

## What Done It?: Scene 1



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September , 2007

You have been called in by the Georgia Bureau of Investigation to help solve a couple of unsolved cases. It appears that there have been a number of break-ins around the Decatur area using large rocks to break through windows and gain entrance into the house.

While the police have been quick to respond and collect evidence from the scene, officers failed to keep track of the rocks from each location. Instead, all the rocks were thrown into a bucket together. Fortunately, they were numbered, but the number was not written down in the case file.

This is where you come in. Below are the descriptions of the rocks taken from witnesses. In front of you are also samples of the rocks from the crime scene, including their labeled number. We have also provided you with a list of common rock types to help you name the rocks and match them to the correct crime scene.

We are counting on you to help us solve these crimes. Good luck!

Again, thank you for your assistance,

A handwritten signature in black ink that reads 'Marcus Narkus'.

Marcus Narkus, Director  
Georgia Bureau of Investigation

## Worksheet: Case files

Case A: The rock looked like it was made of other rock fragments, some of which were fairly large. The pieces in the rock were rounded, like pebbles or cobble.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case B: This rock had very distinct bands and looked like it had layers of different minerals. In a past life it used to be granite.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case C: The rock was very dark and made of fine-grains. The only way I could see the grains was with a microscope – not just with my eye or even with a magnifying glass.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case D: The rock was dark in color, black even, and was foliated. I know this because I dropped it against a table edge and a thin sheet split off.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case E: The rock was very hard and strong. It also had a fossil of something that looked like a fish in it! I accidentally spilled some vinegar on it when I was making a salad later and it made the rock fizz.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

**What Done It?**

*Jennifer J. Pokorny & Yasmine M. McKenzie*

Case F: This rock was very hard and had small crystals in it. It broke when it came through the window and the break was very nice, right along the grain.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case G: This rock was very hard and strong and had many different sizes of crystals. I could tell that it probably used to be limestone but then was subjected to high heat and pressure.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case H: This rock was made up of 4 different minerals which were quite easy to see. I could tell that there was quartz, mica and hornblende but I'm not sure about the other mineral.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case I: The rock looked like it was made of tiny grains of quartz. I think that this type of rock is formed in oceans, lakes and rivers...

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

Case J: This rock looked almost like a crystal. My mother told me that it was most likely made up of halite and formed when water evaporated.

Rock name: \_\_\_\_\_ Number: \_\_\_\_\_

Rock type: \_\_\_\_\_

## Sedimentary Rocks

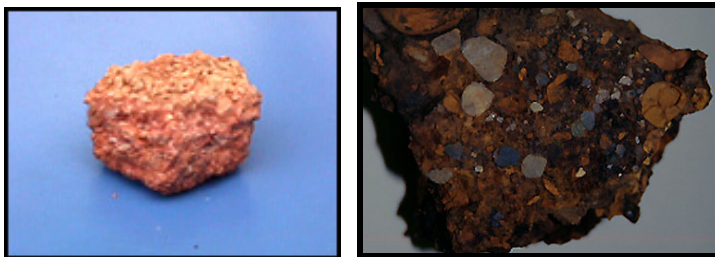
**Sandstone:** Sandstone rocks are sedimentary rocks made from small grains of the minerals quartz and feldspar. They often form in layers. Calcium carbonate, silica, or iron has been added to the water that is in contact with the sand grains. These minerals grow crystals in the spaces around the sand grains. As the crystals fill the gaps the individual sand grains are now transformed into a solid rock.



**Limestone:** Limestone is the most abundant of the non-clastic sedimentary rocks. Limestone is produced from the mineral calcite (calcium carbonate) and sediment. The main source of limestone is the limy ooze formed in the ocean. Limestone rocks are sedimentary rocks that are made from the mineral calcite which came from the beds of evaporated seas and lakes and from sea animal shells. Limestone can easily be dissolved by acids. If you drop vinegar on limestone it will fizz.



**Conglomerate:** Conglomerate rocks are made up of large sediments like sand and pebbles. The sediment is so large that pressure alone cannot hold the rock together; it is also cemented together with dissolved minerals.



**What Done It?**

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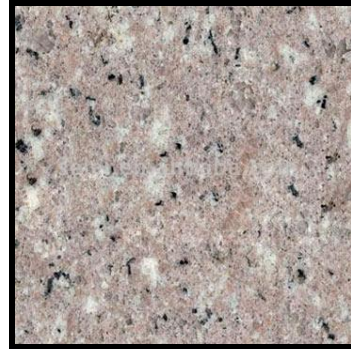
## **Sedimentary Rocks cont.**

**Rock salt:** Halite is common table salt. It forms where brakish (salty) lakes or sea beds dry up. This evaporation of the water causes the salt to precipitate forming the salt crystals. Halite frequently occurs in crystal form. It is usually colorless but can be reddish brown because of iron oxides in the water that it forms in.



## Igneous Rocks

**Granite:** Granite is an igneous rock that is composed of four minerals. These minerals are quartz, feldspar, mica, and usually hornblende. Granite forms as magma cools far under the earth's surface. Because it hardens deep underground it cools very slowly. This allows crystals of the four minerals to grow large enough to be easily seen by the naked eye. Look at the photos of granite below, notice the different crystals in the rock.



**Basalt:** Basalts are dark colored, fine-grained extrusive rock. The mineral grains are so fine that they are impossible to distinguish with the naked eye or even a magnifying glass. They are the most widespread of all the igneous rocks. Most basalts are volcanic in origin and were formed by the rapid cooling and hardening of the lava flows. Some basalts are intrusive having cooled inside the Earth's interior.



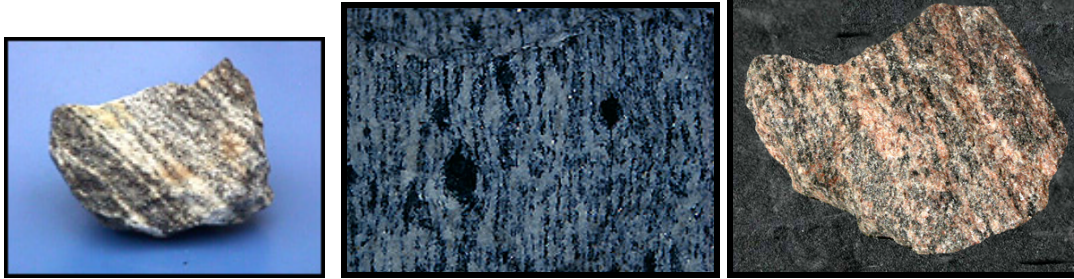
**What Done It?**

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## Metamorphic Rocks

**Gneiss:** Gneiss rocks are metamorphic. These rocks may have been granite, which is an igneous rock, but heat and pressure changed it. You can see how the mineral grains in the rock were flattened through tremendous heat and pressure and are arranged in alternating patterns. Gneiss is coarser than schist and has distinct banding. This banding has alternating layers that are composed of different minerals. Gneiss can be formed from a sedimentary rock such as sandstone or shale, or it can be formed from the metamorphism of the igneous rock granite.



**Quartzite:** Quartzite is composed of sandstone that has been metamorphosed. Quartzite is much harder than the parent rock, sandstone. It forms from sandstone that has come into contact with deeply buried magmas. Quartzite looks similar to its parent rock. The best way to tell quartzite from sandstone is to break the rocks. Sandstone will shatter into many individual grains of sand while quartzite will break across the grains.



**Marble:** Marble is metamorphosed limestone or dolomite. Both limestone and dolomite have a large concentration of calcium carbonate ( $\text{CaCO}_3$ ). Marble has many different sizes of crystals. Marble has many color variances due to the impurities present at formation. Some of the different colors of marble are white, red, black, mottled and banded, gray, pink, and green.



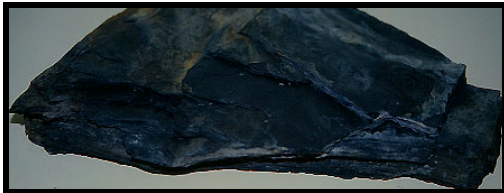
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**Metamorphic Rocks cont.**

**Slate:** Slate is a fine-grained metamorphic rock with perfect cleavage that allows it to split into thin sheets. Slate usually has a light to dark brown streak. Slate is produced by low grade metamorphism, which is caused by relatively low temperatures and pressures.



## What Done It?: Scene 2

September , 2007

Memo

From: Marcus Narkus

To: Bethune Middle School investigators

Thank you for your help in identifying the rock samples and matching them with the case they were involved in. I knew that you could do it!

However, I do have some other questions that I think you could help me with because I don't think that the investigators here could help.

I do not understand how one rock could "turn into" another rock. In case B, the person said that the rock "used to be granite in a past life." What does this mean? How does this happen? Are there different ways for this to happen?

Use the rocks quartzite, granite and sandstone as examples in your illustration.

Again, thank you for your help and I look forward to learning about this from your illustrations.

A handwritten signature in black ink that reads "Marcus Narkus". The signature is written in a cursive style with a horizontal line extending to the left from the start of the name.

Marcus Narkus

## Self/Peer Evaluation

### Individual

Name \_\_\_\_\_

Period \_\_\_\_\_

Scale 1-10 (1 = low, 10 = high)

1. I participated in the group \_\_\_\_\_
2. I completed my portion of the assignment \_\_\_\_\_
3. I listened to my group members suggestions \_\_\_\_\_
4. I learned information about the rock cycle \_\_\_\_\_

### Group

Answer questions 1-3 for each of your group members

Scale 1-10 (1 = low, 10 = high)

Name	Score Q1 – Participation	Score Q2 – Complete assignment	Score Q3 – Listen to suggestions

How would you rate this activity overall \_\_\_\_\_

Would you like to do another activity like this again \_\_\_\_\_

**What Done It?***Jennifer J. Pokorny & Yasmine M. McKenzie***Grading Rubric:**

<b>Categories</b>	<b>Score</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Worksheet		Less than 6 questions completed	6-9 questions completed with some errors	All questions completed with 1-3 errors	Each question completed correctly with all points addressed
Rock cycle illustration / diagram		Missing stages of the cycle, no explanations, incorrect information	Missing stages of the cycle or explanations of cycle changes/ processes	All stages of cycle included, some information is missing or incorrect	All parts of cycle included (stages, processes) and explained clearly, correctly, and creatively
Group participation		Self/peer and facilitator evaluation with average score of 1-2	Self/peer and facilitator evaluation with average score of 3-4	Self/peer and facilitator evaluation with average score of 5-7	Self/peer and facilitator evaluation with an average score of 8-10