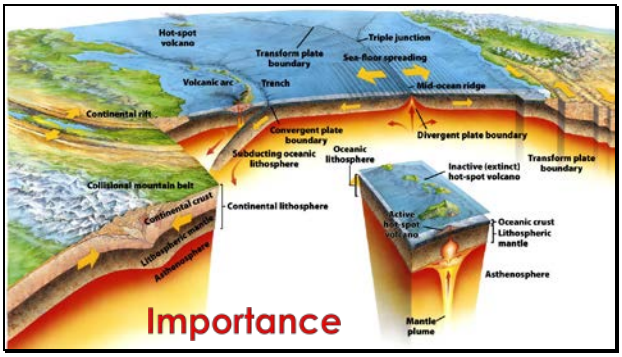
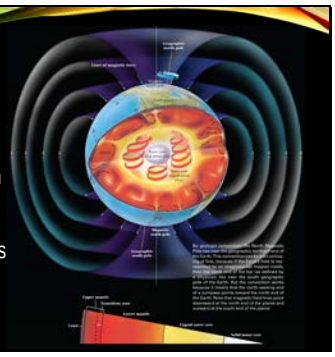
CONTINENTS, SEAS & PLATE TECTONICS

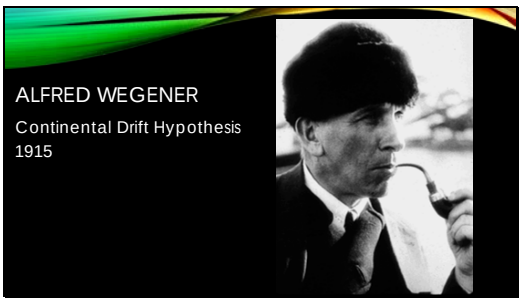
UNI Earth & Environmental Science – Heinzel

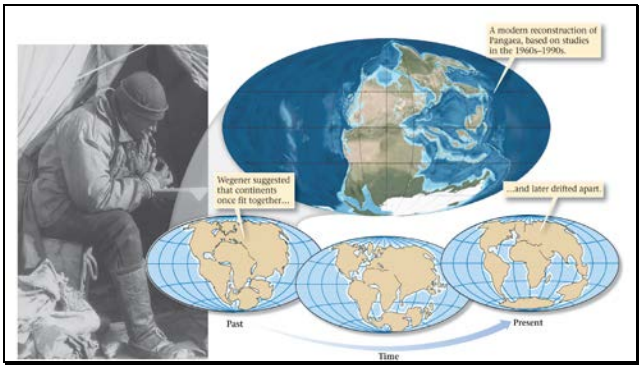


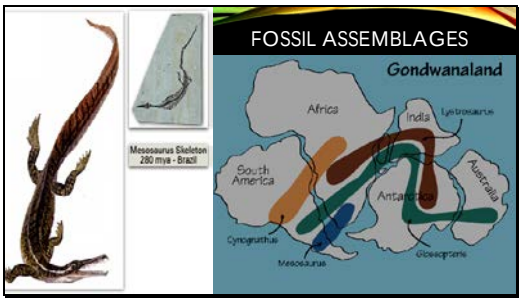
BIG IDEA

The Earth's interior is in constant motion through the processes of convection, with important consequences for the surface.




ALFRED WEGENER
Continental Drift Hypothesis
1915


A modern reconstruction of Pangaea, based on studies in the 1960s–1990s.
Wegener suggested that continents once fit together...
...and later drifted apart.
Past
Present
Time


FOSSIL ASSEMBLAGES
Mesosaurus Skeleton
280 mya - Brazil
Gondwanaland
Africa
India
Lystrosaurus
South America
Antarctica
Australia
Cynognathus
Mesosaurus
Glossopteris

ALIGNMENT OF GLACIAL SEDIMENT

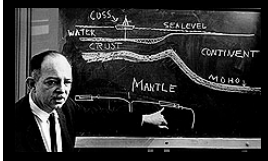
WORLD WAR II

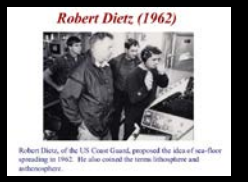
Sea floor mapping
- Submarine warfare
- Communication

MARIE THARP

- Created the first maps to provide evidence of ocean floor rift valleys.
- 1950s

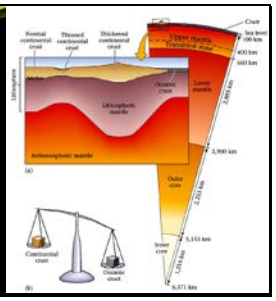
HARRY HESS & ROBERT DIETZ





Crust

Continental
Vs
Oceanic



BIG IDEA

The Earth's tectonic plates consist of rocky crust (lithosphere), the upper most mantle, and move slowly with respect to one another.

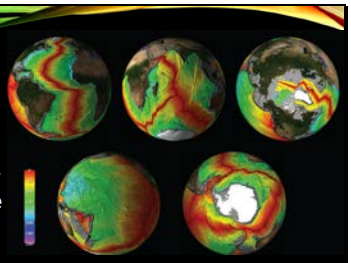
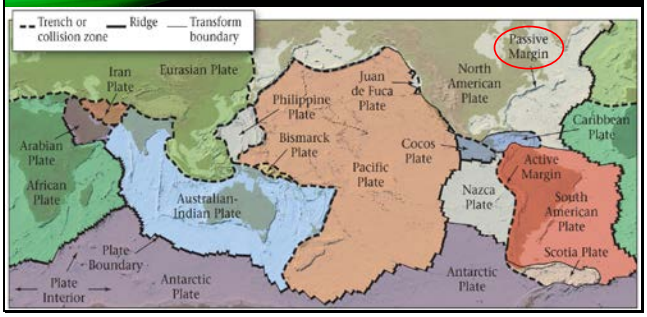
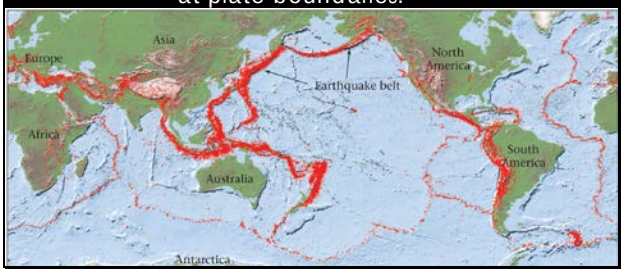


PLATE BOUNDARIES

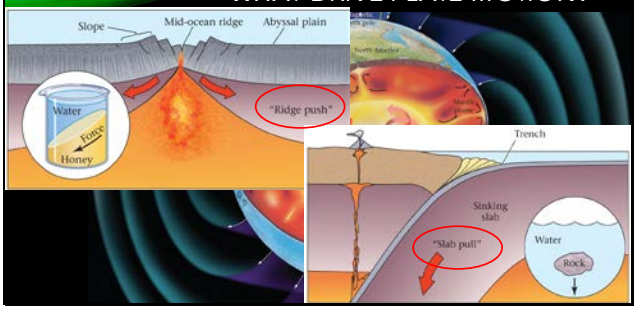


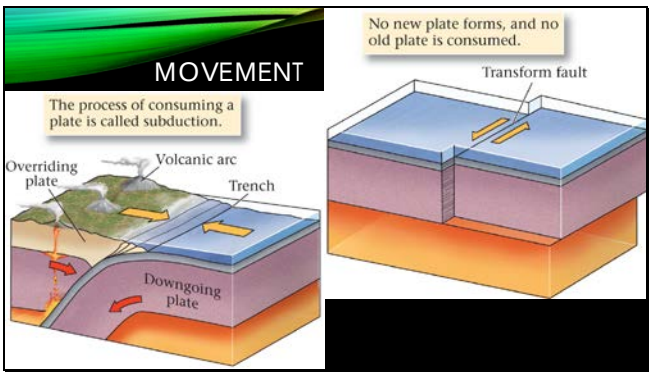
BIG IDEA

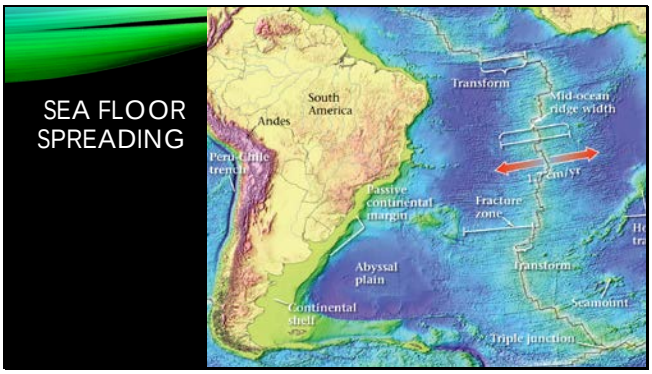
Many active geologic processes occur at plate boundaries.

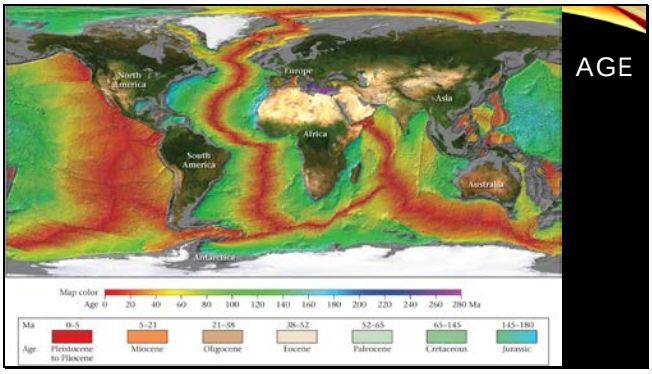


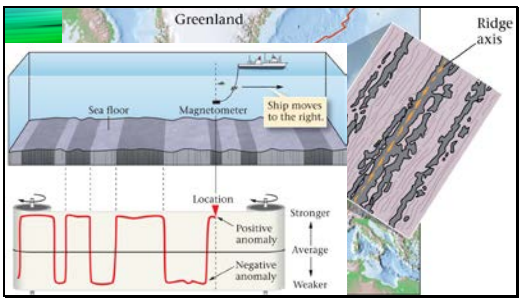
WHAT DRIVE PLATE MOTION?

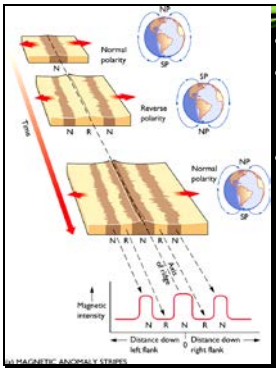



MOVEMENT
The process of consuming a plate is called subduction.
Overriding plate
Volcanic arc
Trench
Downgoing plate
No new plate forms, and no old plate is consumed.
Transform fault


SEA FLOOR SPREADING
South America
Andes
Peru-Chile trench
Passive continental margin
Abyssal plain
Continental shelf
Transform
Mid-ocean ridge width
Fracture zone
Transform
Seamount
Triple junction

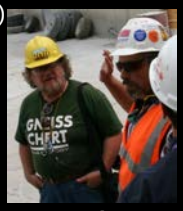

AGE
North America
Europe
Asia
Africa
South America
Australia
Antarctica
Map color
Age 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 Ma
Ma 0–5 5–21 21–38 38–52 52–65 65–145 145–180
Age Pleistocene to Pliocene Miocene Oligocene Eocene Paleocene Cretaceous Jurassic



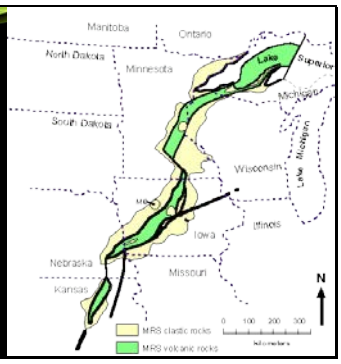


- 171 reversals in 76 Ma
- Rate of Plate movement
  - Distance (Anomaly to ridge)/ Anomaly Age
- Plate movement (2 to 18 cm per year)

MID-CONTINENT RIFT (1.1 GA)

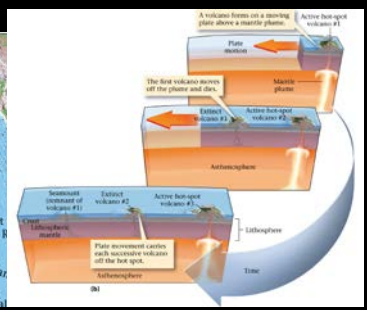


Ray Anderson



HOT SPOTS

Kuril Trench
Aleutian Trench
Emperor Seamounts
Midway Island
Hawaiian Chain
Hawaii
Marshall and Gilbert Islands
Line Islands
Austral Islands


A volcano forms on a moving plate above a mantle plume.
Active hot-spot volcano #1
Plate motion
The first volcano moves off the plume and dies.
Mantle plume
Extinct volcano #1
Active hot-spot volcano #2
Asthenosphere
Seamount (remnant of volcano #1)
Extinct volcano #2
Active hot-spot volcano #3
Crust
Lithospheric mantle
Lithosphere
Plate movement carries each successive volcano off the hot spot.
Asthenosphere
Time
(b)