



Plate Tectonics

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Earth's Interior

How have geologists learned about Earth's inner structure?

- Geologists have used two main types of evidence to learn about Earth's interior: direct evidence from rock samples and indirect evidence from seismic waves.
 - Seismic waves: vibrations that travel through Earth carrying the energy released during an earthquake.



Earth's Interior

The three main layers of Earth are the crust, the mantle, and the core. These layers vary greatly in size, composition, temperature, and pressure.

- Pressure: the force exerted on a surface divided by the area over which the force is exerted.



Earth's Interior

What are the characteristics of Earth's crust, mantle, and core?

- The crust is a layer of solid rock that includes both dry land and the ocean floor.
- Earth's mantle is made up of rock that is very hot, but solid. Scientists divide the mantle into layers based on the physical characteristics of those layers. Overall, the mantle is nearly 3,000 kilometers thick.
- The core is made mostly of the metals iron and nickel. It consists of two parts--a liquid outer core and a solid inner core.



Earth's Interior

- Crust: The layer of rock that forms Earth's outer surface.
- Basalt: A dark, dense, igneous rock with a fine texture, found in oceanic crust.
- Mantle: The layer of hot, solid material between Earth's crust and core.
- Lithosphere: A rigid layer made up of the uppermost part of the mantle and the crust.
- Asthenosphere: The soft layer of the mantle on which the lithosphere floats.
- Outer core: A layer of molten iron and nickel that surrounds the inner core.
- Inner core: The dense sphere of solid iron and nickel at the center of Earth.



Convection and the Mantle

How is heat transferred?


- There are three types of heat transfer: radiation, conduction, and convection.
 - Radiation: The transfer of energy through space.
 - Conduction: The transfer of heat within a material or between materials that are touching.
 - Convection: The transfer of heat by movement of a fluid.



Convection and the Mantle

What causes convection currents?

- Heating and cooling of the fluid, changes in the fluid's density, and the force of gravity combine to set convection currents in motion.
 - Density: The amount of mass in a given space; mass per unit volume.
 - Convection current: The movement of a fluid, caused by differences in temperature, that transfers heat from one part of the fluid to another.



Convection and the Mantle

What causes convection currents in Earth's mantle?

- Heat from the core and the mantle itself causes convection currents in the mantle.



Drifting Continents

What was Alfred Wegener's hypothesis about the continents?

- Wegener's hypothesis was that all the continents were once joined together in a single landmass and have since drifted apart.
 - Continental drift: The hypothesis that the continents slowly move across Earth's surface.
 - Pangaea: The name of the single landmass that broke apart 200 million years ago and gave rise to today's continents.



Drifting Continents

What evidence supported Wegener's hypothesis?

- Wegener gathered evidence from different scientific fields to support his ideas about continental drift. He studied land features, fossils, and evidence of climate change.
 - Fossil: A trace of an ancient organism that has been preserved in rock.



Drifting Continents

Why was Wegener's hypothesis rejected by most scientists of his day?

- Wegener could not provide a satisfactory explanation for the force that pushes or pulls the continents.



Sea-Floor Spreading

What is the process of sea-floor spreading?

- In sea-floor spreading, the sea floor spreads apart along both sides of a mid-ocean ridge as new crust is added. As a result, the ocean floors move like conveyor belts, carrying the continents along with them.
 - Mid-ocean ridge: An undersea mountain chain where new ocean floor is produced; a divergent plate boundary.
 - Sonar: A device that determines the distance of an object under water by recording echoes of sound waves.
 - Sea-floor spreading: The process by which molten material adds new oceanic crust to the ocean floor.



Sea-Floor Spreading

What is the evidence for sea-floor spreading?

- Several types of evidence supported Hess's theory of sea-floor spreading: eruptions of molten material, magnetic stripes in the rock of the ocean floor, and the ages of the rocks themselves.



Sea-Floor Spreading

What happens at deep-ocean trenches?

- In a process taking tens of millions of years, part of the ocean floor sinks back into the mantle at deep-ocean trenches.
 - Deep-ocean trenches: A deep valley along the ocean floor beneath which oceanic crust slowly sinks toward the mantle.
 - Subduction: The process by which oceanic crust sinks beneath a deep-ocean trench and back into the mantle at a convergent plate boundary.



The Theory of Plate Tectonics

What is the theory of plate tectonics?

- The theory of plate tectonics explains the formation, movement, and subduction of Earth's plates.
 - Plate: A section of the lithosphere that slowly moves over the asthenosphere, carrying pieces of continental and oceanic crust.
 - Scientific theory: A well-tested concept that explains a wide range of observations.
 - Plate tectonics: The theory that pieces of Earth's lithosphere are in constant motion, driven by convection currents in the mantle.



The Theory of Plate Tectonics

What are the three types of plate boundaries?

- The three kinds of plate boundaries are:
 - Divergent boundaries: A plate boundary where two plates move away from each other.
 - Convergent boundaries: A plate boundary where two plates move toward each other.
 - Transform boundaries: A plate boundary where two plates move past each other in opposite directions.
 - Fault: A break in Earth's crust where masses of rock slip past each other.
 - Rift valley: A deep valley that forms where two plates move apart.