

Grade 4	Lesson: Types of Rocks Part 3—Metamorphic	Reference to English Interconnections Lesson The Rock Cycle pg. 27 Igneous Rocks Pg. 35
Science Standard(s): Standard III Objective 1 Indicators c and d		
Content Objective(s): Teacher objective: Students will classify common Utah rocks and sort them by appearance according to three basic types: sedimentary, igneous, and metamorphic together with their group and individually on their exit tickets. Student objective [posted] <i>I will be able to classify common Utah rocks and sort them by appearance according to three basic types: sedimentary, igneous, and metamorphic together with my group and individually on my exit ticket.</i>		Language Objective(s): Teacher objective: Students will be able to categorize and describe common Utah rocks by sorting them into groups with my group and independently on my exit ticket. Student objective [posted] <i>I will categorize and describe common Utah rocks by sorting them into groups with my group and independently on my exit ticket.</i>
Essential Questions: What is the Rock Cycle? How are the different types of rocks made?		Required Academic Vocabulary for Word Wall: Listen: rock cycle, igneous, sedimentary, metamorphic, minerals, lava Zuhören: der Gesteinszyklus, vulkanisch/magmatisch, sedimentär, metamorph, die Mineralien, die Lava Speak: minerals, rocks, Sprechen: die Mineralien, das Gestein Read: Write: Sentence Frame: Describing with Adjectives This metamorphic rock is ____, ____, and ____. It is also ____ and ____. Satzbau: Das metamorphe Gestein ist ____, __ und ____. Es ist auch ____ und ____.
Materials: • “Types of Rocks” worksheet (1 per student) • Bread • Salt Water Taffy 2-3 per student • Igneous Rocks Set—1 per table (obsidian, basalt, granite, pumice) • Sedimentary Rocks Set—1 per table (sandstone, shale, conglomerate, limestone) • Metamorphic Rocks Set—1 per table (marble, schist, slate, gneiss) • Descriptive Word Bank—One per table • Hand lens (1 per student) • Exit Tickets		Additional Lesson Vocabulary: Classification Characteristics Quickly Slowly die Einteilung, die Merkmale/Eigenschaften, schnell, langsam Descriptive Word Bank: Layers, Rounded (appearing minerals), Jagged, Cemented, Gritty, Grainy, Dark, Light, Colorful, Smooth, Rough, Shiny, Glasslike, Air holes, Crystals, Stretched, Heavy or Dense, light You can add more as needed! die Schichten, gerundet, zerklüftet, zementiert, grobkörnig, körnig, dunkel, hell, bunt, glatt, rau, glänzend, glasartig, die Luftlöcher, die Kristalle, gedehnt, schwer oder dicht, leicht
Lesson:		Instructional Time: 30 Minutes
Opening: (5 minutes) T: “We have begun our investigation into the rock cycle. We want to be able to describe how minerals and rocks change over time. We have discussed how igneous and sedimentary rocks form and today we will focus on the third and final rock group...Metamorphic Rocks. • Show students the Metamorphic Rock set. T: “Let’s take a look at our learning objective one more time. After today’s lesson, we should be able to meet our objective fully.” Point to the student objective and read it “I will be able to classify common Utah rocks, and sort them by appearance according to three basic types: sedimentary, igneous, and metamorphic, together with my group and		

individually on my exit ticket.' In your partnership, I want one of you to be partner 1 and one of you to be partner 2. Please switch so that you aren't the same as you were last time. Take 5 seconds to decide."

- Students turn to their neighbors and decide who is partner 1 and who is partner 2. Then regain their attention.

T: "We are going to use our questions and answers that we practiced in yesterday's lesson. Partner 1, when I say "go" you will ask your partner, 'What are we going to do today?'" Rewrite the question on the board or post it again. "Partner 2, you will read the objective on the board." Point to the objective. "Then Partner 2, you will ask, 'What is one thing we will learn today and how will we know we learned it?'" Rewrite the question on the board or post it again. "Partner 1 will respond to the question by explaining one thing the class will learn today and how they will know they learned it. Ready? Begin."

- Give the class 1-2 minutes. Regain their attention and begin the lesson.

Introduction to New Material (10 minutes)

T: "Igneous rocks are made from extreme heat. Sedimentary rocks are made from extreme pressure. When we add both heat and pressure, we get metamorphic rocks! I am going to give you something that you normally wouldn't think of as a science tool. Please keep it on your desk until I give you instructions."

- Give each student 2-3 pieces of taffy. Make sure that their hands are clean! When everyone is clean and ready, begin the instructions.

T: "Without talking, when I say 'Go,' I want you to unwrap all your taffy and begin to work with it as if it were clay or paly dough. At first it will be hard, but it will get easier as it warms up. Please work silently so that you can hear my instructions as you work. If it gets loud we won't be able to do this activity. You must be able to stop when I say 'stop.' Ready? Go."

- The students will unwrap their taffy and begin blending them together with their hands.

T: "Your hands are warmer than the taffy. As you work with it, you are adding heat. You are also pushing and applying pressure to the taffy by molding and mixing it with your hands. As you work with the taffy, the 2-3 separate pieces are becoming one large piece."

- Let the students work for about 5 minutes. When they are becoming one large piece you can stop them and regain their attention.

T: "Please put your newly formed metamorphic rock to the side for a minute." They will probably need to clean their hands! "Obviously, real rocks aren't formed by giant hands pressing layers together and heating them up. What do you think causes the extreme heat and pressure on earth that changes igneous and sedimentary rocks into metamorphic rocks?" Call on a couple of students to answer.

S: Heat from the center of the earth. They may understand that the pressure comes from the movement of the earth's crust.

T: "Great job! Real Metamorphic rock forms as other rocks change because of heat from the center of the earth and the movement of Earth's crust. We are going to learn more about this by finishing our notes packet. Please take it out of your desks and turn to the third and last page.

- Students will take the packet out as you put yours under the document camera and prepare the rock samples.

T: "We are going to continue practicing taking notes as we learn about sedimentary rocks. Let's read through this first part together again and I will help you fill it out as we go."

- Read through the first paragraph of the Metamorphic Rocks page and help the students fill in the blanks. Then help them see how rocks change from one to another due to extreme heat and pressure. Use both types of rocks. For example, hold up a piece of granite, talk about heat and pressure from the earth, and hold up a piece of Gneiss. Do this for all parts. Metamorphic rocks don't have to begin as Igneous or Sedimentary. They can also start as a mineral. Mica becomes the Metamorphic rock Schist.

T: "We have now finished all of our notes! Let's keep these so that we can use them in our studies later. Now we are going to investigate metamorphic rocks!"

Guided Practice: (10 minutes)

Pass out the word banks, hand lenses, and a Sample Box of Sedimentary Rocks to each table. Post the Sentence Frames 'This Sedimentary rock is __, __, and __.' and 'It is also __ and __.'

T: "Remember that these sentence frames can be used to put adjectives together to describe anything. We have used them to identify and describe igneous and sedimentary rocks and today we will use these same tools to describe the characteristics of our metamorphic rocks. On your table, I want you to number yourselves off from 1 to __" (This depends on how many students you have on a table or in a group—make sure that you have at least one rock sample per person in a group.) "Take 10 seconds to decide."

- Students turn to their neighbors and decide who is person 1, person 2, and so on. Then regain their attention.

T: "Thank you for being so fast. For this activity, we are going to use our sentence frames to describe the appearance of the rocks and decide how we can identify metamorphic rocks in the future."

Use the Modeling Cycle:

Teacher Does:

- Use a puppet, stuffed animal, or imaginary partner to use as your partner to model.

T: "I am Person 1 and my (puppet, stuffed animal, imaginary partner) is everyone else in my group. As Partner 1, first, I will pick a rock from the Metamorphic Rock Sample Collection that is on my table. I will use the word bank to find three words that describe it. I might say," (point to the sentence frame and hold up the gneiss) **"This metamorphic rock is, heavy, grainy, and has stretched layers."** Point to the next sentence frame on the board and say. **"My group will then see if there are any more words to describe that rock. Someone in my group might say,"** Have the puppet say, **"It is also rough and colorful."** After Person 1 has done this part, it is person 2's turn to pick a new rock and describe it using the first sentence frame.

Teacher Does with Student:

- Select a student to come up and model with you.

T: "I am Person 1 and _____ is Person 2, another person in my group. As person 1, I will pick the rock and three words to describe it." Point to the sentence frames on the board. **"My partner will then list 2 more adjectives."** Have the student hold up the sandstone. **"This metamorphic rock is, heavy, grainy, and has stretched layers."** Point to the second sentence frame.

S: It is also colorful and rough.

T: "Now person 2 will pick a rock and describe it with the first sentence frame." Have the student pick out a new rock and describe it using the sentence frame.

S: This metamorphic rock is rough, colorful, and heavy.

T: The same process will continue until everyone has had a turn picking a rock and describing it. I think you are all ready to do this without any more examples.

All Students Practice:

T: "Now I want you to work with your tables and repeat the process until everyone has had a chance to pick a rock. You will find that some of the adjectives are used multiple time and some aren't used at all. I will give you 8-10 minutes to do this activity. Ready? Begin."

- Give the class 8-10 minutes. Walk around the room monitoring their attention and use of the sentence frames. Make sure that everyone is participating. Regain their attention.

T: "You all did really well on this activity. Now, with your groups, can you decide on the 3 adjectives that were used to describe the most rocks? Take 1 minute to determine which ones you used the most and then we will share. Go."

- Let them discuss their adjectives. After 1 minute, regain their attention and call on one group at a time to share the top three adjectives they used to describe their igneous rocks.

T: "Metamorphic rocks usually have larger crystals and minerals. They often have stretched uneven layers. They may look like a stretched version of another type of rock. They are usually stronger and more durable than their sedimentary counterparts."

Independent Practice: (5 minutes)

Pass out the Exit Tickets

T: "For the last part of our lesson, you need to use your descriptive words to describe the appearance of igneous rocks. Please pick a metamorphic rock from the center of your table and use it to fill out your exit ticket on your own. You have 4 minutes. Begin."

Closing: (5 minutes)

T: "On the board you will see our learning objective for today. Let's see if we met our objective."

Point and refer to the objective on the board *'I will be able to classify common Utah rocks and sort them by appearance according to three basic types: sedimentary, igneous, and metamorphic together with my group and individually on my exit ticket.'*

"We have finally met our objective. You should now be able to classify Utah rocks as either Igneous, Sedimentary, or Metamorphic. When I say 'go,' you will turn to your partner and you will both read the objective on the board together one more time. Go." Give the class 20 seconds.

- Students read the objective.

T: "When I say 'go' Partner 1 will turn to Partner 2 and explain how they would describe metamorphic rocks. Go."

S: Metamorphic rocks have larger crystals and minerals, they are formed from other rocks and often have stretched layers.

- Get the students' attention. Have 2 or 3 students share.

T: "When I say 'go' Partner 2 will turn to Partner 1 and list at least 3 Utah Metamorphic Rocks that we learned about today. You can use your notes if you are stuck."

S: Gneiss, Marble, Slate, Quartzite, and Schist.

- Call on a high, medium and low student, in that order, to share.

T: "In order to get a better idea of how well we understand this, I want to do one more quick evaluation. When I say 'go,' I want you to give me a thumbs up if you think you could easily classify rocks as igneous, sedimentary, and metamorphic. If it would be a little hard and you would need some help, put your thumb sideways. If it would be hard and you would need a lot of help, point your thumb down. Ready. Go." Look around to see who needs more help. This is a concept that many of them will need more practice on. **"Great! Now that we know how different types of rocks are formed, in our next lessons we are going to study the next part of the rock cycle and learn how they break down again."**

Assessment:

- Use of sentence frames and adjectives
- Exit Tickets
- Thumbs up and down

Extra Ideas:

- Students need lots of extra practice learning which Utah Rocks fit into each category.

Types of Rocks—Answer Sheet

Igneous Rocks

Igneous rocks that EXIT the earth's crust are called EXTRUSIVE igneous rocks. Extrusive igneous rocks form from extreme heat, and cool very quickly when they come to the earth's surface. Usually you don't see crystals in them. Draw a picture to show how extrusive igneous rocks EXIT the earth's crust. Obsidian, tuff, pumice, and basalt are all extrusive igneous rocks.

Igneous Rocks that stay in the earth's crust are called INTRUSIVE igneous rocks. This type of rock also forms from extreme heat, but cools very slowly, so usually crystals have a chance to grow. Draw a picture of how intrusive igneous rocks are formed. Granite and Gabbro are intrusive igneous rock.

Sedimentary Rocks

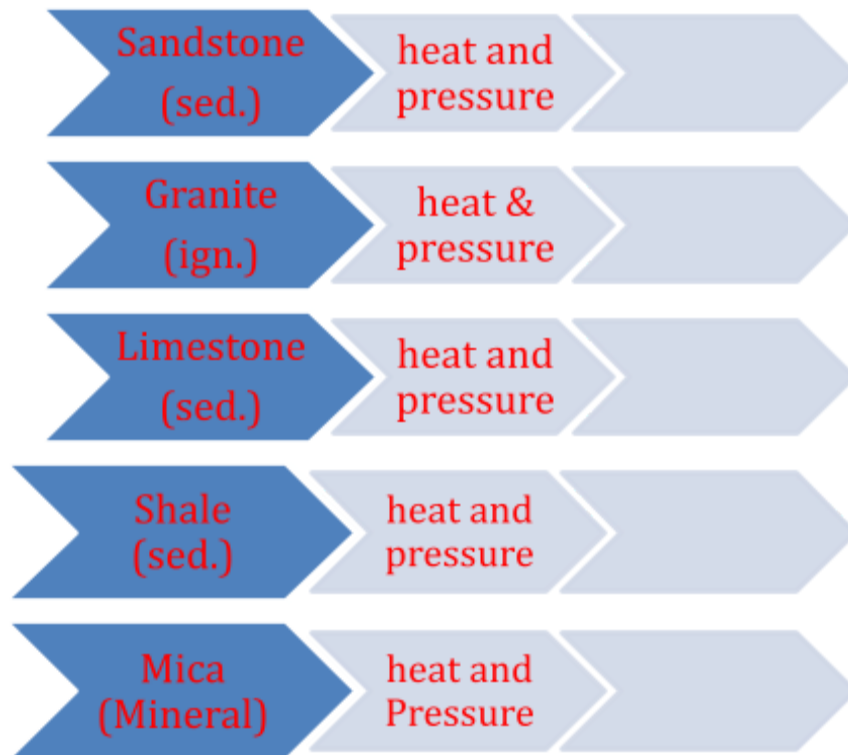
Sedimentary rocks are made of sediments which are tiny pieces of rock that

have been pressed together under extreme pressure. My favorite sedimentary rock is _____.

Sedimentary rocks are special because usually that is where fossils are found! Draw a picture of a fossil below.

Metamorphic Rocks

The word "morph" means to change. Metamorphic rocks are rocks that have been changed from one type of rock to a new one. Metamorphic rocks are changed through extreme heat from the earth's core AND extreme pressure created by the movement of the earth's crust.



Sandstone—Quartzite
Granite—Gneiss
Limestone—Marble
Shale—Slate
Mica—Schist

Name:

Types of Rocks

Igneous Rocks

Igneous rocks that EXIT the earth's crust are called EXTRUSIVE igneous rocks. Extrusive igneous rocks form from _____, and cool very _____ when they come to the earth's surface. Usually you don't see crystals in them. Draw a picture to show how extrusive igneous rocks EXIT

the earth's crust. _____, _____, _____, and _____ are all extrusive igneous rocks.

Igneous Rocks that stay in the earth's crust are called INTRUSIVE igneous rocks. This type of rock also forms from _____, but cools very _____, so usually _____ have a chance to grow. Draw a picture of how intrusive igneous rocks are formed. _____ and _____ are intrusive igneous rock.

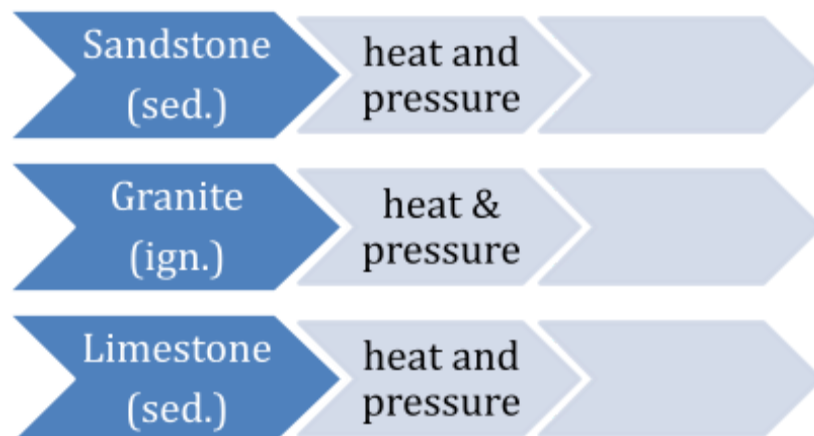
Sedimentary Rocks

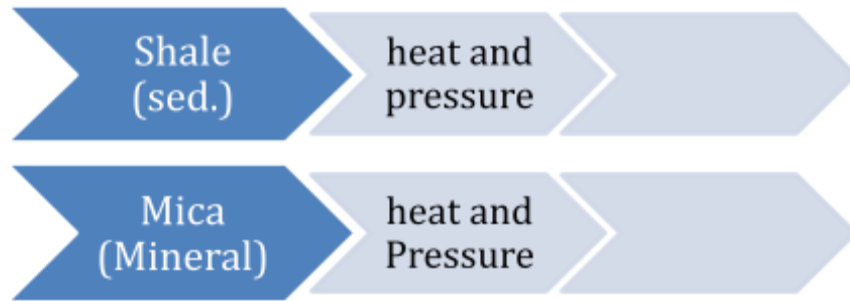
Sedimentary rocks are made of sediments which are tiny _____ that have been pressed together under _____.

Sedimentary rocks are special because usually that is where _____ are found! Draw a picture of a fossil below.

Metamorphic Rocks

The word "morph" means to change. Metamorphic rocks are rocks that have been changed from one type of rock to a new one. Metamorphic rocks are changed through _____ from the earth's core AND _____ created by the movement of the earth's crust.



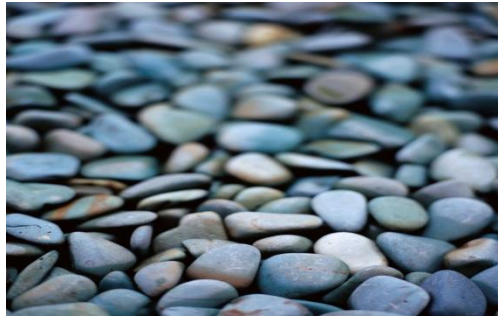


Descriptive Word Bank

Layers



Rounded



Jagged



Gritty/Grainy



Dark or Light



Heavy/Dense



or Light Colorful



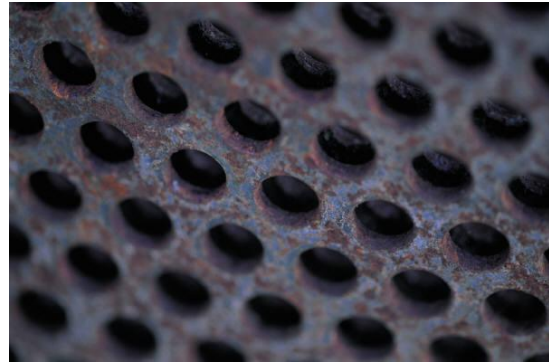
Smooth or Rough



Shiny/Glasslike



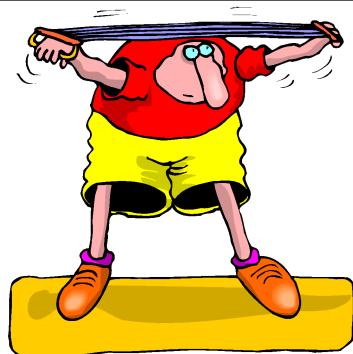
Airholes



Crystals



Stretched

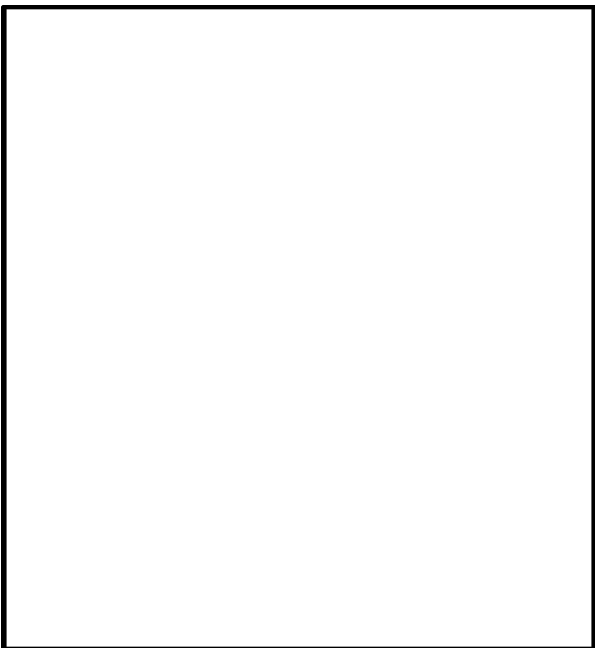


Exit Ticket

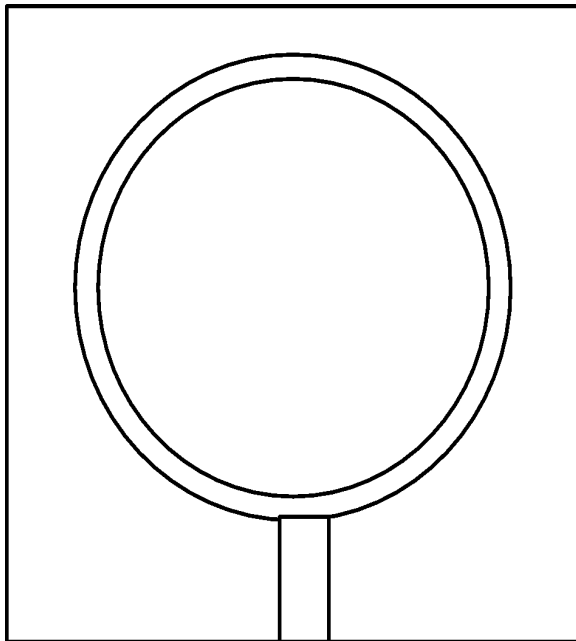
How are Metamorphic Rocks formed?

Select a METAMORPHIC ROCK to observe.

This is a picture of my metamorphic rock.



I saw this in the hand lens.



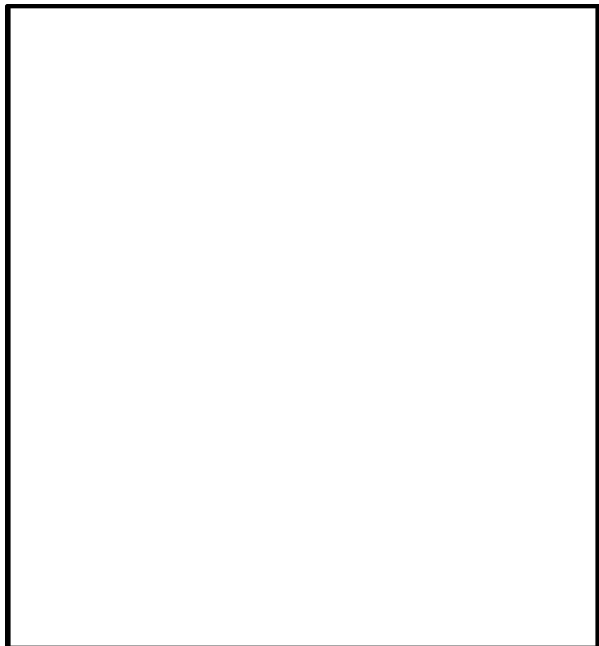
Use descriptive words to talk about your Metamorphic Rock's color, size, and shape:

Exit Ticket

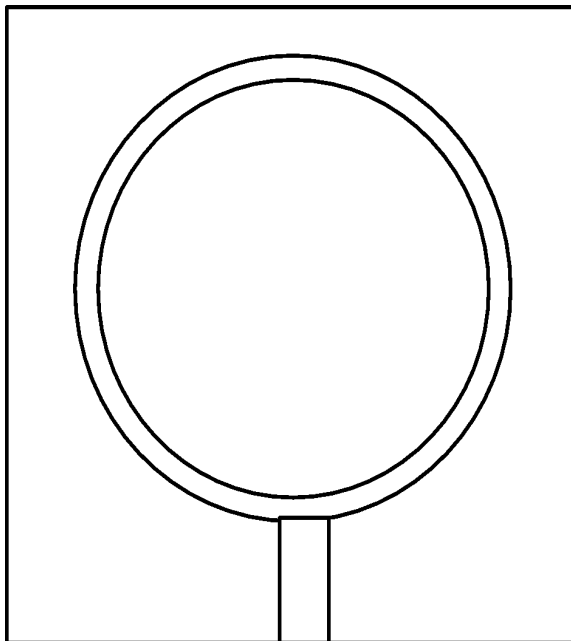
How are Metamorphic Rocks formed?

Select a METAMORPHIC ROCK to observe.

This is a picture of my metamorphic rock.



I saw this in the lens.



Use descriptive words to talk about your Metamorphic Rock's color, size, and shape: