

Scientific Method

- Problem/Question
- Research
- Hypotheses
- Experiment
- Analyse
- Conclude

Supporting Evidence of Wegener's theory

- Landforms
- Fossils
- Climate

Landforms

- South America & Africa have similar mountain ranges
- Europe & North America have similar coal fields

Fossils

- Fossil-any trace of an ancient organism that has been preserved in rock
- Mesosaur fossils have been found in places now separated by oceans
- Glossopeteris (fern like plant) fossils have been in rocks in Africa, South America, Australia, India, & Antarctica (Glossopeteris)

Climate

- Spitsbergen Island lies in the Arctic Ocean, north of Norway, covered with ice
- Fossils of tropical have been discovered under the ice
- South Africa - deep scratches in rock indicate glacier movement there!!!

REJECTED!!!

- Scientists rejected Wegener's theory of continental drift
- Most scientists in the 1900's believed the Earth was cooling + shrinking causing the continents to move & mountains to form

Is sea-floor spreading like continental drift?

- 1960
- Harry Hess, when studying the mid-ocean ridge, proposed that the ocean floor moved like a "conveyor belt" moving the continents with them
- Sea-floor spreading is the continually adding to the ocean floor

E10 back

Sea-floor Spreading

- Molten material rises up from the mantle
- It spreads out, cools off, & hardens
- It pushes the older rock rock out on both sides of the ridge
- New crust forms!

Wait a minute...!

- Hess' idea of sea floor spreading caused scientists to revisit Wegener's idea of continental drift!

So where does all of the old crust being pushed out go?

- Subduction: It is the process by which the ocean floor sinks beneath a deep ocean trench & back into the mantle

Sea Floor Spreading & Subduction...

- Can change the shape of the oceans
- The ocean floor is renewed every 200 million years (That's the time it takes for new crust to form, move across the ocean floor, & sink into a trench)

What is the Theory of Plate Tectonics?

- 1965
- Tuzo Wilson proposed that the cracks in Earth's surface were broken into section called "plates"
- He combined the idea of sea floor spreading, Earth's plates & continental drift into a single theory single

Plate Tectonics Theory

- A geological theory that states that pieces of Earth's lithosphere are in constant, slow motion driven by convection currents in the mantle

How does it work?

- Lithospheric plates float on top of the asthenosphere
- Convection currents rise in the asthenosphere & spread out under the plates
- No plate can move without affecting another plate
- Plates move extremely slow at 1-10 cm per year
- As the plates move, collide, or pull apart...it produces great changes on Earth's surface
- Like volcanoes, earthquakes, mountain ranges, & deep ocean trenches

E10 Summary

Geologic Processes Unit Name \_\_\_\_\_ Pd \_\_\_\_\_

What do Earth's layers consist of?

- crust
- mantle
- core

Crust

- Layer of rock that forms Earth's "outer skin"
- Includes rocks, mountains, soil, water
- Thin: 5-40 km km thick
- 870°C

2 Types:

- Continental: Dry land (granite)
- oceanic: Ocean (basalt)

Mantle

- Layer of hot rock
- 2,900 km thick
- 2,200°C

2 Sub layers:

- Lithosphere
- Asthenosphere

Lithosphere

- rigid
- Much like the crust
- 100 km thick
- floats on top of the asthenosphere

Asthenosphere

- plastic like
- Material can flow slowly like hot tar
- Has both solid & liquid qualities

Core

- Consists of outer & inner core
- 5,000°C
- Makes up 1/3 of Earth's mass

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Geologic Processes Unit Name \_\_\_\_\_ Pd \_\_\_\_\_

2 sub layers:

- Outer Core
- Inner Core

Outer Core

- Layer of molten material metal
- layers the inner core
- 2,250 km thick

Inner Core

- Dense solid ball of metal
- Extreme pressure does not allow Fe & Ni to spread out to form liquid
- 1,200 km thick iron + nickel

What are the 3 ways that heat is transferred?

- radiation
- conduction
- convection

Radiation

- Heat transferred by EM waves through space (EM = electromagnetic waves)
- EX: sitting by the fire

Conduction

- Heat transferred through direct contact
- EX: spoon in hot chocolate

Convection

- Heat transferred through a fluid movement of either a gas or liquid
- EX: Chicken noodle soup heating on the stove

Which of these do you think happens in Earth's mantle?

- convection
- convection currents flow in the asthenosphere
- Heated material rises to the top of the mantle (lithosphere), cool, then sinks back to the bottom

What does the Theory of Continental Drift state?

- 1910
- Alfred Wegener hypothesized that all the continents had once been a single landmass
- A Supercontinent called "Pangaea"