

Inside Earth: Chapter 1- Plate Tectonics



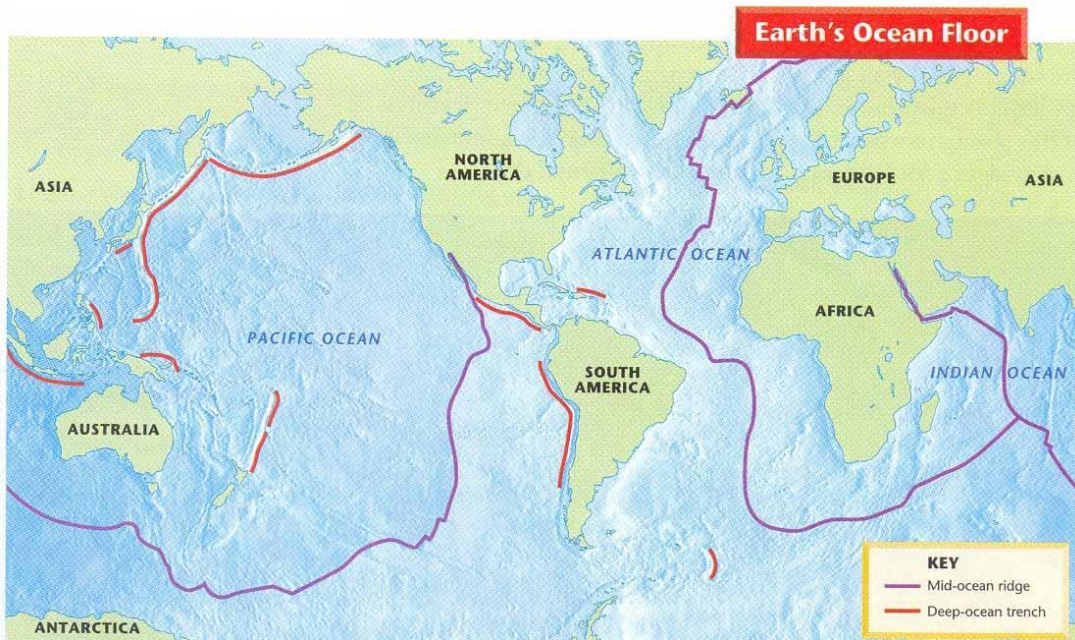
Section 4: Sea-Floor Spreading

Guide For Reading

- What is the process of sea-floor spreading?
- What happens to the ocean floor at deep ocean trenches?

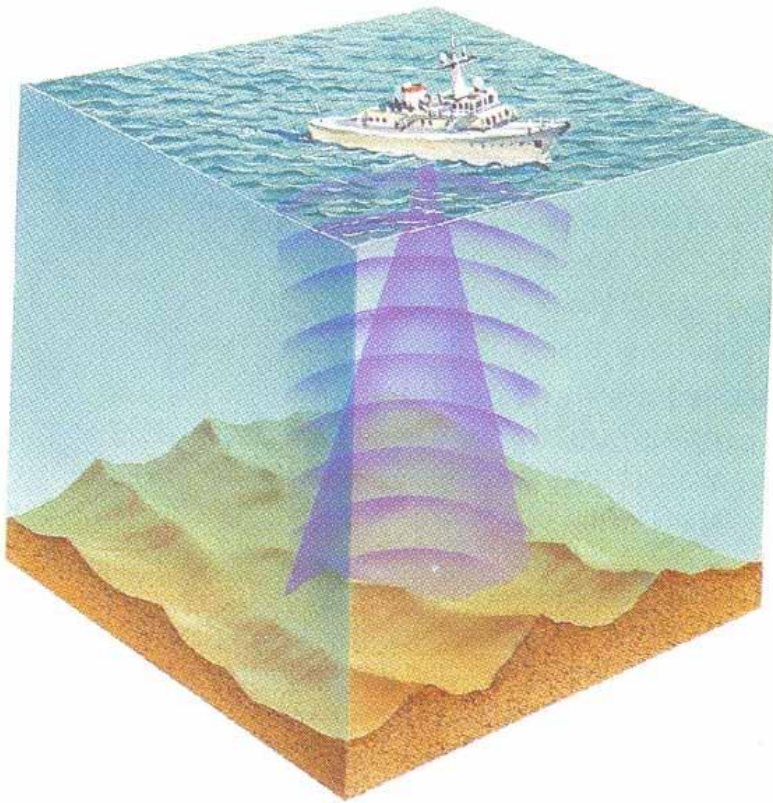
Mapping the Mid-Ocean Ridge

Mid-Ocean Ridge



- Mid-Ocean Ridge: The undersea mountain chain where new ocean floor is produced; a divergent plate boundary

Sonar



- Sonar: A device that determines the distance of an object under water by recording echoes of sound waves

Checkpoint (Page 34) What device is used to map the ocean floor?

- The sonar is used to map the ocean floor
 - Sonar bounces sound waves off underwater objects and then records the echoes of these sound waves
 - The time it takes for the echo to arrive indicates the distance to the object

Evidence for Sea-Floor Spreading

Sea-Floor Spreading

- Sea-floor spreading: The process by which molten material adds new oceanic crust to the ocean floor

Checkpoint (Page 37) What evidence did scientists find for sea-floor spreading?

- Evidence from molten material
- Evidence from magnetic stripes
- Evidence from drilling samples

Evidence From Molten Material

- Alvin's crew found strange rocks shaped like pillows or like toothpaste squeezed from a tube
- Such rocks can form only when molten material hardens quickly after erupting under water
- The presence of these rocks showed that molten material has erupted again and again from cracks along the central valley of the mid-ocean ridge.

Evidence From Magnetic Stripes

- Scientists discovered that the rock that makes up the ocean floor lies in a pattern of magnetized "stripes"
- 780,000 years ago, magnetic poles reversed themselves
 - If they reversed today, the needle in a compass would point south instead of north
- The rock in the ocean is made of iron, which began as molten material

Evidence From Drilling Samples

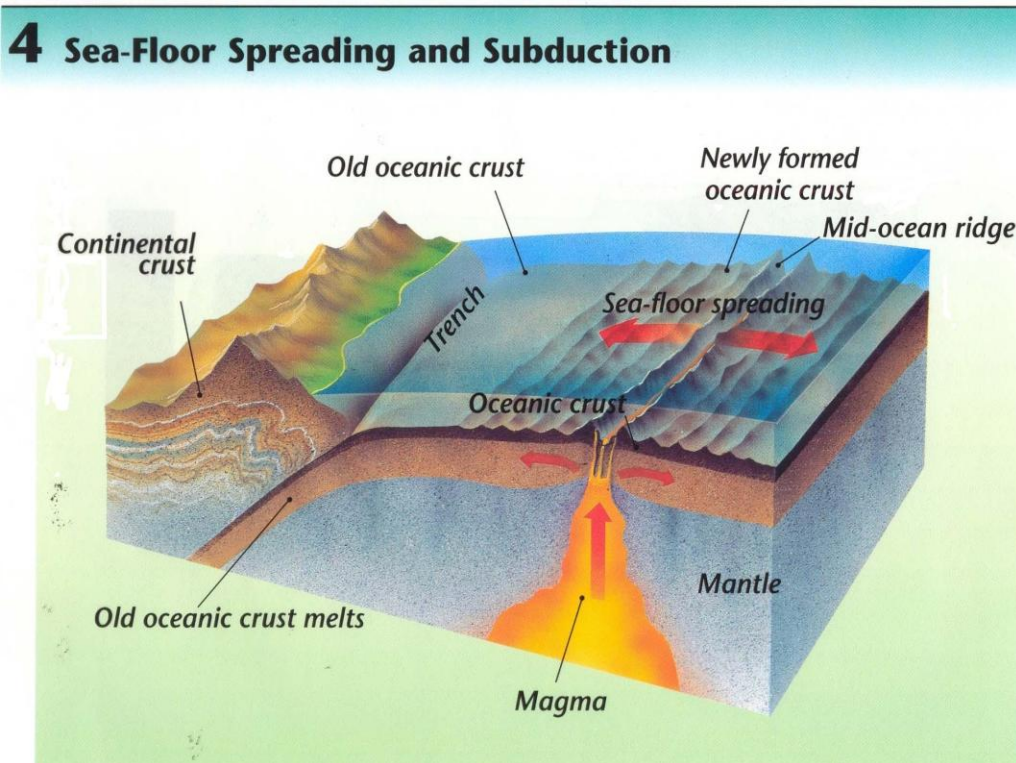
- When scientists sampled the rocks, they found that the further away from the ridge the rocks were the older they were
- The younger rocks were always in the center of the ridges

Subduction at Deep-Ocean Trenches

Deep-Ocean Trenches

- Deep-Ocean Trenches: A deep valley along the ocean floor through which oceanic crust slowly sinks towards the mantle

Subduction



- Subduction: The process by which oceanic crust sinks through a deep-ocean trench and back into the mantle; a convergent plate boundary

Guide For Reading: What happens to the ocean floor at deep ocean trenches?

- At deep-ocean trenches, two plates collide causing the denser of the two plates to dive back to the mantle. This process is known as subduction.
- Over tens of million of years, this material melts back into molten material and may rise again as new oceanic crust.

Guide For Reading: What is the process of sea-floor spreading?

- At the mid-ocean ridge, molten material rises from the mantle and erupts. The molten material then spreads out, pushing older rock to both sides of the ridge.
- Over tens of millions of years, the process continues until the oldest ocean floor collides with the continental crust
- The more dense oceanic crust subducts (sinks) back into the mantle at a deep-ocean trench

Subduction and Earth's Oceans

Subduction in the Pacific Ocean

- Subduction in the Pacific Ocean is occurring at a greater rate than sea-floor is expanding
- This is caused by the large amount of trenches

Subduction in the Atlantic

- The Atlantic Ocean is expanding at a greater rate than subducting
- This is because of the low number of trenches in the Atlantic
- Over time the entire ocean gets larger and pushes against the continents