Module 6

R o c k s

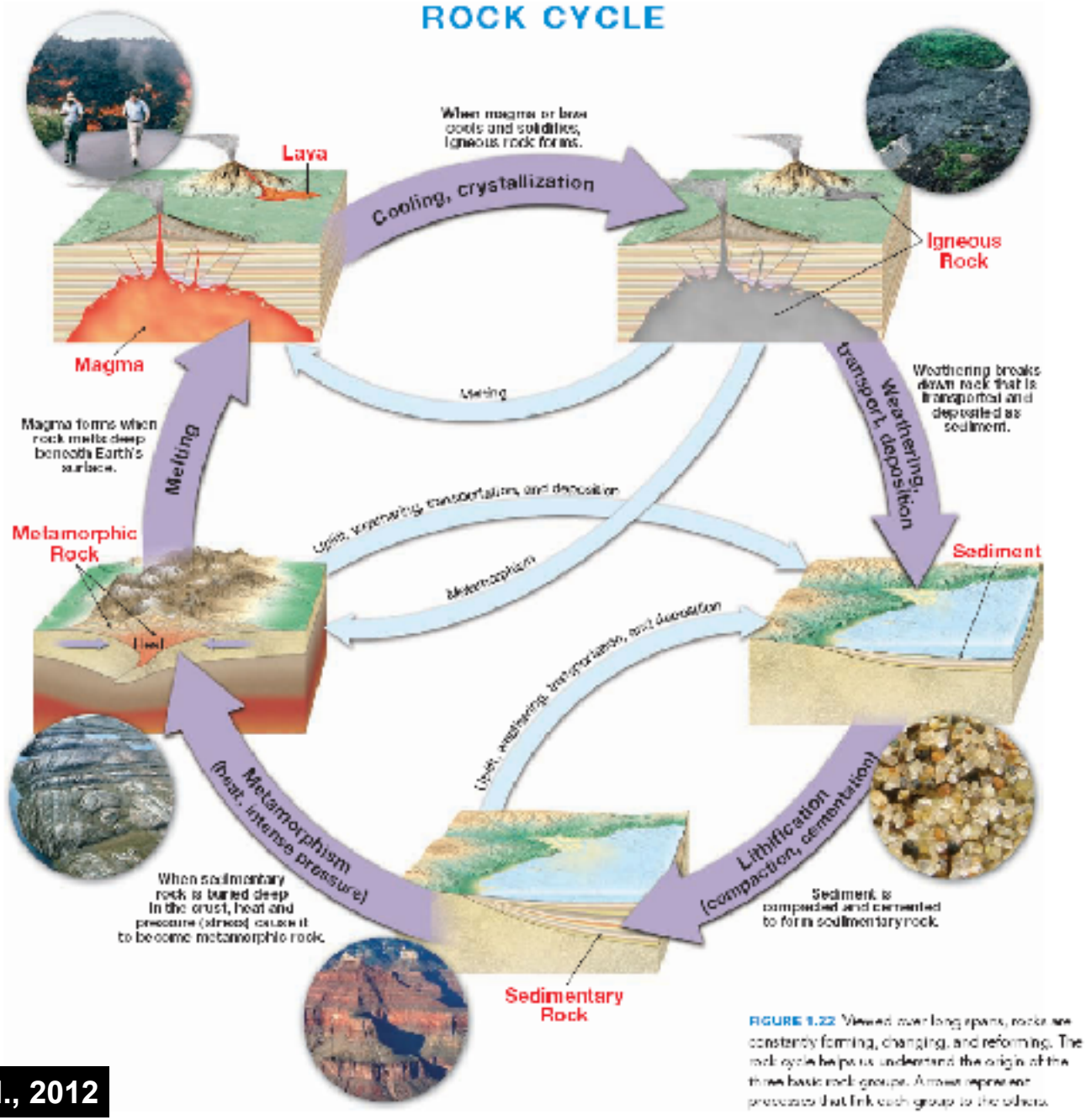
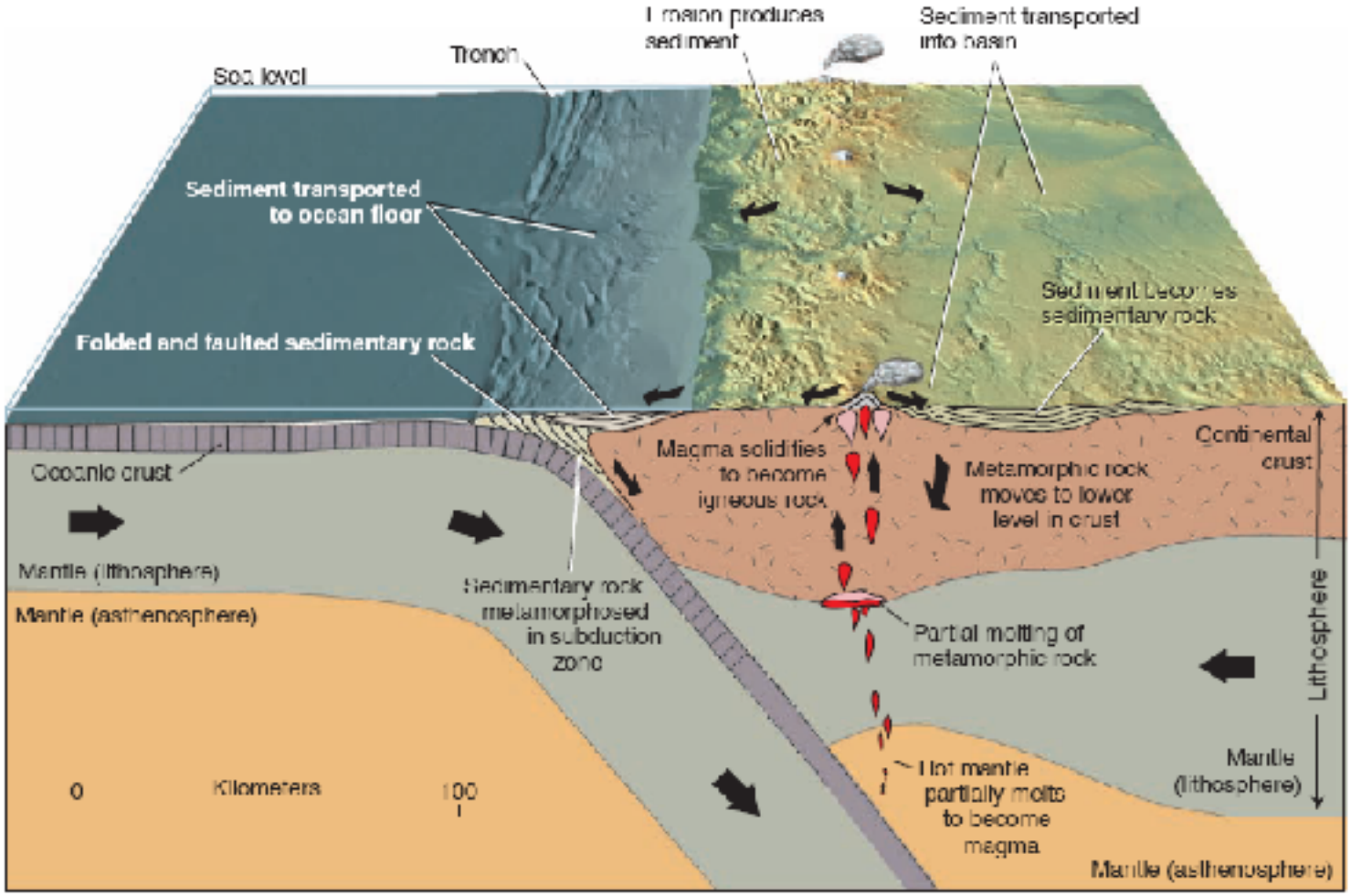


FIGURE 5.22 Viewed over long spans, rocks are constantly forming, changing, and reforming. The rock cycle helps us understand the origin of the three basic rock groups. Arrows represent processes that link each group to the others.

Lutgens et al., 2012

The Rock Cycle & Plate Tectonic



Carlson et al 2011

FIGURE 11.2

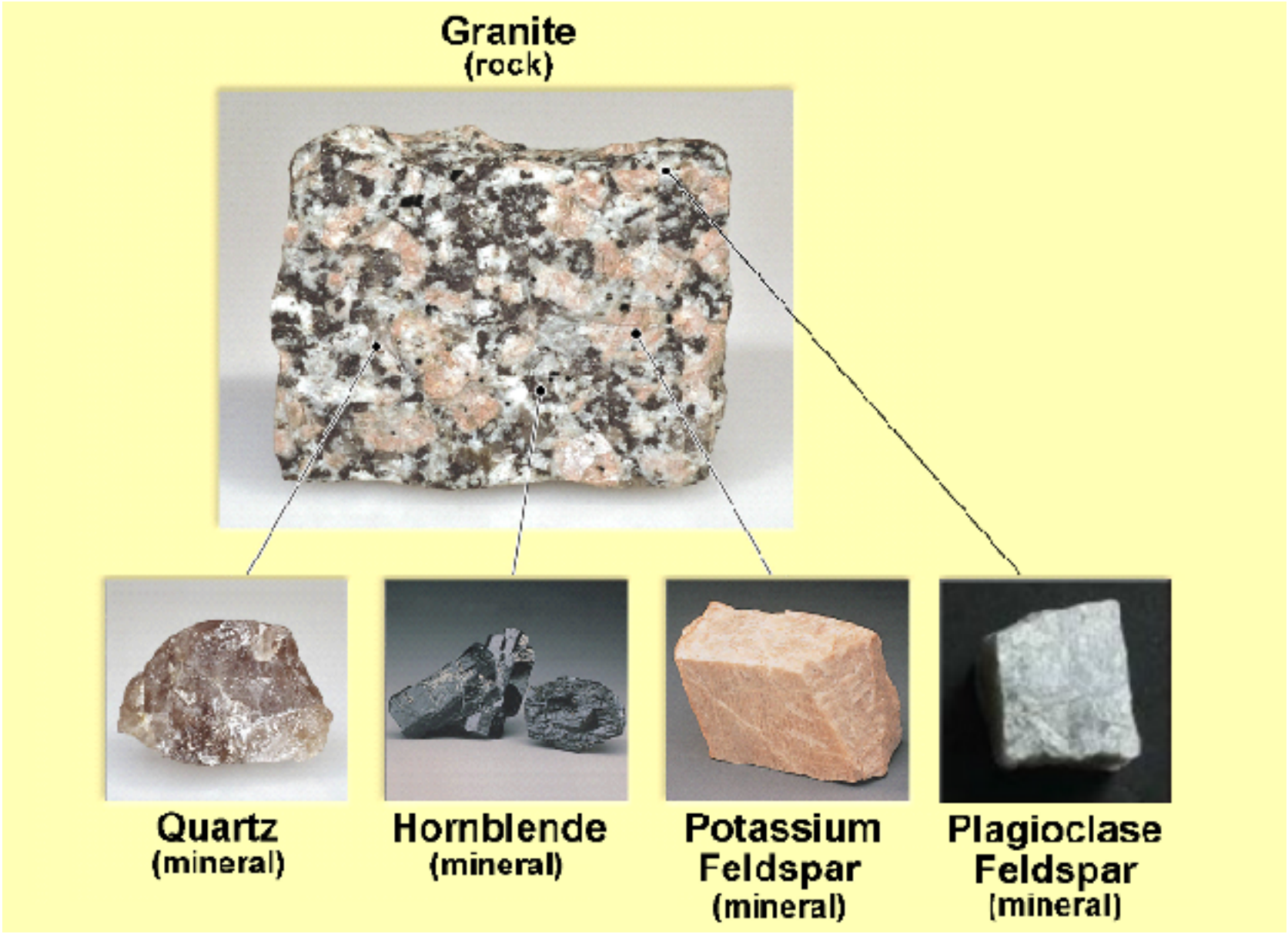
The rock cycle with respect to a convergent plate boundary. Magma formed within the mantle solidifies as igneous rock at the volcano. Sediment from the eroded volcano collects in the basin to the right of the diagram. Sediment converts to sedimentary rock as it is buried by more sediment. Deeply buried sedimentary rocks are metamorphosed. The most deeply buried metamorphic rocks partially melt, and the magma moves upward. An alternate way the rock cycle works is shown on the left of the diagram. Sediment from the continent (and volcano) becomes sedimentary rock, some of which is carried down the subduction zone. It is metamorphosed as it descends. It may contribute to the magma that forms in the mantle above the subduction zone.

What is a rock?

- A rock is a naturally formed aggregate composed of one or more minerals
- Rocks are aggregates of one or more minerals

Which one is the best answer?

Rocks



Example of a rock, an aggregate of more than one minerals

Rocks

- Rocks are classified on the basis of how they form

- There are 3 major classes of rock:
  - Igneous rock
  - Sedimentary rock
  - Metamorphic rock

Igneous Rocks

- **Igneous Rocks formed by crystallization of molten rock material**
  - **Molten rock material below Earth's surface is called *magma***
  - **Molten rock material erupted above Earth's surface is called *lava***
  - **The name changes because the composition of the molten material changes as it is erupted due to escape of volatile gases**

Metamorphic Rocks

- **Metamorphic rocks are changed rocks (from pre-existing rocks)**

- **They are *formed in the solid state* in response to the following *agents of metamorphism*:**
  - **Change in *pressure***
  - **Change in *temperature***
  - **Change in *pressure* and *temperature***

Metamorphic Rocks

- **The *protolith* (the *parent rock*) is the preexisting rock from which the metamorphic rock was formed**

- **Metamorphism may cause a change in a rock's:**
  - ***Composition***
  - ***Mineral assemblage***
  - ***Texture***
  - ***All of the above***

Sedimentary Rocks

- **Rocks formed by materials derived from preexisting rocks, by surfacial processes followed by diagenesis.**
- **There are 2 main classes of sedimentary rocks**
  - à ***Clastic (detrital) sedimentary rocks***
  - à ***Chemical (non-clastic) sedimentary rocks***

Sedimentary Rocks

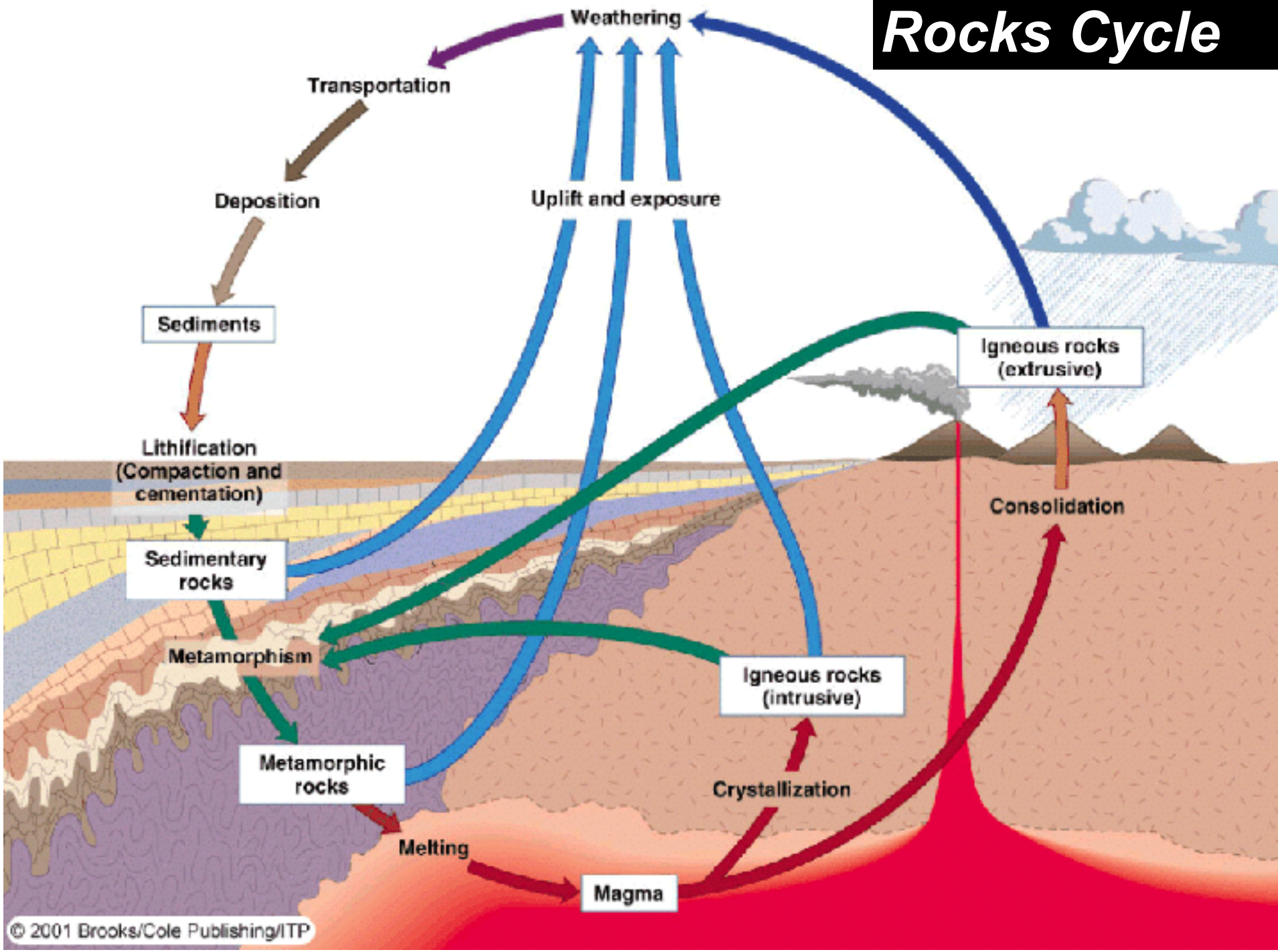
- ***Clastic sedimentary rocks*** **are formed from bits and pieces of previously existing rocks, called clasts or detritus**
- ***Chemical (Non-clastic) sedimentary rocks*** **are formed in several ways**
  - **By precipitation from aqueous solution**
  - **From plant material**
  - **From animal material**

Sedimentary Rocks

Processes Leading to Formation of Clastic Sedimentary Rocks

- ***Weathering:*** **the processes that change rocks' size and composition at or near Earth's surface**
- ***Erosion and Transportation:*** **removal of rock particles (clasts) from their source by water, wind, or glacial ice**
- ***Deposition:*** **the settling of clasts on Earth's surface as sediments, leads to formation of a sedimentary bed**
- ***Compaction:*** **pressing together of clasts, squeezing out pore water, by pressure exerted by overlying beds**
- ***Lithification:*** **cementation of clasts together to form a sedimentary rock**
- ***Diagenesis:*** **a process of conversion of unconsolidated sediments to coherent sedimentary rocks**

Rocks Cycle


Weathering
Transportation
Deposition
Uplift and exposure
Sediments
Lithification
(Compaction and
cementation)
Sedimentary
rocks
Metamorphism
Metamorphic
rocks
Melting
Magma
Crystallization
Igneous rocks
(intrusive)
Igneous rocks
(extrusive)
Consolidation
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Rocks

How can you identify rocks megascopically?

- ***Color:*** **the first guide to differentiate minerals, texture, and structure**
- ***Mineral composition:*** **names (with brief description) and percentage of individual mineral**
- ***Texture:*** **the relationship between the grains of minerals forming a rock**
- ***Structure:*** **the relationship between different parts of a rock**