

Plate Tectonics

17.1 Drifting Continents

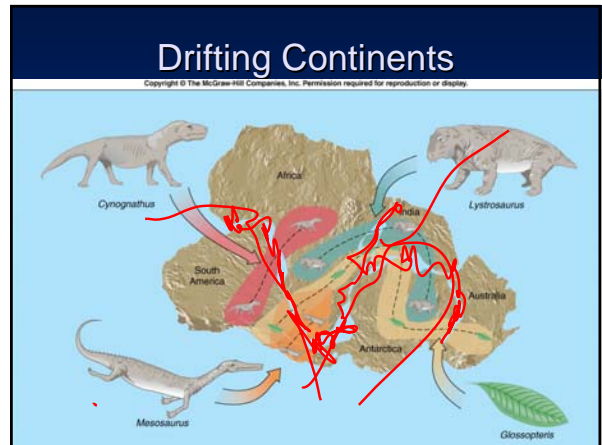
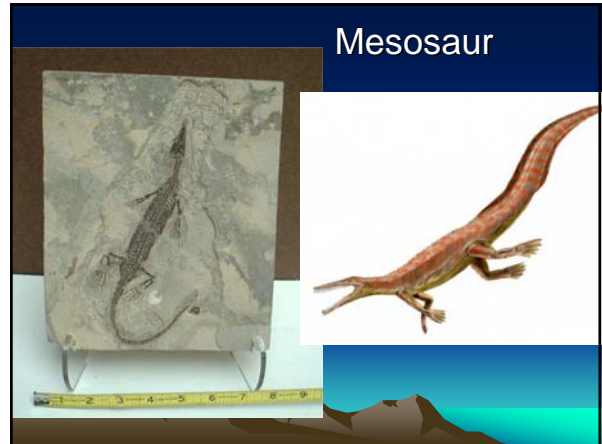


- ### Drifting Continents
- Early Evidence
 - Abraham Ortelius
 - Late 1500's
 - Noticed the fit of South America and Africa
 - Explained it in terms of floods and earthquakes
 - Eduard Seuss
 - Proposed that southern continents were once together
 - Named it Gondwanaland
 - Alfred Wegener
 - Early 1900
 - He brought scientific evidence of his theory

- ### Drifting Continents
- Theory of Continental Drift
 - Continents had been joined as a single landmass 200 million years ago
 - Supercontinent named Pangaea greek "all earth"
 - They slowly moved to current position
 - How can this be explained? Proven?
 - Need for evidence



- ### Continental Drift Evidence
- Puzzle-like fit was first observation
 - Common Mountain Ranges / rock types
 - Evidence from fossils
 - Land animal
 - Labyrinthodont
 - Aquatic Animal
 - Mesosaurus
 - Plant
 - glossopteris



- ### Continental Drift Evidence
- Glacial Deposits
 - Indicate that landmasses had been located near poles and drifted
 - Glacial striations
 - Bedrock Geology
 - Matching rock types
 - Coal deposits

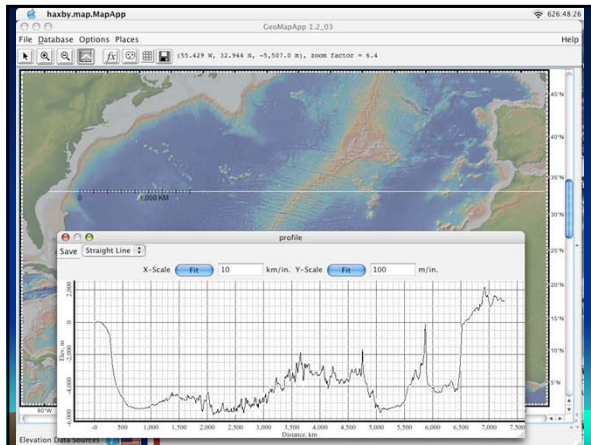
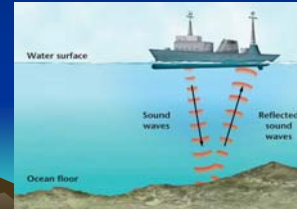


Theory gets rejected

- Wegener's theory was not accepted by the scientific community
 - No explanation for what causes continents to move (he proposed rotation of earth)
 - No explanation for how a continent could move without shattering
 - 1930 - Wegener died in Greenland searching for more evidence
 - theory put on hold until the 1960's

Seafloor Spreading

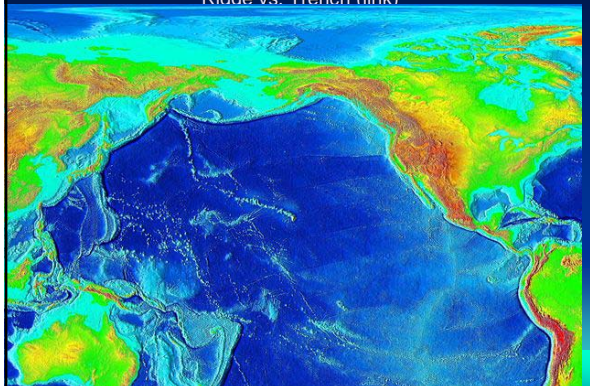
- Ocean floor was thought to be flat prior to WW2.
- SONAR – helped to create the first profiles of the ocean floor
- Sound Navigation And Ranging



Seafloor Spreading

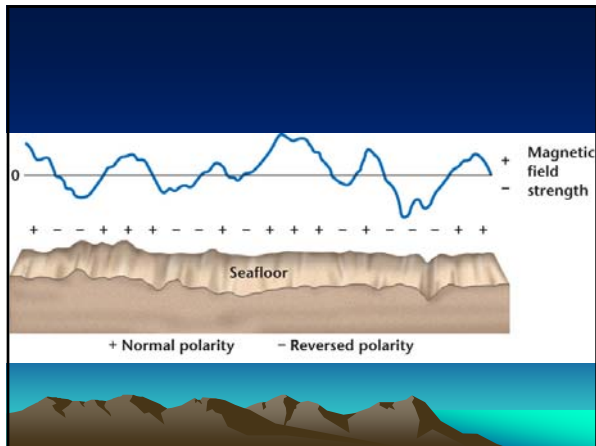
- Findings???
 - Ocean floor topography had large mountains with huge canyons in the middle
 - Aka – Mid ocean ridge
 - Deep sea trenches
 - Deepest places on earth 29,000+ feet deep

Ridge vs. Trench (link)



Seafloor Spreading

- Magnetometer
 - Sensor pulled by ships
 - Detects magnetic field
- Discovery of magnetic variation in ocean floor
- Paleomagnetism – study of earth's magnetic field in the past
- At times earth's magnetic field direction has reversed and this has been preserved in rock record



-The magnetic data collected from the ocean floor matched the pattern of magnetic reversals that had been found in basalt flows on land.

From this match, scientists were able to determine the age of the ocean floor from a magnetic recording and quickly create isochron maps of the ocean floor.

Ocean ridge

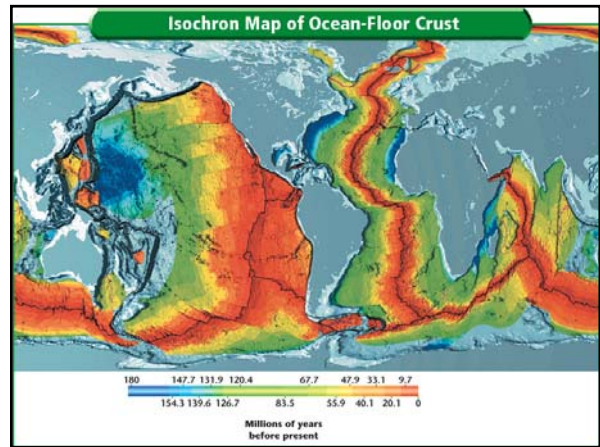
Age (millions of years)

Normal polarity

Reversed polarity

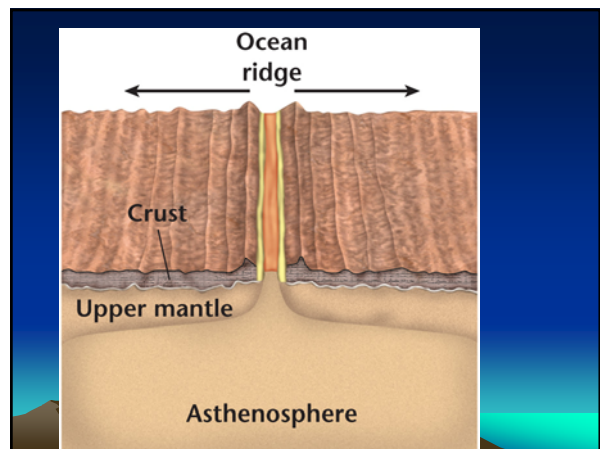
Seafloor Spreading

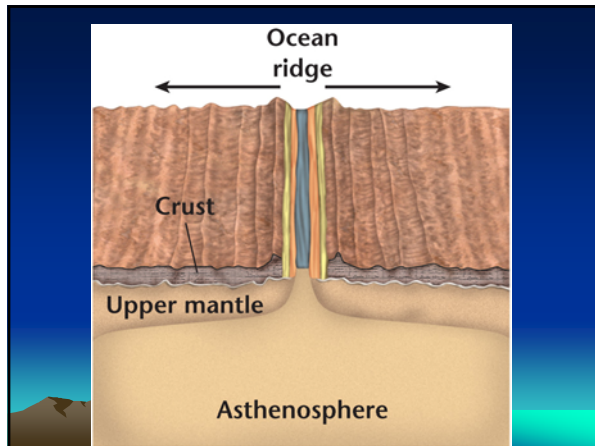
- Core Samples
- Sediment profile taken
 - Discovery of thin sediments near ridge
 - Thick sediments near trenches
 - Inference?
 - Sediments take time to build up so the ocean floor was older near the trenches



Seafloor Spreading

- Seafloor Spreading theory
- Proposed by Harry Hess
- New ocean floor is created at ocean ridges
- Pressure pushes crust apart
- Magma fills in the gap and solidifies
- Old crust is pulled into earth at trenches
- Cycle repeats





Seafloor Spreading Theory

- This was the Missing link to support Continental Drift!
- Continents are not pushing through ocean crust, as Wegener proposed
- they ride with ocean crust as it slowly moves away from ocean ridges.
- What could cause entire continents to move?
The search for knowledge continues