose two activities from each category.
- **Cadettes (grades 6-8).** Choose three activities from each category.
- **Seniors (grades 9-10).** Choose three activities from each category.
- **Ambassadors (grades 11-12).** Choose three activities from each category.

When you're done, [submit photos](#) and a story to inspire other Girl Scouts to earn this patch, too. [Purchase patch](#) by June 30, 2025.

Sources: McCreedy, Dale, and Kate Tabachnick. *Science in the Worlds*, The Franklin Institute, Philadelphia, PA, 1992.

McCreedy, D., McAndrew, E., Paquette, M. F., & Tabachnick, K. (n.d.). *Science Sleuth*. The Franklin Institute.

Discover

Your enthusiasm for science can flourish in any setting! Perhaps it's a person in your community or an experience at a Girl Scout event that ignites that passion. You'll never truly discover the possibilities until you immerse yourself and explore the vast realms that science presents.

- **Picture a Scientist** - There are many worlds of science to explore. Some sciences explore health, others explore art, and even the great outdoors. Think about your favorite world of science then draw a picture of a scientist in that field. Creativity has no limits in this activity! Practice creating a picture of your scientist using different mediums or materials. You can draw a picture or digitally create an image of a scientist.
- **Create a Scientist Journal** - Many famous scientists started their exploration with a spark of passion, just like you! Gather pictures and information about some of the scientists listed below. During your research investigate why the scientist is famous, what inspired that person to become a scientist, and what type of work they do. Use the information and pictures you collect to make a Worlds of Science journal.
 - Elizabeth Blackwell
 - Jane Goodall
 - Anita Harris
 - Sally Ride
 - Sylvia Acevedo
 - Ellen S. Richards
 - Maureen Raymo
 - Sandra Faber
 - Beverly Goodman
 - Marcia McNutt
- **Catch the Beat** - To discover the world of health science try this experiment. What is the strongest muscle in your body? If you guessed your heart, you're correct! Your heart rate is the number of times your heart beats in one minute. To calculate your heart rate, find your pulse by placing your index and middle finger on a pulse point. Two easy pulse points are located on your wrist, just below your thumb, and just

underneath the jaw on both sides of your neck. Count the amount of beats you feel for 30 seconds then multiply that number by two to calculate your heart rate. Heart rates are measured in beats per minute. Practice calculating your heartbeat while resting, after jumping 25 times, and finally after three minutes of dancing. What difference do you notice in your heart rate after each activity?

- **Blending Colors** - To discover the world of science in art try this experiment. Create a color spinner and explore what happens when colors of the rainbow are combined. Cut out the color wheel and color each section a different color of the rainbow in ROYGBIV sequence. Tape your color wheel to cardboard circle and make a small hole through the center. Stick a pencil through the hole to create a spinning top. The wheel should rest in the middle of the pencil securely for the spinner to work properly. Practice spinning your wheel and expressing what colors you see. Did you notice yellowish or grayish color while the spinner spun? When the color wheel spins rapidly, your brain cannot process each color separately. As a result, color images are blended and appear as a mixture of all the colors. Try this experiment with your troop or family. What colors do they see when you spin your spinner?
- **Geo-walk** - To discover the world of science outdoors try this experiment. Think of an outdoors area that you like to visit often. This place should have numerous signs of erosion. Erosion is the process where natural forces, like wind, water, or ice, remove and transport soil or rock material from one location to another. Examples to look for include erosion on a hillside, plants growing on rocks or splitting rocks, and wind or water erosion. Visit the place you had in mind then complete a treasure hunt on your trip. During your treasure hunt find one example of each erosion scenario mentioned in the list below. Use a journal or camera to document your discoveries during the treasure hunt. When you are done, share your discoveries with your troop.
 - Erosion on a hillside.
 - Plants growing on or in splitting rocks.
 - Signs of wind or water erosion.
 - Rocks that have been weathered.
 - Signs of nature that is changed by animals or people.
- **Scientific Observations** - Let's practice doing what scientists do! Scientists make a lot of observations in their respective fields of study. In this activity you will closely observe different fibers. Fibers are small natural and manufactured units of matter. Fibers can be spun into yarn, woven into fabric, or bonded together. Most often we see fibers in our clothing, but fibers are also found in the newspaper we'll work with today. Grab two full sheets of newspaper and a magnifying glass to practice making

your own observations about its fibers. To observe the fiber's durability, color, and texture begin ripping the newspaper into pieces carefully. Slowly rip the pages in a variety of different directions first horizontally, then vertically. Does the paper rip more easily one way than the other? Do the torn edges look different? Where do you think fibers in newspaper come from? Continue ripping the paper into stamp-sized pieces. When you're done observing, look for a recycling plant in your community that would take your paper scraps or research ways to make recycled paper. For more exploration use your magnifying glass to observe the fibers in your clothing.

Connect

Your inner genius is blossoming, and now is the perfect moment to elevate your discoveries. Embrace the opportunity to experiment with the world around you.

- **Suspended Geodes** - Geologists are scientists that study Earth's structure and the processes that have shaped our planet. They study a wide variety of topics including rocks and minerals. For this experiment grab the ingredients listed below and practice making sugar crystals with your troop. Combine three cups of sugar and three cups of water in a pot. Cover the pot and heat the mixture until all the sugar has dissolved, stirring occasionally. Initially, the solution will appear cloudy, but it should clear up within 10 minutes. Once it becomes clear, immediately turn off the heat to avoid caramelization. Cover the pot and allow the sugar solution to cool to room temperature. When it has completely cooled, transfer it into a large jar. Pour $\frac{1}{4}$ cup of the syrup into a clear bowl. Add a sprinkle of sugar directly into the bowl. Next, cut a length of nylon fishing line measuring 20 cm, and tape one end to a stick. Suspend the other end of the line into the bowl. For this experiment, it's not necessary for the entire line to be coated in sugar crystals—just one or two will work. Leave the bowl sit overnight, and by the next day, crystals should start to form on the line. Once this happens, remove the fishing line from the bowl and hang it (along with the attached crystals) in the jar of your remaining sugar solution. Cover the top of the jar partially with plastic wrap to prevent a sugar crust from forming on the solution's surface. Place the jar in a cool, shaded area and wait for the crystals to grow larger. Once you feel the crystal has reached the desired size, remove it and dry it with a paper towel.
 - A saucepan
 - A clear bowl/dish
 - Three cups of sugar
 - Wooden spoon

- Mason jars with lids
 - Measuring cup
 - Paper towels
- **Make a Spectroscope** - Astronomers are scientists that investigate the universe and our galactic backyard. They use a variety of tools to help them make observations and draw conclusions about the world around us. One tool is a spectroscope; this tool splits starlight into a light pattern. Astronomers use this pattern to learn the age of stars, what gases the star is made of, and how hot the star is. Use an empty toothpaste box to make your very own spectroscope to use on lights here on Earth and around your home. Your box opens at both ends and has a tongue that folds in and a pair of ears. Cut a square of construction paper with all four sides equal to the length of the toothpaste box. Roll the paper loosely and insert it into the box. Cut two more pieces of construction paper that are the same size of each end's openings. Tape these smaller pieces of paper to the inside of each tongue to create a black-box effect. With a hole puncher, punch a hole in the center of the dark paper and tongue on one end, then close the flap. On the opposite end cut a small viewing slit at the top of the box, in the middle of the tongue. Tape this end closed but avoid covering your viewing slit with tape. Cut small pieces of [diffraction](#) grating paper larger enough to cover the punched hole. Tape the diffraction paper over the hole and avoid covering the hole with tape. Close your box and your spectroscope is ready! Look through the hole and point the slit directly at a light source in your house. You should see a small rainbow appear in your spectroscope. Try looking at different types of light for any differences. Remember to never look directly at the sun with your spectroscope!
 - **DNA Extraction** - Molecular biologists are scientists that study the genetic makeup of cells to better understand human biology. They conduct experiments to observe and manipulate DNA. In this experiment you will practice extracting DNA from fruit. Gather a few strawberries, place them into a sandwich sized Ziploc bag, then gently mash the fruit in the bag thoroughly. Place the bag in a safe place then begin creating an extraction solution. To make your extraction solution, mix two teaspoons of dish soap, one teaspoon of salt, and half a cup of water in a small cup. Once your extraction solution is ready, slowly pour the solution into the bag of mashed strawberries and gently mix the solution into the strawberries. Next, grab a coffee filter or cheesecloth to filter your strawberry solution. Place the cloth or filter over an empty cup and pour the strawberry mixture into the cup. Slowly pour chilled rubbing alcohol into the filtered strawberry solution and gently stir with a skewer. As you stir, the skewer should collect a stringy, slime-like substance. This substance is strawberry DNA! Take a few minutes to make observations. Be sure to log your observations in your Worlds of Science journal.
 - **Build a Water Clock** - Water clocks date back to some of the earliest civilizations and come in all shapes and sizes. Over time water clocks were replaced with sand

clocks because sand did not freeze in the cold or evaporate in the heat. This simplified water clock design will help you determine the time by measuring the flow of water from one container to another. For this activity you will begin by gathering a 2-liter clear plastic bottle, scissors, a compass or drawing pin, a marker, stopwatch, and food coloring. First, cut the bottle in half then unscrew the bottle top and poke a small hole in it. Next you will flip the top half of your bottle upside down and insert it into the bottom half of your bottle. Fill the top half of the bottle with water. You can add a few drops of food coloring to your water to make it more visually appealing. Watch a clock as the water drains and mark lines on the bottom half of the bottle to indicate measures of time (i.e. 30 secs or one minute). Once you calculate the amount of time it takes for the water to drain, your water clock is ready for use! You now have a timer to use for a variety of activities. For more fun, add more bottles to your design, build a bigger clock, or explore ways to measure longer amounts of time.

- **Craters on the Moon** - Take a journey to the moon for crater samples. Don't have a rocket? No problem! This experiment can take place in any open space. Spread a layer of flour in a tray then sprinkle cocoa powder over the top of your flour layer. Look around for small rocks, balls, or marbles. You will pretend that these items are meteoroid debris that causes craters on your moon surface. Drop your small rocks, balls, or marbles into the tray from a variety of different heights. Observe the different moon craters formed after each drop. Do you notice a difference in crater sizes or shapes? Brainstorm other reasons for changes in your crater impacts.
- **Leaf Chromatography** - Colors of the rainbow are all around us! Sometimes we see them and other times they're hidden in the science around us. In this experiment you will explore the different color pigments found in a leaf. Leaves contain multiple pigments - chlorophyll is typically green, carotenoids are typically yellow or orange, and anthocyanins are typically red or purple. Collect an assortment of leaves and tear them into small pieces. Place the pieces of leaves into a bowl and pour a small amount of rubbing alcohol into the bowl. While the leaves are soaking, use a spoon to crush the leaves. This will help the leaves release the pigments they contain. Pour the leaf and rubbing alcohol mixture into a glass mason jar, cover the jar with plastic wrap, and let the mixture sit for 30 minutes. While your mixture sits, take a coffee filter and cut a one-inch-wide strip. Make sure the strip of filter paper is long enough to reach the bottom of your mason jar. Place one end of the strip into the leaf mixture jar, making sure it touches the liquid. The other end of the filter strip will hang over the edge of the jar. Observe what happens to the strip over the next hour. As the liquid travels up the filter, pigments from the leaf will become visible and may even begin to separate into different colors.

Take Action

As a Girl Scout, you can make the world a better place!

- **Plan a Moon Watch Party** - Moonlight is actually light from the sun reflected off the moon. On Earth we always see the same side of the moon, but as the moon orbits, we see different portions of the illuminated surface. Use your World of Science journal to record observations of the moon each night over a weeklong period. Invite other Girl Scout members to join you then share your observations at a future troop meeting.
- **Visit a Paper or Recycling Plant** - Research paper plants near you, then plan a trip to visit the plant and learn about the process of making paper. Explore the different fibers the plant uses to create paper. Take pictures during your trip and share what you learn with a younger Girl Scout troop.
- **Interview a Scientist** - Visit your local library, ask adults in your troop, or explore the web to compile a list of science contacts in your community. You're encouraged to find contacts with a variety of scientific backgrounds. Choose three contacts from your list, then request an opportunity to meet with them for an interview. Use the list of questions below to help conduct your conversation during the interview. After your interview is complete, send a thank you note to each scientist.
- **Host a Science Fair** - Invite local Girl Scouts to showcase their passion for science! During the Science Fair encourage Girl Scouts to present science projects or dress up as a famous scientist and present a project detailing that scientist's work. Presentations can include but are not limited to poster boards, experiment demonstrations, or interactive activities. Girl Scouts should have the option to participate independently, in small groups, or a troop. For more fun, think of a fun and exciting theme for your science fair event.
- **Get Involved in Citizen Science Projects** - Contribute to real-world scientific research by collecting data, observing nature, identifying flora and wildlife, or participating in online games. Here's a list of projects that you can research more information about online.
 - NASA's GLOBE Observer
 - iNaturalist's City Nature Challenge
 - Girl Scout Climate Challenge
 - Girl Scout Tree Promise
 - Great Sunflower Project
 - Globe at Night
 - Squirrel Ecology
 - Bee Photo Project
 - Seasonal Changes

- **Trash to Treasure** - Collect discarded materials and transform them into unique art pieces that highlight the issues of waste and pollution in your community.