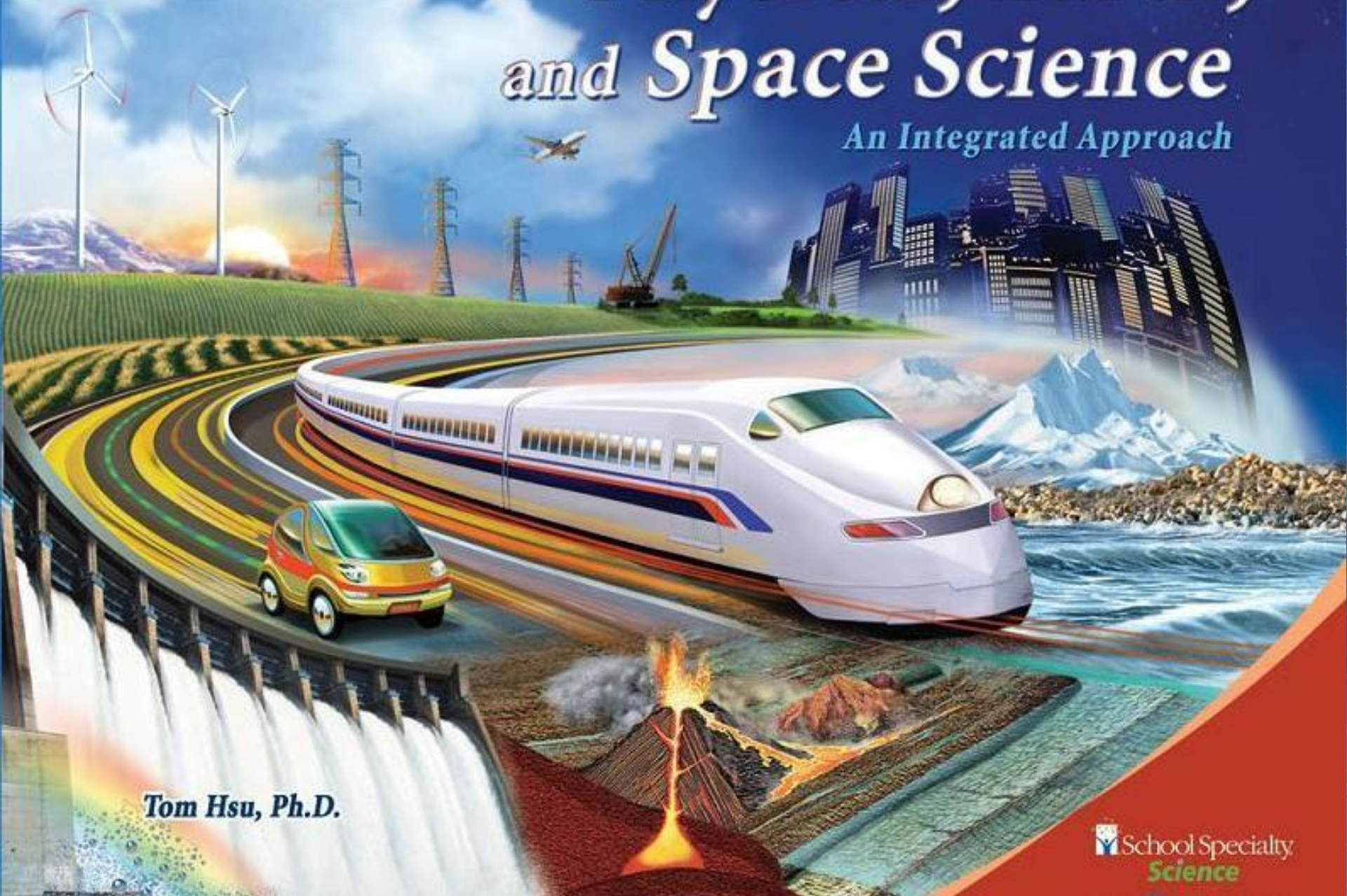


cpo science

Physical, Earth, and Space Science

An Integrated Approach



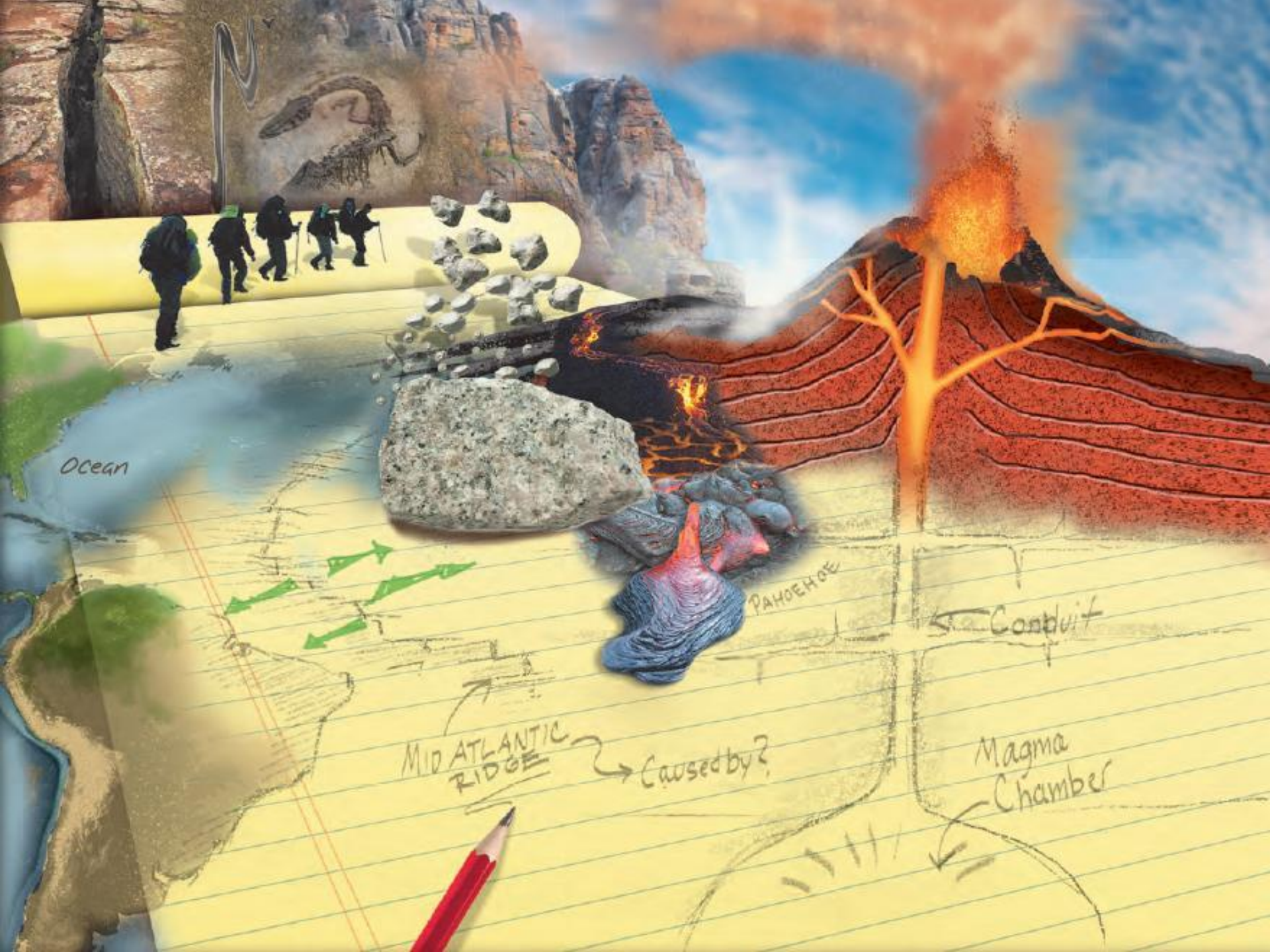
Tom Hsu, Ph.D.

 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 Nineteen: Changing Earth

- **19.1 Inside Earth**
- **19.2 Plate Tectonics**
- **19.3 Plate Boundaries**
- **19.4 Metamorphic Rocks**



19.4 Learning Goals

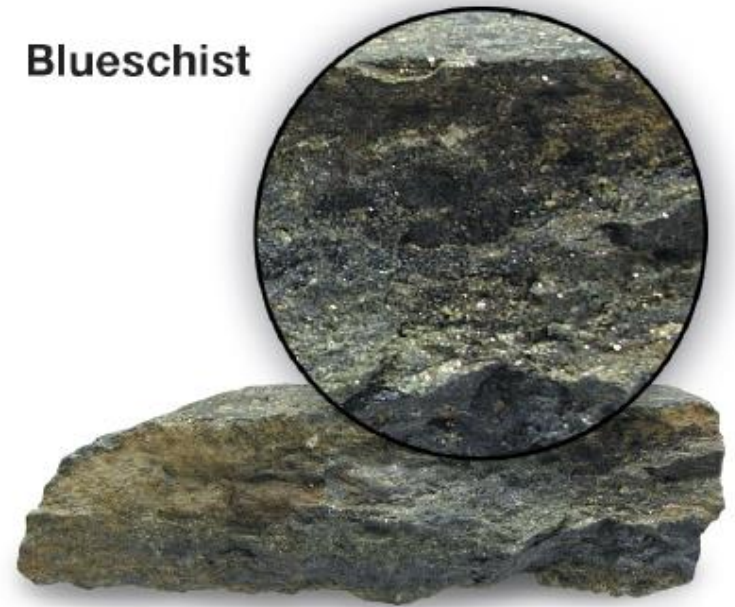
- **Define metamorphism.**
- **Identify characteristics of metamorphic rocks.**
- **Differentiate between regional and contact metamorphism.**



19.4 Metamorphic Rocks

- * **The word metamorphic means “changed form.”**
- * **A metamorphic rock is a rock formed from another kind of rock due to heat and pressure.**

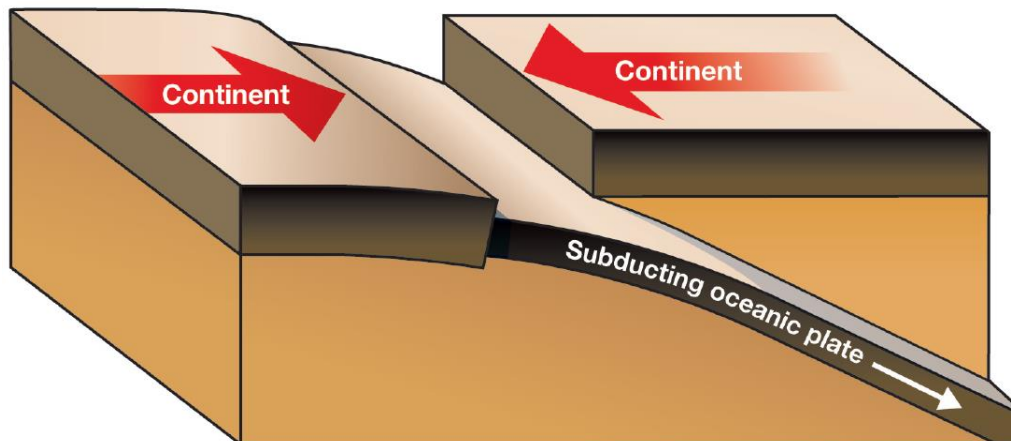
Blueschist





19.4 Metamorphic rock

- * Large-scale metamorphic events, called *regional metamorphism*, occur when lithospheric plates subduct or collide.





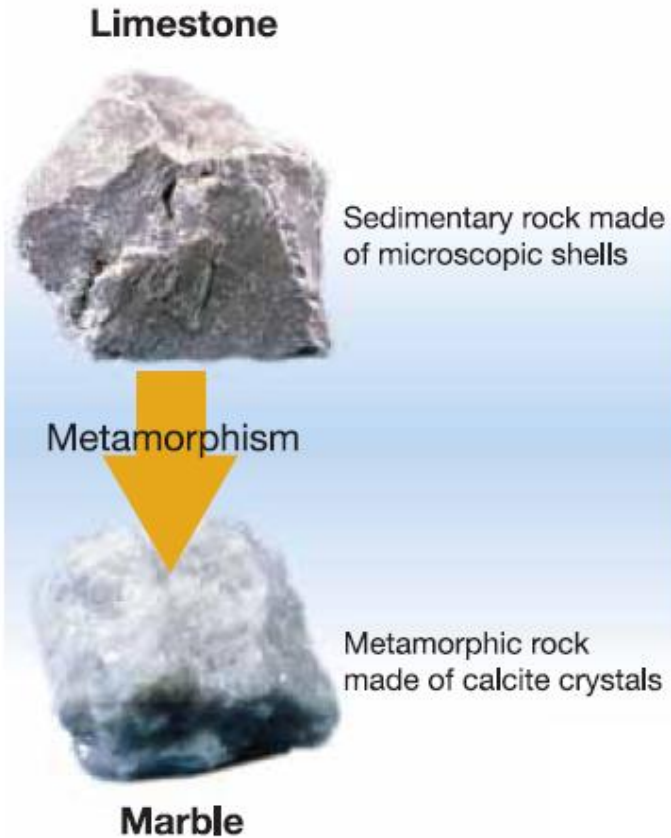
19.4 Metamorphic rocks

- * When magma comes in contact with another type of rock, the high heat may form metamorphic rock near the point of contact.
- * This is called *contact metamorphism*.





19.4 Metamorphic rocks

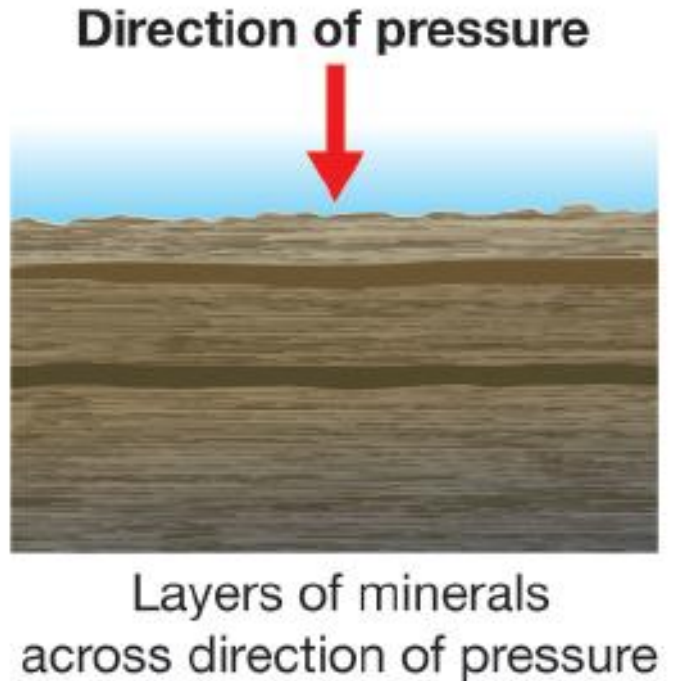


- **Limestone is a rock made of shells.**
- **During contact metamorphism limestone becomes marble under heat and pressure.**

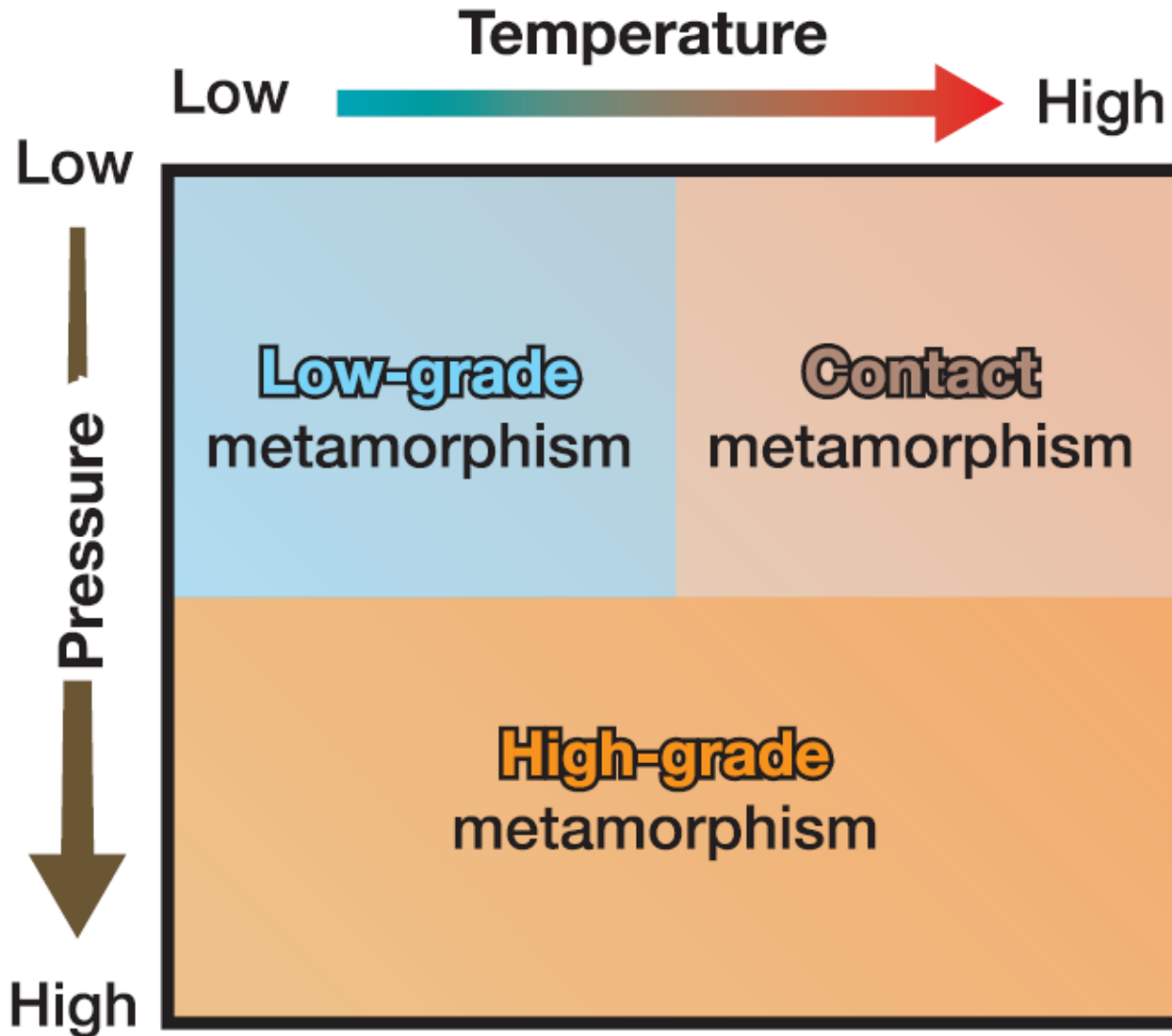


19.4 Metamorphic rocks

- * *High-grade metamorphism* involves high pressure and either low or high temperatures.
- * In this process, the minerals in a rock change to form new minerals.



Forming Metamorphic Rocks





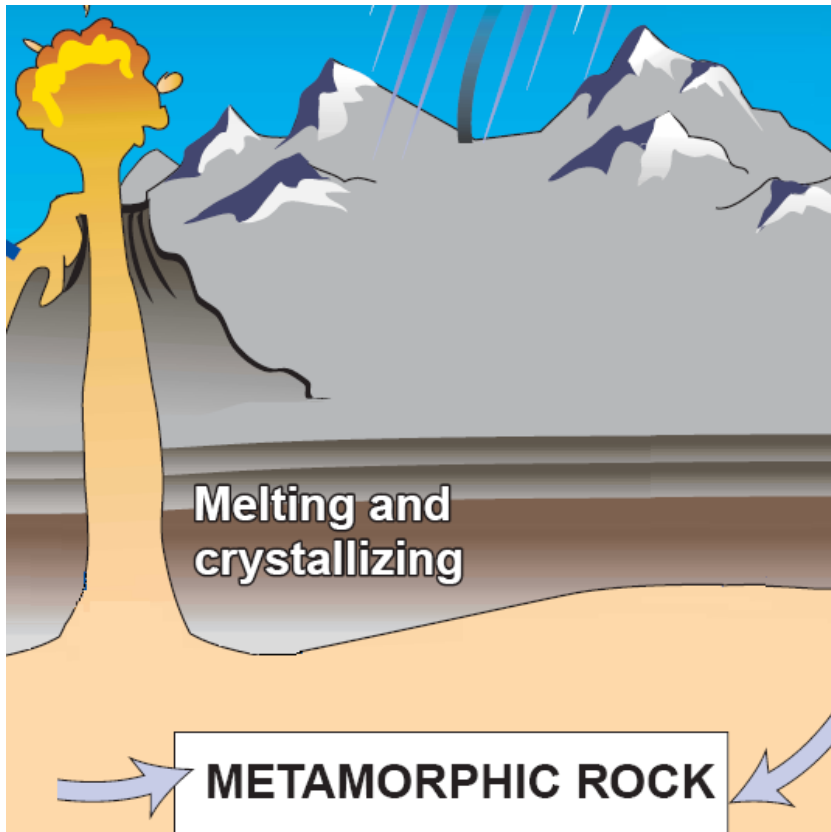
19.4 Changing rocks

Class	Material/Rock	Earth Process
Sedimentary Rock	Loose silt and clay	Sediments carried to low basins; grains in loose contact
	Compact silt and clay	Compaction due to weight of sediments presses grains together; excess water removed
	Mudstone	Lithification (rock formation); pressure causes grain points to fuse; pore spaces may fill with other minerals
Metamorphic Rock	Slate and phyllite	Clay minerals recrystallize to micas due to pressure; rock develops a tendency to split into sheets
	Schist	Minerals are recrystallized and micas increase in size
	Gneiss	New minerals form in alternating light and dark bands.
	Migmatite	Transition to igneous rock; some minerals in rock begin to melt
Igneous Rock	Any	Rock melts forming magma; magma cools and crystallizes to form igneous rocks

Increasing Pressure and Temperature



19.4 Metamorphic rocks



- * Heat and pressure result when colliding continents form mountains at a convergent boundary.
- * Mountains are where we find metamorphic rocks.



19.4 Metamorphic rocks tell great stories

- Geologists use rocks as clues to understand the history of Earth.

Eclogite



Clues that a subduction zone existed



Gneiss

A clue that a mountain range once existed



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.**



- **Metamorphic Rock SMART Presentation**