GEOLOGY

Grades 7-8

STUDENT JOURNAL

This journal belongs to:

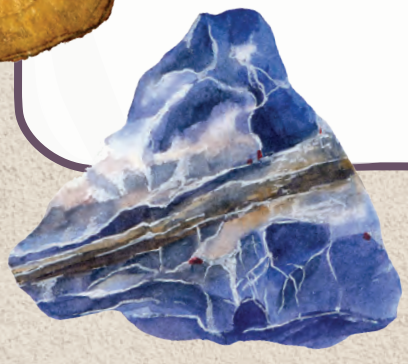
THE GOOD AND THE BEAUTIFUL

INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Geology* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the student journal.

The lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.



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NAME THAT BOUNDARY

Using the word bank below, find the missing word in each description and write it in the appropriate box. Then write the name of the type of boundary above each description on the line provided.

_____

oceanic crust converges with oceanic crust. A subduction zone is formed where one crust goes [ ] the other.

_____

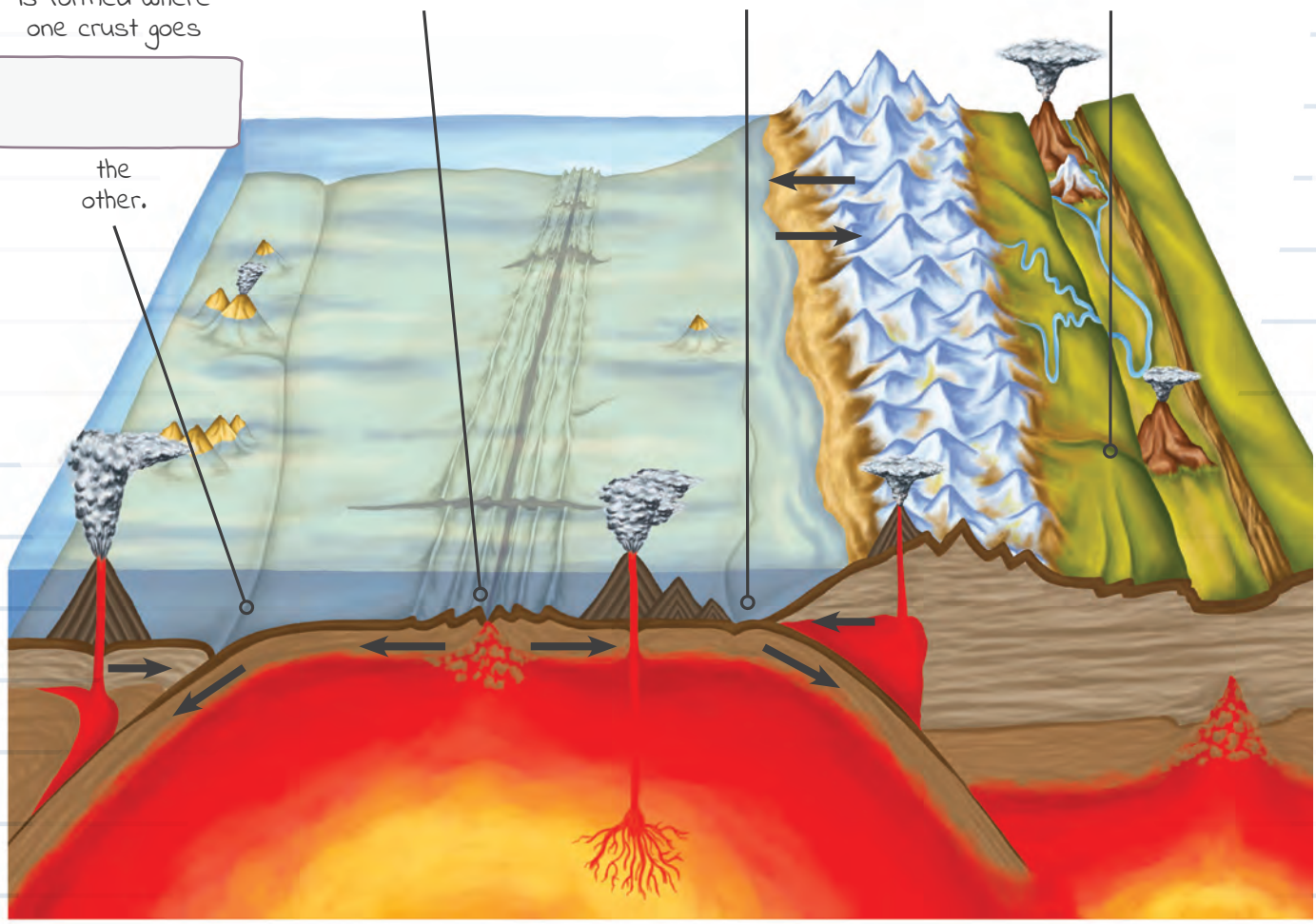
Two plates pull [ ] from each other.

_____

oceanic crust converges with continental crust. A [ ] zone is formed where the oceanic crust goes under the continental crust.

_____

Two plates slide [ ] each other.



subduction

under

away

past

Convergent Boundary: oceanic/oceanic

Convergent Boundary: oceanic/continental

Divergent Boundary

Transform Boundary

Lesson 6

OBSERVING MINERAL PROPERTIES

COLOR

What is the mineral's color?

Take note that

- different minerals can have the same color. (Ex: Gold and pyrite, also called fool's gold, both have a bright yellow color.)
- some minerals come in more than one color. (Ex: The mineral quartz can be found in colors such as purple, white, or pink.)

LUSTER

How does the mineral reflect light?

Choose one of these descriptive words: glassy, metallic, pearly, greasy, silky, or dull.

Copper: metallic

Garnet: glassy

Stilbite: pearly

Nepheline: greasy

Charoite: silky

Kaolinite: dull

FRACTURE + CLEAVAGE

How does the mineral look when it breaks (fractures)?

- Fractures can be described as smooth, splintered, chipped, or jagged.
- Does it leave a smooth, flat surface or side? If so, it also has cleavage (all minerals fracture, but not all have cleavage). How many sides have cleavage?

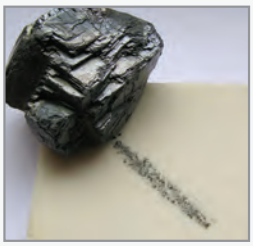
Kyanite: splintered fracture, 1 side of cleavage

Calcite: smooth fracture, 6 sides of cleavage

STREAK

When the mineral is scratched (across a streak plate), what color is the powdered trail that is left behind?

The streak color is specific to each mineral. It is the same color even if the mineral itself can come in different colors. (Ex: Although quartz comes in different colors, its streak color is always white.)



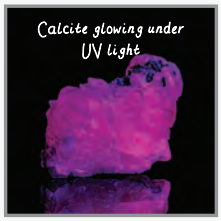
HARDNESS

How hard is the mineral? Hard, medium, or soft?

- The copper nail can only scratch <u>soft</u> minerals.
- The steel nail can scratch both <u>soft</u> and <u>medium</u> minerals.
- Minerals that can't be scratched by either nail are <u>hard</u> minerals.

OTHER

What other observations do you notice? How does it feel and smell? Are there any special things to note?



Some minerals have unusual properties, like glowing in ultraviolet light or under heat, being magnetic, sparking when struck sharply, or fizzing when exposed to acid. (NOTE: You will probably not observe these unusual properties in the minerals you are observing.)

MINERAL OBSERVATIONS

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

MINERAL NAME:

Color: ____________ Luster: ____________

Fracture: ____________

Cleavage? YES or NO # of sides: ____

Streak: ____________ Hardness: ____________

Other: ____________

Sketch:

EXTENSION

Instructions:

1. Read the information below.
2. Describe what a mud pot and a travertine terrace are and how minerals play a role in these hydrothermal features.

Minerals and Mud Pots

As we study geology, we gain a greater appreciation for God's handiwork. English physicist James Joule said, "After the knowledge of, and obedience to, the will of God, the next aim must be to know something of His attributes of wisdom, power, and goodness as evidenced by His handiwork."

Some of the most interesting of God's creations include hydrothermal features. Similar to volcanoes, hydrothermal features have openings in the earth's crust from which heat can escape. Rather than lava, they expel water. Under these openings lies a network of channels and chambers in which water collects and escapes back up to the surface.

A special type of hydrothermal feature is called a ***mud pot***. This is an acidic hot spring capable of breaking down the surrounding rock, resulting in mud that rumbles and pops (similar to the way boiling oatmeal would look).

Minerals that are found in the mud can turn the mud pots into various colors. In Yellowstone National Park, USA, there are mud pots known as "paint pots" because they are tinted pink, beige, and gray from the iron oxide found in the mud.

Another beautiful display of the way minerals and hydrothermal features interact is found in ***travertine terraces***. Hot water dissolves minerals such as limestone. The minerals rise with the water, collect, and solidify on land, resulting in stunning terraces. These types of terraces are found at Yellowstone's Mammoth Hot Springs.

This type of hydrothermal feature is also found in Pamukkale [paw–MOOK–kuh–lay], Turkey. *Pamukkale* means "cotton castle" in Turkish. It is a geologic

Yellowstone mud pot

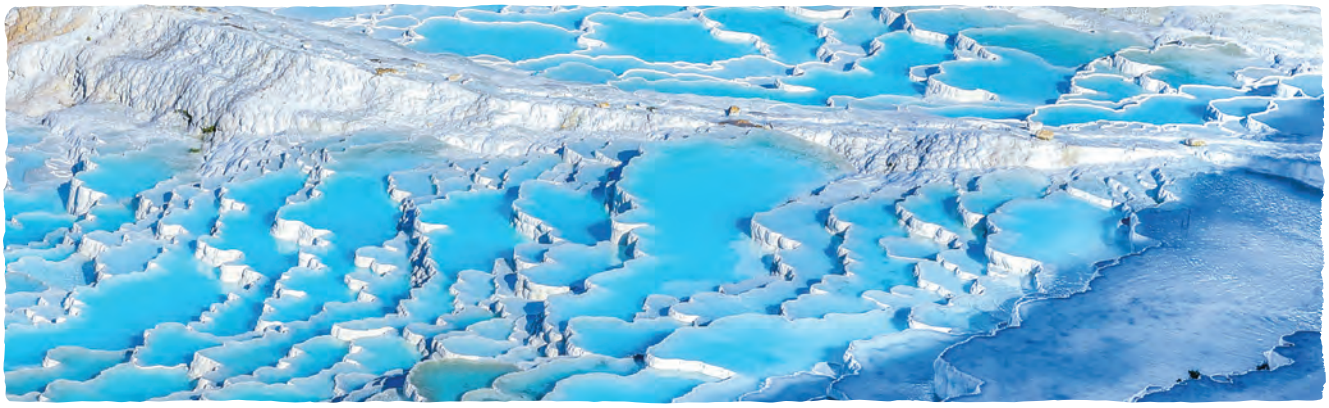
Yellowstone "paint pot" mud pot

hot spot where the heated underground water makes its way to the surface and emerges as hot springs. As the water passes through channels in the rock to reach the surface, a mineral called calcium carbonate dissolves into the water. The mineral-filled water flows across the land and collects in shallow pools. When water evaporates from these pools, the solid terrace-building mineral, called travertine, is left behind. These deposits at Pamukkale are especially striking because of the pure white color of the mineral calcium carbonate and the terraced layers of limestone rock over which it forms, creating the spectacular "cotton" walls that give the region its name.

It's pretty incredible what minerals can do to bring color, beauty, and variety to God's creations that we enjoy here on Earth.

Mammoth Hot Springs, Yellowstone, USA

Pamukkale, Turkey



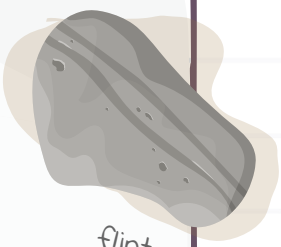
PRECIOUS STONES

Match the words and definitions.

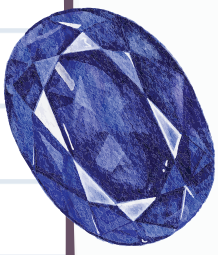
Crystal	a three-dimensional solid that has its internal atoms arranged in a highly organized way
Gem	a rock with a hollow cavity containing crystals
Geode	a crystal mineral that is considered highly valuable; they are often cut and polished to make jewelry

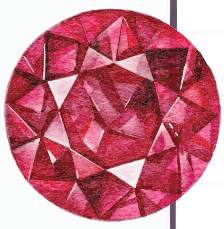
Determine which precious stone name should go in each blank space by looking at the pictures. Fill in the blanks with the correct precious stone name. Then read the following poem by Christina Rossetti entitled "Precious Stones."

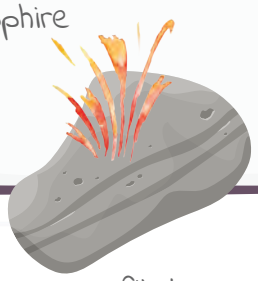

diamond


flint

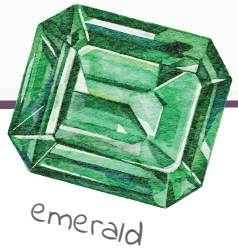
An _____ is as green as grass;
a _____ red as blood;
A _____ shines as blue as heaven;
A _____ lies in the mud.
A diamond is a brilliant stone,
To catch the world's desire;
An opal holds a fiery spark;
But a flint holds fire.


sapphire


ruby


flint


opal


emerald

INTRUSIVE ROCKS

stone granite

This rock has a "salt and pepper" look that is formed from white plagioclase (a type of feldspar) and black minerals called hornblende and biotite. This coarse-grained rock often forms above convergent boundaries (where an oceanic plate subducts beneath a continental plate). In the stone industry, it is often used for faux (fake) granite countertops.

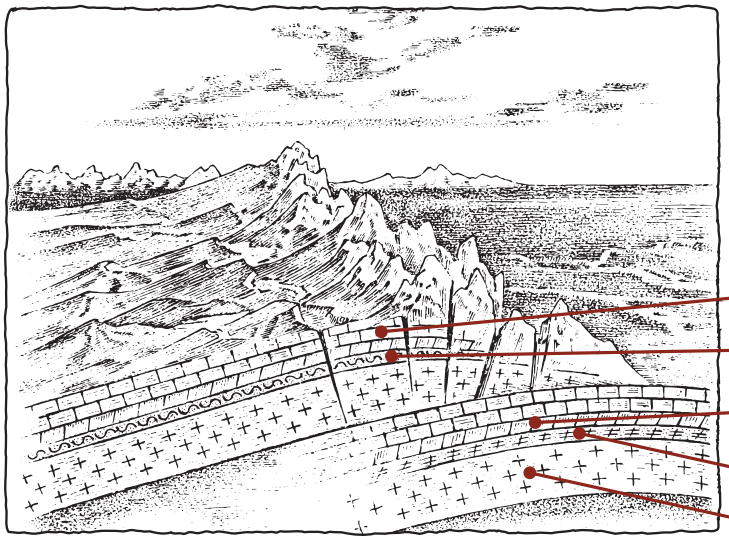
This rock usually looks light pink or gray with distinguishing crystals, which often give it a slightly speckled look. It is mostly made of quartz and feldspar. It is the best-known intrusive igneous rock because there is plenty of it on the earth's surface in mountains that have risen up to above the earth's surface. We use this for many things, such as countertops, tiles, and the outsides of buildings.

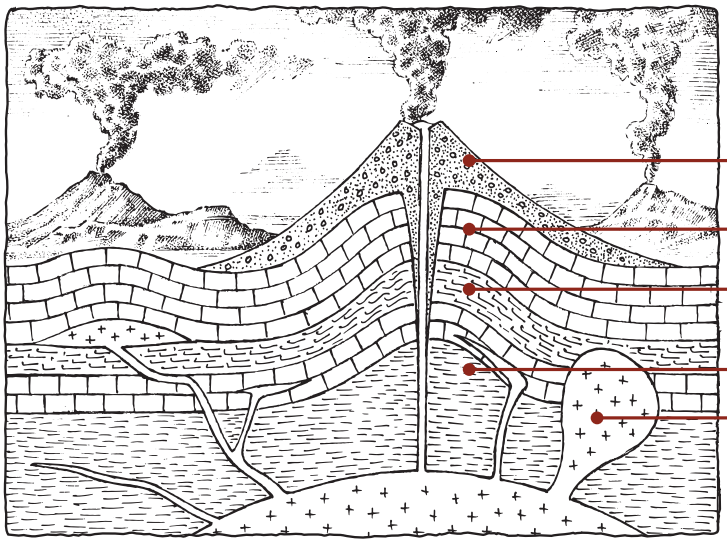
This coarse-grained rock is typically a greenish color. This rock is found in the earth's crust and forms in vertical pipe-like structures. While this is a rarer type of rock, it is well-known because it has the perfect conditions for diamonds to form; in fact, it is the main source of mined diamonds today.

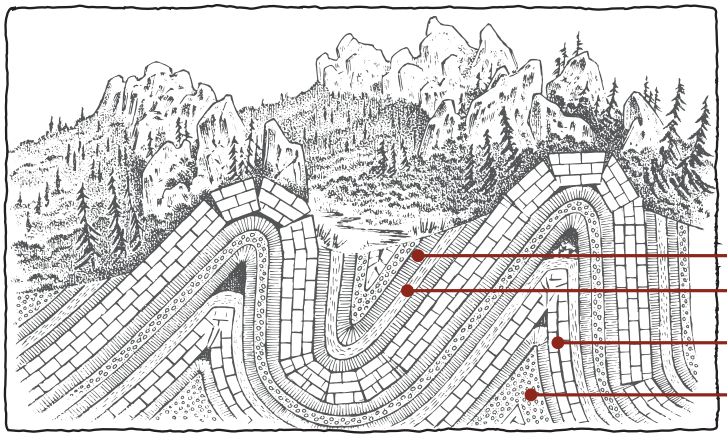
Lithology Maps

LITHOLOGY KEY

- limestone
- conglomerate
- shale
- chalk
- intrusive igneous
- soft clay
- dolostone
- siltstone
- metamorphic rock







EXTENSION

Instructions:

1. Read the information below. In your science journal, create a timeline, marking the dates of theories or creations made by these notable geologists.
2. The discoveries by many geologists were sometimes met with criticism. In your science journal, write down some character traits you believe they possessed in order to continue with their work despite these difficulties.

Notable Geologists

Without the hard work of geologists, we wouldn't know all the amazing things that we do. Their passions, interests, and talents have been able to further our understanding of the earth we live on.

Alfred Wegener (1880–1930)

In 1912 this German geologist proposed a theory called continental drift. Wegener [VAY–gun–er] claimed that the continents used to be one landmass that slowly drifted apart. This idea didn't come to him overnight, but instead, it began as a curious study of a world map. While browsing at the library, he read some interesting research about identical fossils that were found in both Brazil and Africa. He learned of fossils of tropical creatures located in nontropical areas. He also found that the geological composition of the Appalachian Mountains in the United States matched that of the Scottish Highlands in the United Kingdom. Though Wegener used these findings to support his claim, it was widely rejected. However, his ideas set a foundation for the now-accepted theory of plate tectonics.

Louis Agassiz (1807–1873)

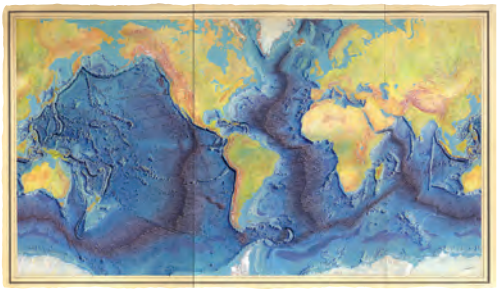
Agassiz [AG–uh–see] studied long scratches in rock that were left by glaciers. These scratches were found on landforms where glaciers could not have existed, such as in warm valleys. In 1840 his research supported the idea of our earth experiencing an Ice Age. Agassiz said, "The glacier was God's great plough set at work ages ago to grind, furrow, and knead over, as it were, the surface of the earth." Agassiz was also a biologist who studied animal kingdoms and classifications, especially living and fossilized fish. He firmly believed that God created the earth and that every species was created as "a thought of God."

William Smith (1769–1839)

This English geologist's interest in rocks was sparked by merely noticing a pattern. For his work, Smith had to descend into mine shafts, where he discovered sequential patterns in the rock strata (layers). He also found numerous fossils in the rock and categorized them into groups. In 1815 he created a geological map of all of England and Wales, based on his findings of different types of rock forms. Smith was incredibly detailed and meticulous in his work, which led him to develop techniques still used by geologists today. He is named the "Founder of Stratigraphy."

Marie Tharp (1920–2006)

Tharp began her study of geology in college just before World War II, where a flyer posted on a bulletin board caught her eye. It not only promised a degree in geology but also guaranteed a job. Since most men were off fighting in the war, many women took part in this degree program. After completing her education, Tharp started a partnership with Bruce Heezen, an American geologist, and spent the next 25 years studying records of how sound waves bounce off the seafloor. This gave hints to the seafloor's topography, or its physical features. By 1957 Tharp and Heezen successfully published a map of the Atlantic Ocean floor, including the discovery of the Mid-Atlantic Ridge. Then, in 1977, they mapped and published *The World Ocean Floor*. Because of Tharp's great work and diligence, we now have a better understanding of the seafloor.



This painting of the mid-ocean ridges was done by Heinrich Berann based on the scientific findings of Marie Tharp and Bruce Heezen (1977).

Lesson 14

MAJESTIC MOUNTAINS

Label each mountain range with the correct mountain form.