by Cindy Steele

Gee, I Love Geodes!

Welcome back to Puddles' Craft Corner. Geodes are one of the great mysteries in the rock and mineral world! On the outside, they look like a plain uninteresting rock. But break them open, and you find the most amazingly beautiful crystals hiding inside!

Geodes, for kids, are a wonderful introduction to geology and provide a hands-on tool for learning how rocks are formed.

Geodes might look ordinary on the outside, but their beauty is on the inside. In Greek the work geode means "shape of the Earth". A geode is formed with a mixture of liquid and minerals fill the empty space of a hollow rock. Geodes are created over time. It may take millions of years for the space inside the rock to be filled.

So, What Are Geodes Anyway?

It seems humans have been forever fascinated by geodes. Maybe it is our deep-seated pursuit of a hidden treasure, of which the geode caters to. Think of it, an unassuming rough rock that when opened up, reveals a hidden and hollow sphere of crystals within. The so-called “diamond in the rough.”

So, what exactly makes up these inside globes of sparkly materials? Simply speaking, geodes are hollow rocks that contain an insanely beautiful array of crystal formations inside. And depending on the minerals that make up the geode, different geodes will contain different kinds of crystals, such as amethyst, agate and quartz.

Geodes can be found in locations all over the world and can be anywhere from s few inches to tomb sized geodes that may weigh upwards of a ton!

How Do Geodes Form?

Geodes can occur within either volcanic or sedimentary rocks. Beginning as hollow bubbles inside other rocks, geodes form over many years. Basically, geodes are sedimentary rocks, the crystals within the bubbles forming as a result of a chemical reaction that leads to precipitation of minerals that become those crystals.

The outer shell of a geode is made of a very hard rock, and crystals form inside geodes only when the perfect combination of temperature, pressure changes and evaporation exist. As water seeps into the rocks around a geode, minerals are

deposited inside the hollow rock. Typically, these minerals become agate and quartz, which form in layers very slowly, over the course of thousands of years.

Geode crystals can be large or small, filling the entire cavity of the outer shell or creating rings of crystals lining the shell. The outer rind of geodes is usually bumpy and made of a type of quartz called chalcedony. However, just because a rock has an outer layer of chalcedony and has a lumpy appearance does not mean that it is a geode – it needs to be cracked open to discover whether there are crystals inside.

- ***Volcanic Geodes***

  The most widely known and most popular geodes are those that formed in areas of volcanic activity. Empty spaces in cooling lava flows often are filled with agate, quartz, opal, and other material delivered by hydrothermal water or groundwater. Some spaces are occupied by gases that were trapped in the lava flow before its surface cooled and crusted over.

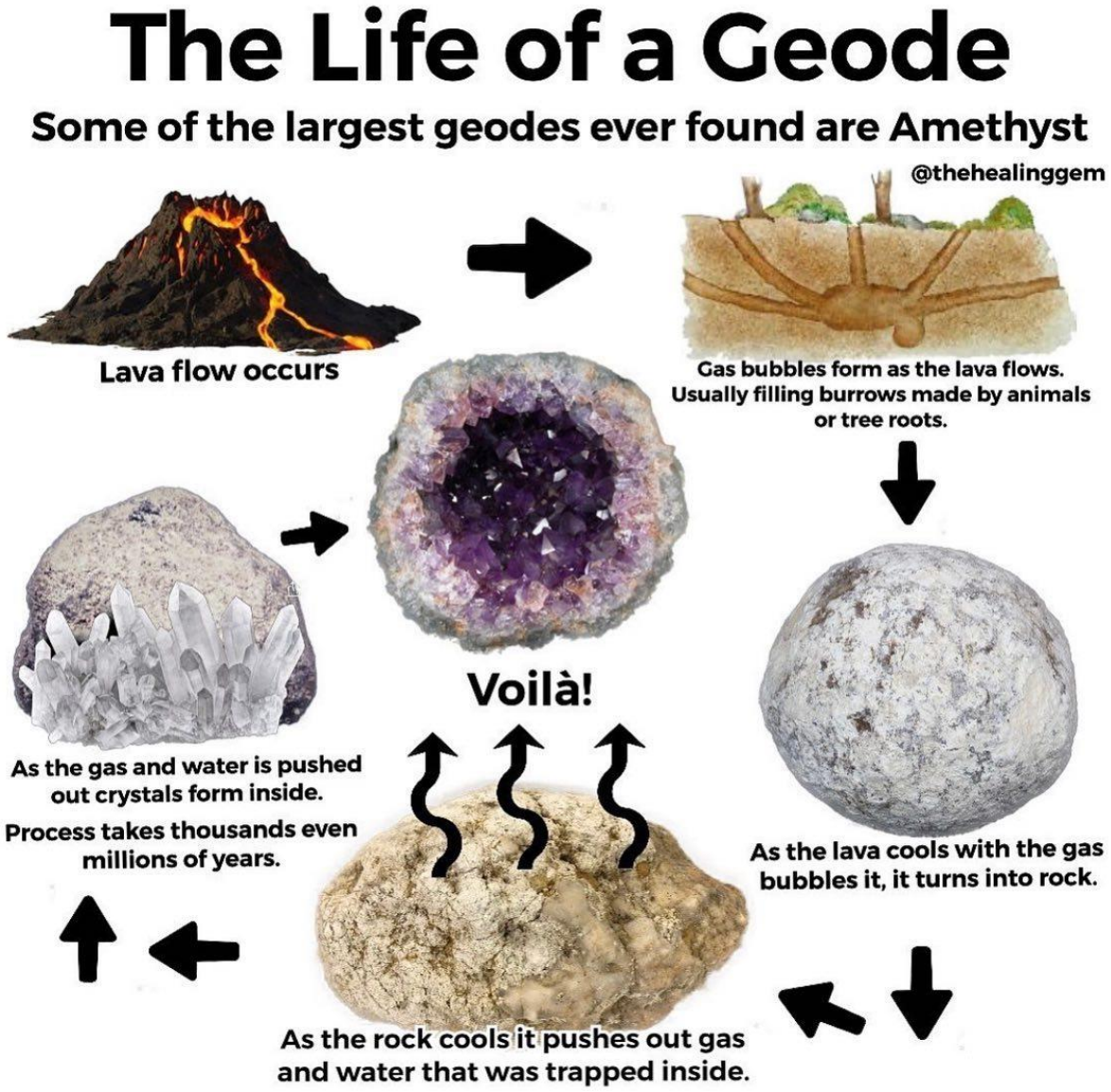
  Where does all of the gas come from? Some magmas contain a lot of dissolved gas. When these magmas move up to the surface, the gas expands. When the magma erupts as a lava flow, so much gas is released that not all of it is able to escape. Some of that gas can be trapped in the lava to produce a large cavity when the lava solidifies.

  Other hollow spaces in solidified lava flows were produced as liquid lava flowed out after the flow was only partially solidified. These small "lava tubes" produce some of the largest and longest geodes. Many cathedral geodes are branches of these lava tubes that later infilled with mineral material. Many of them have the geometry of long tree branches, being nearly three to four feet across and several feet long.

  That's when the real magic begins to happen.

  These hollow rock shells are porous, so over time mineral-rich groundwater or rainwater will begin to seep inside. Layers upon layers of minerals begin to line the cavity.

  Because the mineral-rich water that seeps inside geodes is different, that is why the insides of geodes look different. The inside could be filled with quartz crystals, hematite, dolomite, calcite, and agate.



- ***<u>Sedimentary Geodes</u>***

  Geodes in sedimentary rocks are usually found in limestones, dolomites, and shale. In these deposits a gas-filled hollow space can serve as the opening for geode formation. Shells, tree branches, roots and other organic materials often decay away to leave a hollow space for the formation of mineral materials. These cavities can be filled with quartz, opal, agate, or carbonate minerals. They are usually smaller than the geodes formed in volcanic rocks.

Geodes are most easily collected when their host rocks have weathered away. This can occur because basalt, limestones, dolomites, and shales weather much more readily and rapidly than the quartz and chalcedony that typically form the outer layer of a geode. The host rock weathers away, and the geodes are left on the surface, washed into a stream, or stranded in a residual soil. In these situations, the geodes are easily found and collected. Some geodes are produced by mining the host rock, but that method is difficult, costly, and often damages the geode.

What Are the Colors, Shapes, and Sizes of Geodes?

It is possible to synthetically alter the color of geode crystals, but there is a wide range of naturally occurring geode colors. Most geodes are composed of chalcedony, quartz, and agate.

Blue Agate That Has Been Polished

Layers of chalcedony can be white, gray, blue, yellow, or orange, and the color depends on the location where the geode formed. Quartz can appear transparent, white, or purple; purple quartz is often referred to as *amethyst*, which is

Amethyst Cathedral Geode

the most valuable variety of quartz. The color of agate layers inside a geode depends on the minerals in the stone, and can include shades of red, blue, green, and copper.

Most often, geodes are round or oval. They vary in size from under an inch to several feet wide.

Where Geodes Are Found

Most geodes are found in desert regions, but they can be found nearly anywhere that has limestone or volcanic rock in the environment. In the United States, geodes are most likely to be found in Indiana, Iowa, Missouri, Illinois, Kentucky, and Utah. Across the globe, geodes are commonly found in Mexico, Australia, Brazil, Uruguay, and Namibia.

How To Break Open Geodes Safely

Hunting for geodes takes time and patience but requires only a few simple tools. Safety googles, a hammer, and a rock pick are all you need to get started searching for geodes. *The safety goggles are the most important tool. When broken, pieces of the geode could fly up, so eye protection is very important!

Once you think you've found some geodes, there are several ways to reveal what's inside the rocks you've collected in the field. If you can't stand the suspense, you could crack your potential geode open with a heavier rock right

when you find it, but this method may smash a valuable geode into many fragments. For a cleaner break, geologists use a rock or tile saw to cut potential geodes in half evenly – which will give you one half to keep and another to share with a friend!

Breaking Open a Geode with a Pick Hammer

Using a Special Cutter to Cut a Geode in Half

Several huge geodes have been found is many different places around the world. The largest amethyst geode in the world is the 'Empress of Uruguay'. This huge geode is eleven feet tall and weighs two and a half tons! It is located in Atherton, North Queensland, Australia.

Miners working on mining in the country of Uruguay found one of the most unusual geodes that has ever been found. While chipping away at the rocks, they discovered this amazing quartz geode at the border of Uruguay and Brazil when they split open a rock to discover a beautiful purple heart on each side of it. Experts who have studied this geode have authenticated it as a true geode formed in nature!

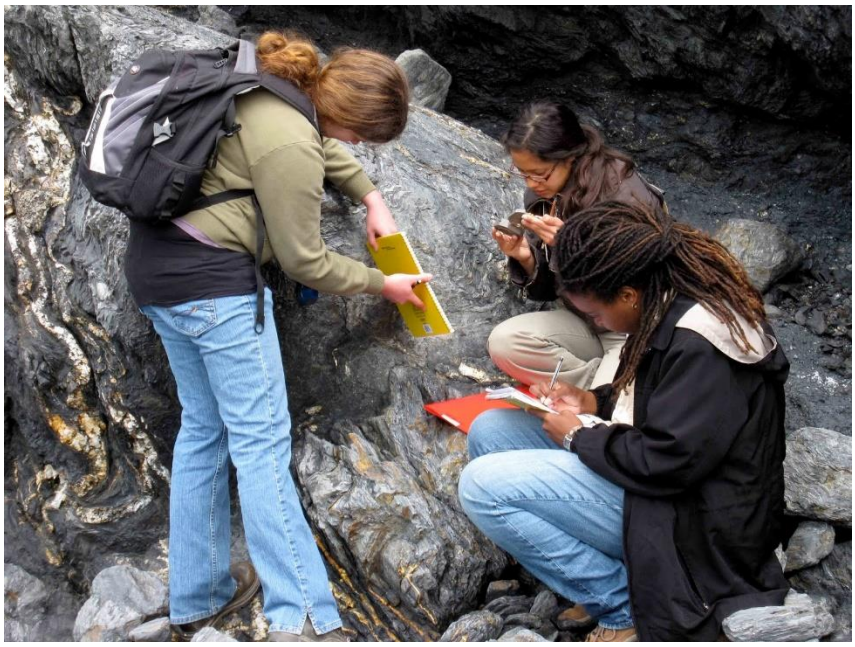
Geode Jewelry and Decorations

Small geodes are often sliced and polished. Especially nice slices might be displayed in specially made frames or stands. Some have their translucent beauty displayed in stained-glass panels or windows like the photo. Less spectacular specimens might be dyed and used to make wind chimes, coasters, or decorative magnets. Small sections of geodes with attractive and colorful crystals are often sawn into small pieces that will stand upright or into slabs that are used as display items. Many small geodes are polished and used as beautiful jewelry, also.

Examples of Jewelry Made into Jewelry

I Want to Be a Geologist!

Have you ever found an interesting looking rock outside and wondered where it came from? Then you were thinking like a geologist! A geologist is a scientist that studies the surface of the Earth and what it is made of. This branch of science is called geology, which means the study of rocks, minerals, and geodes of the Earth. If you like digging in the dirt, then this may be the job for you!



What Do Geologists Do?

- Geologists do many things, not just study rocks. Being a geologist may bring you to some interesting places around the world to study landforms and other geologic sites. Here are a few things geologists do:

- Collect samples of rocks, soil, and sometimes fossils like dinosaurs from all over the world.

- Study how the Earth changed over time to look like it does today.

- Measure the impacts of natural disasters like earthquakes and volcanic eruptions.

- Monitor soil quality for the best farming.

- Geologists use skills from many other types of science like chemistry, physics, and biology to make connections between the causes and effects of Earth processes.

- If you think you want to be a geologist when you grow up, you can already start taking steps to get there! Some things you can do are:

1. The first thing you can do is to try your best in your science and math classes.
2. Visit your local museums and nature centers to learn about the geology of your area.
3. Take any rock and mineral classes offered in your area, if possible.
4. Get out and get hands-on experience! Volunteer at a local museum or heritage center that has a rock and mineral collection or a focus on geology.
5. Make sure you enjoy being outdoors. A lot of a geologist's time is spent outdoors.
6. Be sure you also like research and working in a lab. If a geologist isn't outside on a dig site, they are probably researching information or working in a science lab.
7. Probably, most of all, be sure you like to learn new things! The science of geology is basically about learning new things in school and college, and the actual job is all about learning and discovering! What could be a better job!!!

Here's A Simple Fun Science Activity Showing How to Make Your Very Own Simulated Geode!

Courtesy of onelittleproject.com

There are many ways to grow your own crystals! Using Borax and brightly colored chenille stems (pipe cleaners) is one of the easiest and beautiful! Use these pipe cleaners and a simple borax and water solution to grow your own crystal gems. This is such a pretty and fun science experiment!

Here's what you'll need:

1. A box of borax (found near the laundry detergent at the store)
2. Brightly colored chenille stems (pipe cleaners)
3. Popsicle sticks
4. Thread
5. Glass jar
6. Water
7. Glass bowl or measuring cup to heat the water.
8. Scissors
9. Food Coloring (if you want very intense color)
10. Measuring cup

Directions:

*****This experiment requires hot water, so adult supervision is especially important. Parts of this need to be done by the adult.***

Making borax crystals is such a cool science experiment! It takes a bit of patience to let the crystals grow, but the results are amazing!

Borax crystals are a great chemistry experiment showing the recrystallization process. Kids can see how molecules react to different temperatures, and literally see changes in matter as the crystals form.

Borax is a naturally occurring compound made from boron, sodium, and oxygen. Borax is also known as sodium borate or sodium tetraborate.

The borax we buy is the natural element, ground down into powder. Most people use borax as a “laundry booster” or as a household cleaner.

Borax is a soft crystal mineral that is soluble, meaning that it can be dissolved in liquid (especially water). With this experiment we are dissolving as much borax as possible in the hot water, creating a “supersaturated solution”.

Cold water doesn't hold as much borax as hot water. So as the supersaturated borax and water solution cools down, the borax separates from the water and forms crystals on whatever is placed in the solution.

Your borax crystals will technically be clear or translucent. But the crystals will look like they're the same color as the pipe cleaner they're growing on. So, if you use a purple pipe cleaner, your borax crystal will look purple.

You can add food coloring to your borax solution to make the color stronger, but we find that it really isn't necessary since the pipe cleaner colors are already so bright. If your crystals become very thick on the pipe cleaners, the color may not show through and the food coloring makes it show up much better, but it is your choice.

Instructions:

Step 1: Shape your crystal base.

- Bend 2 to 3 pipe cleaners around each other to form your crystal's shape.

- Choose whatever shape you'd like for your crystal! Make sure there aren't any gaps or holes between the pipe cleaners.

- Cut an 8-inch piece of thread.

- Tie the thread onto one of the pipe cleaners.

- Tie the other end of thread to a popsicle stick. Suspend the pipe cleaners in the mason jar, testing to make sure they don't touch the bottom or sides of the jar.

Step 2: Prepare borax solution.

- Pour 3/4 cup of borax into 2 cups of boiling water.

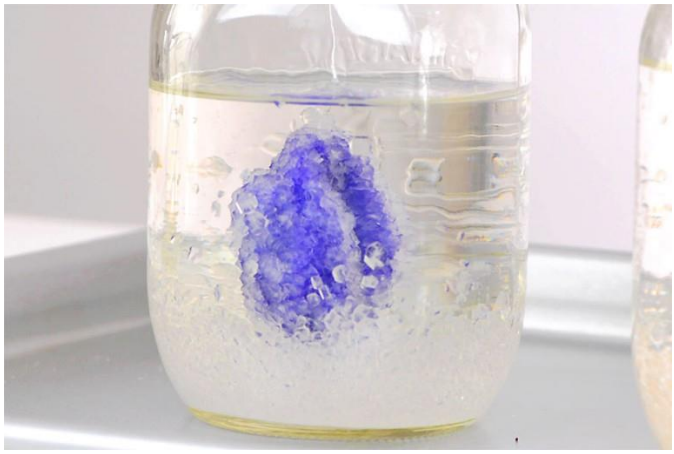
- Stir the borax and water together until the borax is fully dissolved. If the borax isn't dissolving, microwave the jar for 30 seconds at a time until it's dissolved.

- Pour the borax solution into the empty mason jar.

- Drop in your pipe cleaners, resting the popsicle stick on the mouth of the jar.

Step 3: Wait for the crystals to form.

- Let the pipe cleaners sit in the borax solution for 8 to 24 hours. Watch the crystals grow!



- Lift up the popsicle stick to remove the crystal from the borax solution. Cut off the thread as close to the crystal as possible. Set the crystal on a paper towel to dry.

- Your borax crystal is complete!

Helpful Tips:

You can microwave your borax solution after it is stirred to get it really hot. The hotter the better!

When you're done with the borax solution you can pour the remaining liquid into a load of laundry or down the drain with more hot water to dilute it.
If you can't get the crystals off the bottom of the jar, fill the jar with hot water to cover the residue and microwave until the crystals have dissolved again.

Puddles, the Blue Goose, is ready to help us make our very own geode! Hands-on activities are some of the best ways for kids to learn about something. Hands-on activities allow children to use their senses while learning. They see, touch, and move real objects to complete tasks. This means that science, nature, and more are amazingly brought to life! Children begin to understand the meaning behind what they are doing.

Now, let's gather up a few supplies and make our very own crafty geode!

Let's Make Geodes!

Materials:

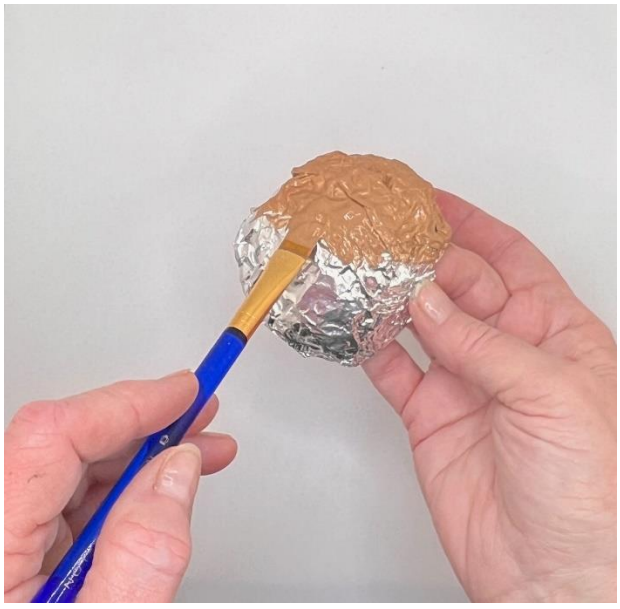
1. Epsom Salts
2. Food Colorings
3. Aluminum Foil
4. Glue
5. Plastic Cups
6. Paint Brush
7. Light Brown Paint

Procedure:

1. Gather all materials. You can find Epsom salts in the pharmacy section at the grocery store. You need a square of aluminum foil about 12” x 12”.

2. Mold the foil into a small bowl shape. It should look like a half of a geode that has been broken open. Don't worry about it being bumpy. It's supposed to be the texture of the outer geode rock.

3. Let's Paint the back and edge of the geode brown to match the rock exterior of a geode. It may take two coats to cover the foil. Get the paint into all the crevices on the back. Paint the top edges brown, also. Let this dry.



4. While the paint is drying, decide what color you want your geode crystals to be. Put about a half cup of epsom salts into a cup, add several drops of food coloring, and stir with a popsicle stick or a plastic spoon. Keep adding food coloring until you get the intensity of color that you want.

5. Now, pour quite a bit of glue into the bowl of the geode. Spread it all around the inside…all the way up to meet the painted edges. Be sure to have a thick coat of glue to hold the crystals.

6. Now for the fun part, pour your beautifully colored crystals into the geode! Put your geode in something to catch the extra crystals. Pour in the crystals. Be sure to get a thick coat of crystals everywhere there is glue. Pat it down a little bit to be sure the crystals are really stuck to the glue.

7. Let your geode sit for a little bit to be sure that lots of crystals are stuck to the glue. Then, pour out all of the extra crystals.

8. Finally, look how your finished geode sparkles! It will need to dry completely before handling very much!

9. The blue geode was so pretty, I decided to make three different colored geodes! I made blue, pink, and yellow geodes! What colors will your geodes be?

If you would like to take this one step further and learn more about paleontology and fossils while reading a charming children's book, here are some terrific fiction and fun nonfiction books with beautiful artwork:

Cracking Geodes by Lily and Charlotte Fisher

Dig and Discover Geodes by Nancy Dickman

Rocks, Minerals, and Gems by Miranda Smith and Sean Callery

Rocks and Minerals: National Geographic Kids by Kathleen Zoehfeld

Gems for Kids by Lee Hall and Ashley Hall

Puddles is excited for next month at Hagerman National Wildlife Refuge. Check out our April Newsletter for another fun craft celebrating Spring at the Refuge!