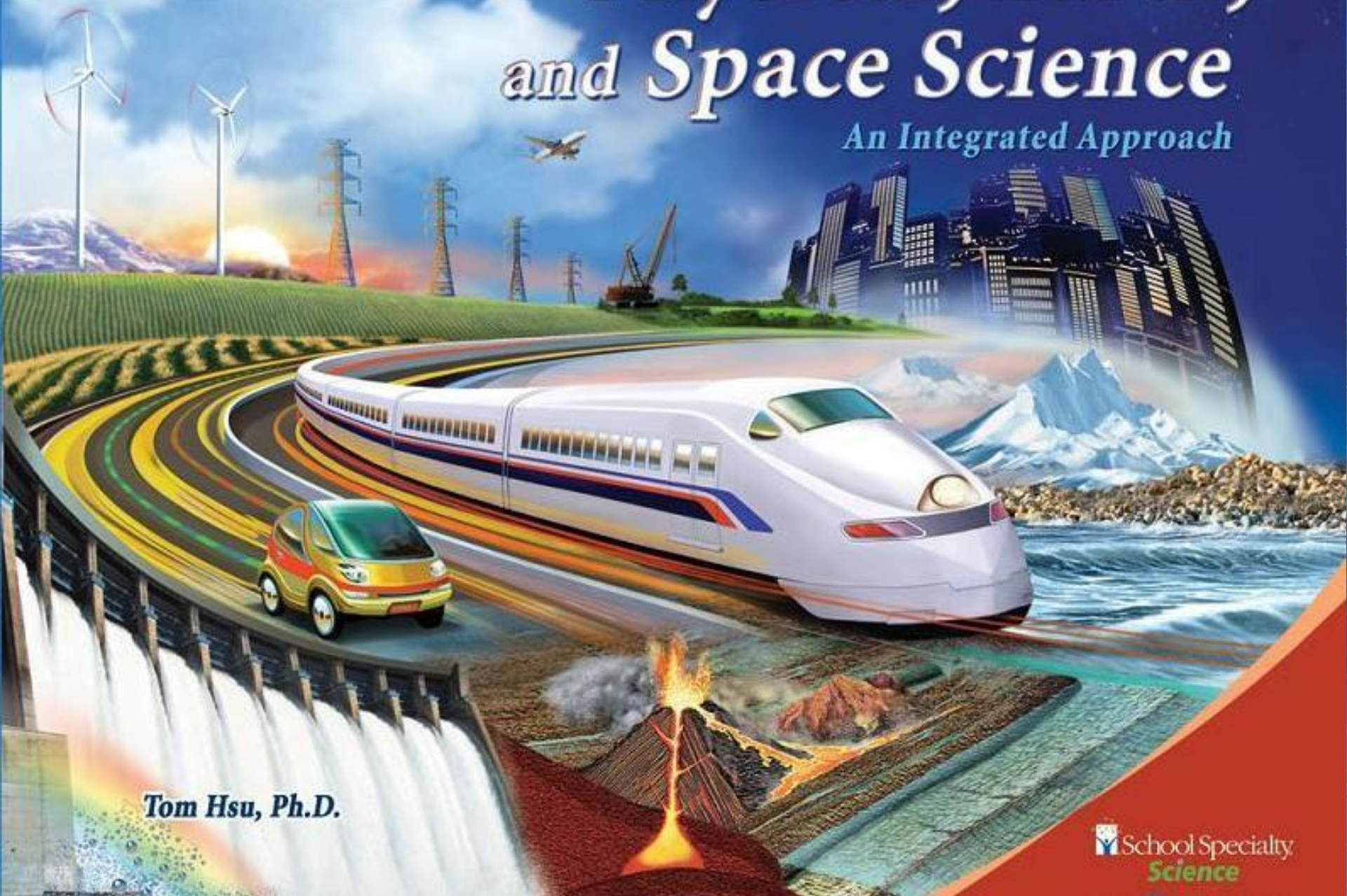


cpo science

Physical, Earth, and Space Science

An Integrated Approach



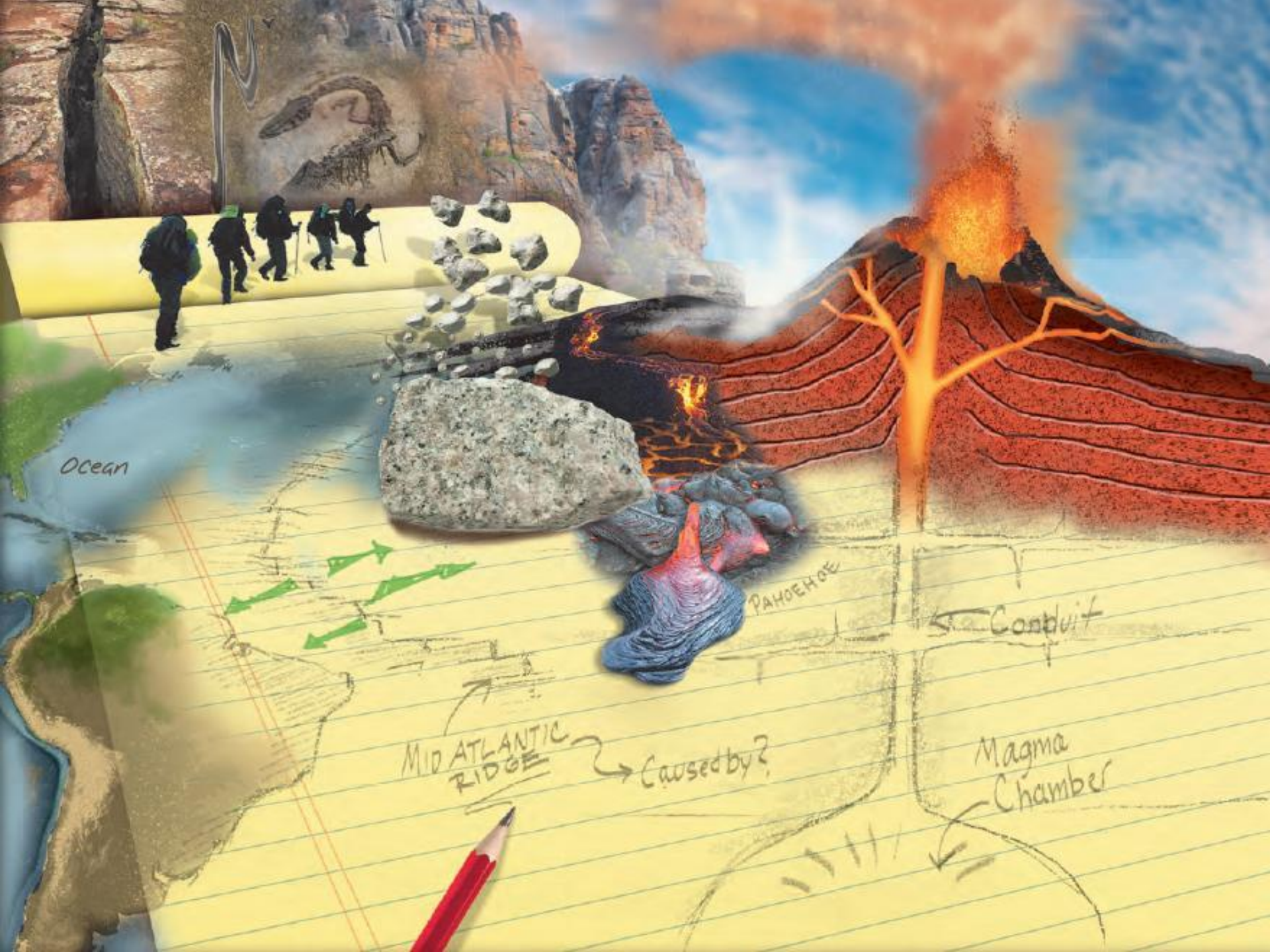
Tom Hsu, Ph.D.

 School Specialty
Science



UNIT SIX: Earth's Structure

- **Chapter 18 Earth's History and Rocks**
- **Chapter 19 Changing Earth**
- **Chapter 20 Earthquakes and Volcanoes**



Ocean

РАНОЕНОЕ

Conduit

MID ATLANTIC RIDGE

Caused by?

Magma Chamber



Chapter Eighteen: Earth's History and Rocks

- **18.1 Geologic Time**
- **18.2 Relative Dating**
- **18.3 The Rock Cycle**



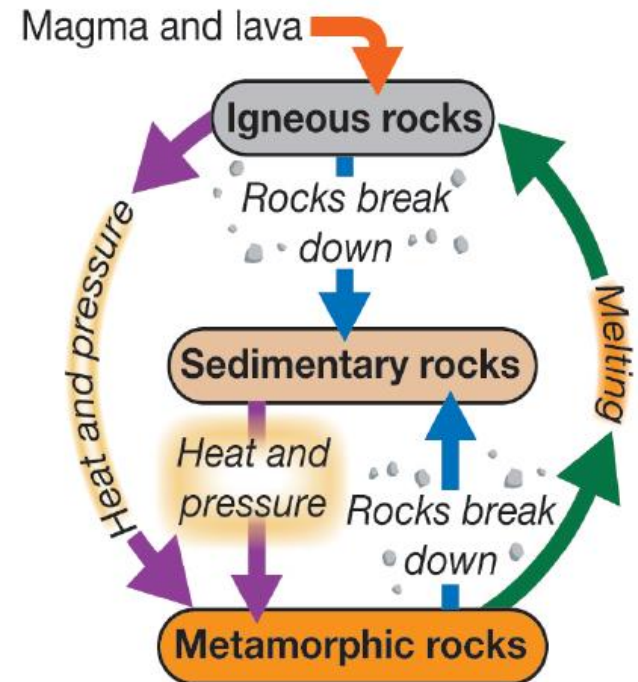
18.3 Learning Goals

- **Describe the properties of minerals and explain how minerals are formed.**
- **Apply Mohs hardness scale to identify minerals.**
- **Explore pathways of the rock cycle.**

Investigation 18C

The Rock Cycle

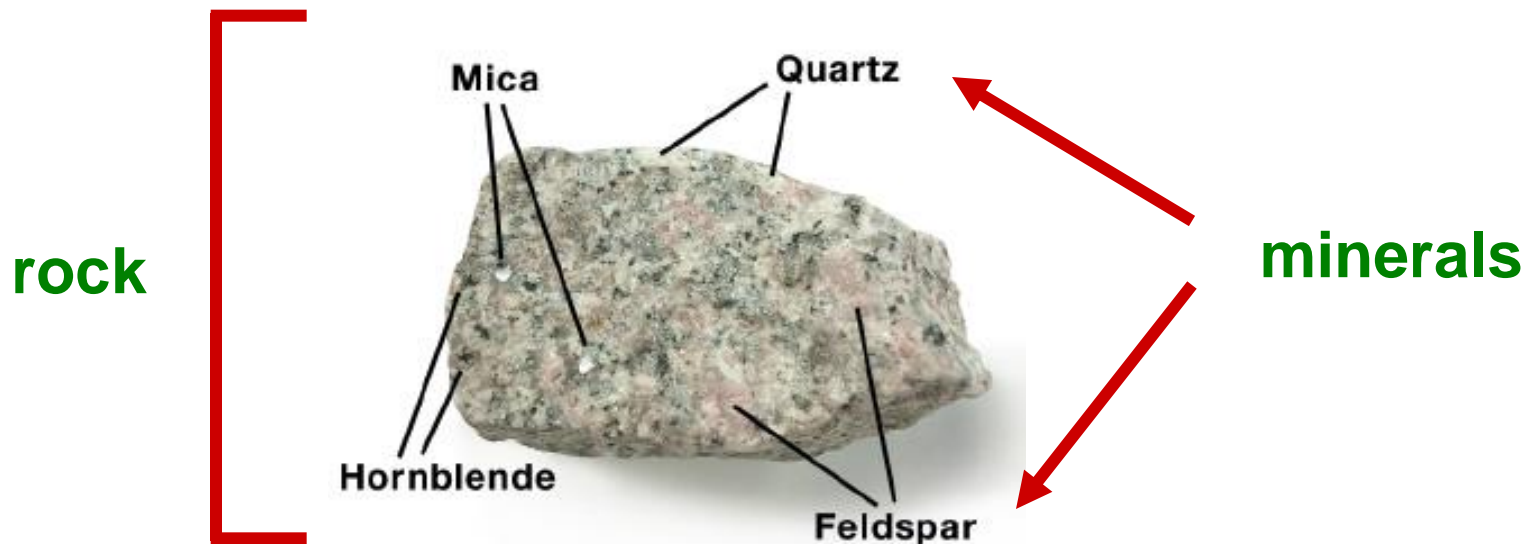
- **Key Question:**
How does the rock cycle create new rocks and change one type into another?





18.3 The composition of rocks

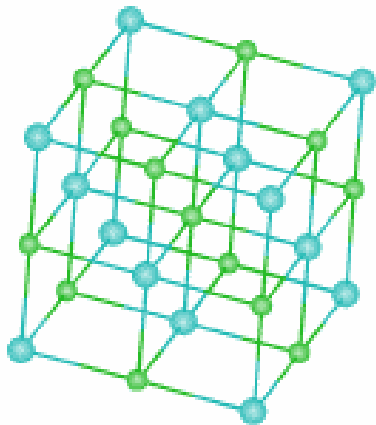
- * A **rock** is a naturally-formed solid made of one or more minerals.





18.3 Rocks are made of minerals

- * A *mineral* is a solid, inorganic object with a defined chemical composition.
- * Minerals have atoms arranged into orderly structures called crystals.

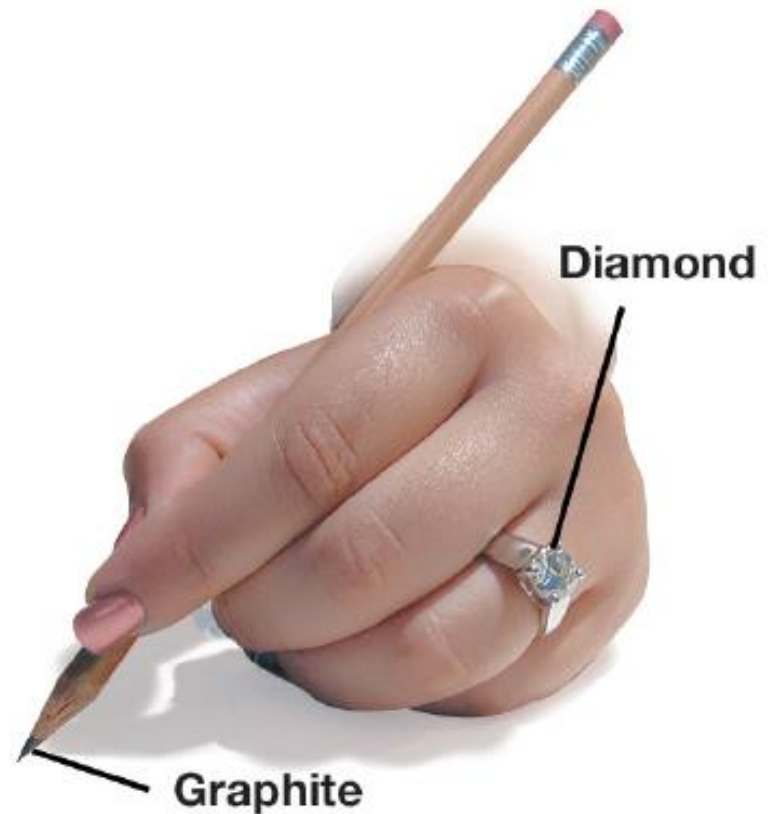


This cubic mineral is often placed on food. Can you guess what it is?



18.3 Rocks are made of minerals

- **Diamonds and graphite are both minerals that are made of carbon, but their crystalline structures are different.**





18.3 Rocks are made of minerals

- * There are more than 4,000 minerals on Earth.
- * The two most abundant elements in Earth's crust, are oxygen and silicon.
- Add into notes

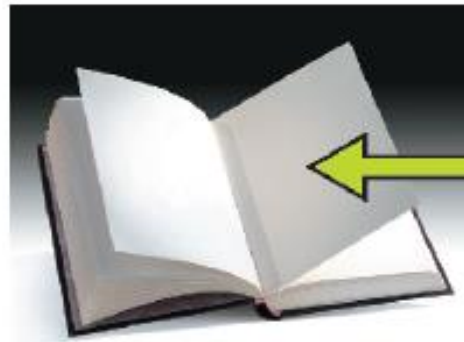
Approximate percentage by weight of elements in Earth's crust	
oxygen	46.6%
silicon	27.7%
other minerals	25.7%



18.3 Common minerals and cleavage planes

- Mica is a rock with its minerals stacked like the pages in a book.
- * ***A cleavage plane*** is a surface along which a mineral cleanly splits.

Mica (muscovite)
One cleavage plane



There is **one** cleavage plane for the page of a book.



18.3 Common minerals and cleavage planes

- * Feldspar is the most abundant mineral in Earth's crust.
- * Like feldspar, hornblende has two cleavage planes.



Feldspar



Hornblende



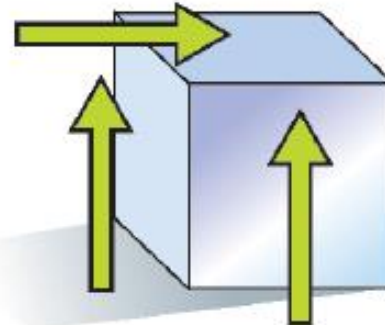
18.3 Common minerals and cleavage planes

- * The mineral halite has three directions of cleavage and breaks into cubes.

There are **three** cleavage planes for a cube.



Halite





18.3 Common minerals and cleavage planes

Quartz
No cleavage planes



- * Quartz is the second most abundant mineral in Earth's crust.
- * Unlike feldspar, quartz lacks cleavage planes.
- * When quartz breaks, it does not split along planes. Quartz has a fracture.






18.3 Mohs hardness scale

- * *Mohs hardness scale* was developed in 1812 by Friedrich Mohs (an Austrian mineral expert) as a method to identify minerals.
- * This scale uses 10 minerals to represent variations in hardness.

Mineral	Hardness
talc	1
gypsum	2
calcite	3
fluorite	4
apatite	5
orthoclase (feldspar)	6
quartz	7
topaz	8
corundum	9
diamond	10

Mohs Hardness Scale

Mineral	Common item	Hardness
Talc		1
Gypsum		2
Calcite	Fingernail 	3
Fluorite	Penny 	4
Apatite		5
Orthoclase (feldspar)	Glass 	6
Quartz		7
Topaz		8
Corundum		9
Diamond		10



18.3 Groups of rocks

- * There are three groups of rocks that are formed by the processes in the Earth's crust.
- * An *igneous rock* forms from the cooling and crystallizing of magma or lava.
- * A *sedimentary rock* is made of sediments.
- * A *metamorphic rock* is a rock that is formed from another rock because of heat and pressure.



Rock Group

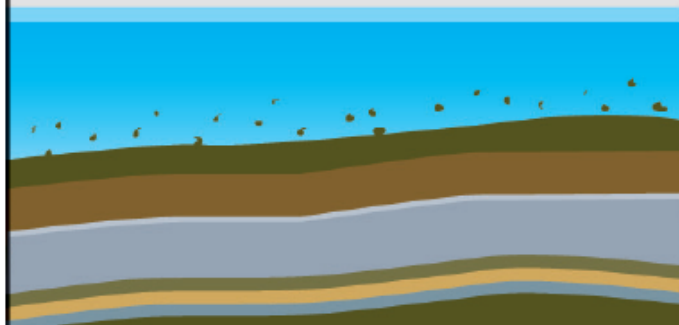
Formation

Igneous



These rocks form when molten rock (lava or magma) cools and crystallizes.

Sedimentary



Particles of other rocks and minerals or once-living things are moved by water, wind, ice, or gravity and eventually settle in layers. The layers are compacted and cemented to form a new rock.

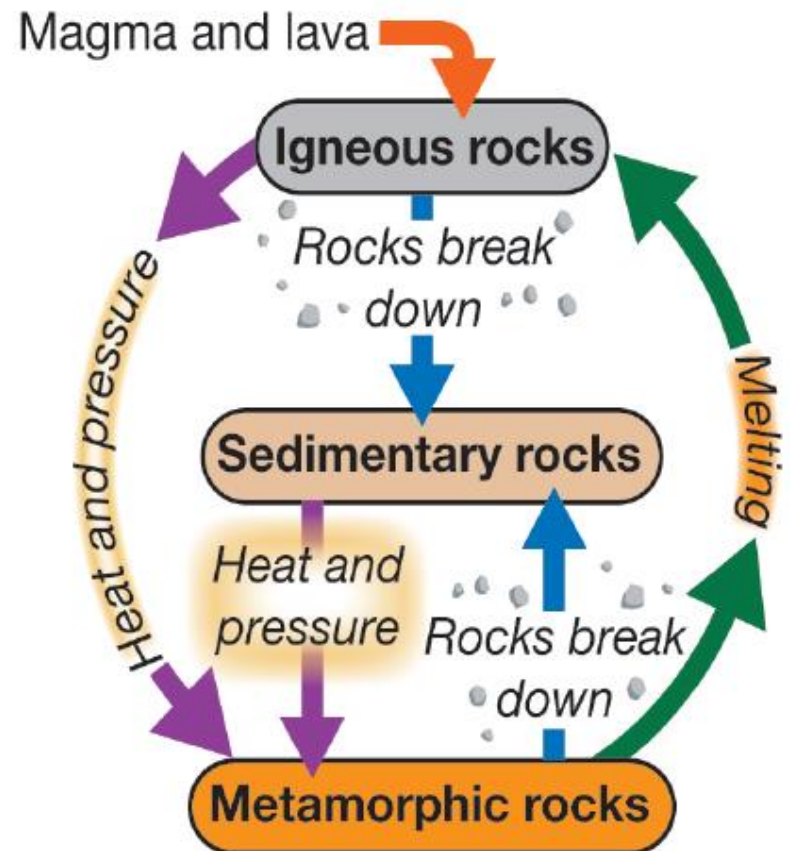
Metamorphic



These rocks form from other rocks that are changed by heat and pressure.

18.3 Rocks keep moving

- * **The *rock cycle*** allows material to keep changing form and moving from place to place on Earth.





18.3 Rocks keep moving

- The processes that keep rock material moving through the rock cycle include weathering, erosion, deposition, compaction and cementation, metamorphism, and melting and crystallizing.
- * An important geologic process— *plate tectonics*— plays an important role in the rock cycle.



The Rock Cycle

**IGNEOUS
ROCK**

Lava

Crystallizing

Weathering and erosion of
all rocks (sedimentary, igneous,
metamorphic)

Deposition
of sediment

Compaction and
cementation

**SEDIMENTARY
ROCK**

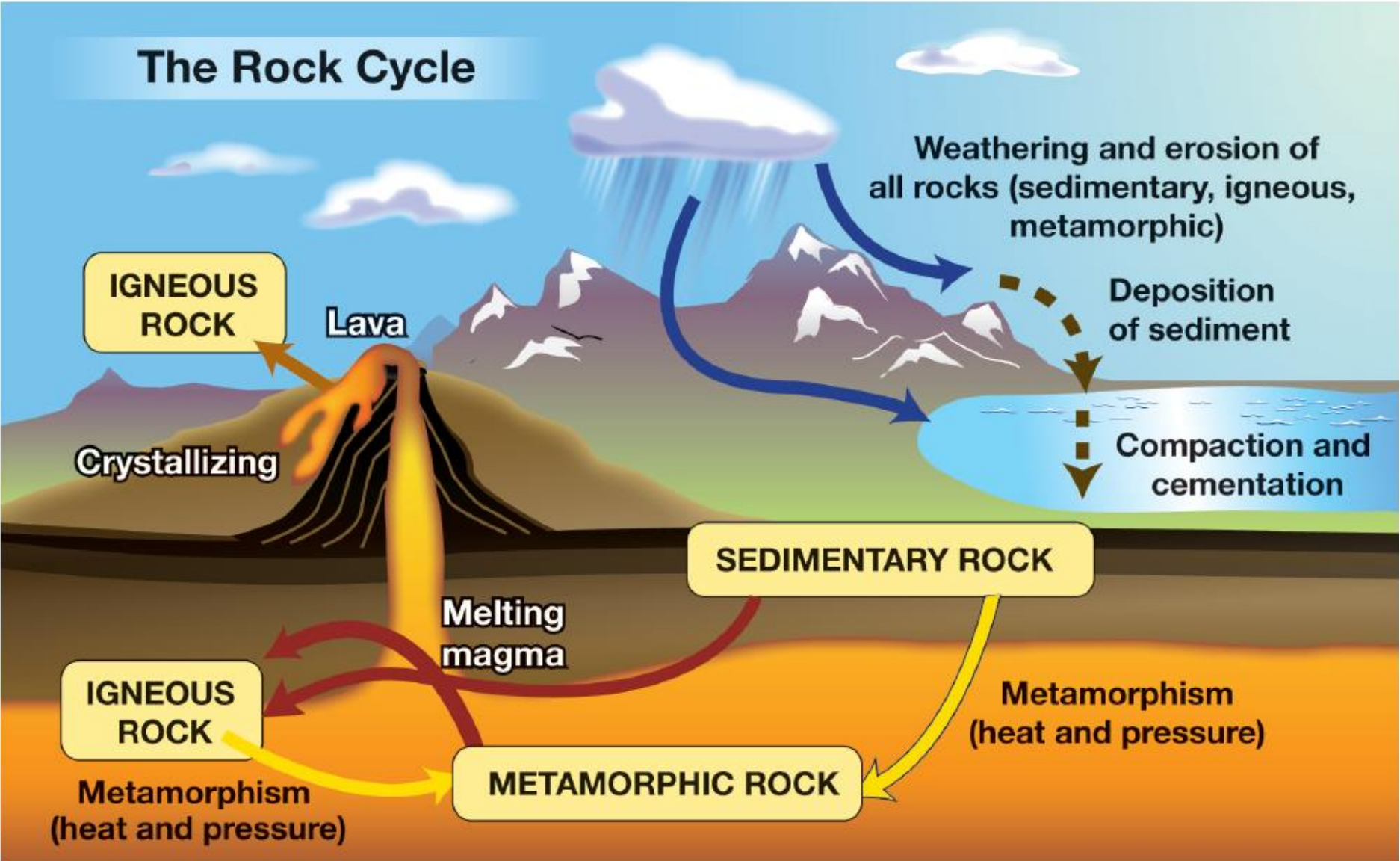
Melting
magma

Metamorphism
(heat and pressure)

**IGNEOUS
ROCK**

**METAMORPHIC
ROCK**

Metamorphism
(heat and pressure)





PALEONTOLOGY ►► CONNECTION

Mass Extinction:

Devastation and Opportunity



- **At the end of the Cretaceous Period, almost all of Earth's large vertebrates (including the dinosaurs), and most of the oceans' plankton became extinct. Research is currently underway to find out what caused this mass extinction.**