Guided Notes: Plate Tectonics

**An Idea Before Its Time**

**◆** Wegener’s **continental \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** hypothesis stated that the continents had once been joined to form a single supercontinent.

• Wegener proposed that the supercontinent, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,** began to break apart 200 million years ago and form the present landmasses.

**◆** Evidence

• The Continental **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

• Matching **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

- **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** evidence for continental drift includes several fossil organisms found on different landmasses.

• Rock **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

- Rock evidence for continental exists in the form of several mountain belts that end at one coastline, only to reappear on a landmass across the ocean.

• Ancient **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Rejecting the Hypothesis**

**◆** A New Theory Emerges

• Wegener could not provide an explanation of exactly what made the continents move. News technology lead to findings which then lead to a new theory called plate **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**Earth’s Major Roles**

**◆** According to the **plate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** theory, the uppermost mantle, along with the overlying crust, behaves as a strong, rigid layer. This layer is known as the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

• A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is one of numerous rigid sections of the lithosphere that move as a unit over the material of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**Types of Plate Boundaries**

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **boundaries** (also called spreading centers) are the place where two plates move apart.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **boundaries** form where two plates move together.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **fault boundaries** are margins where two plates grind past each other without the production or destruction of the lithosphere.

**Divergent Boundaries**

**◆** Oceanic Ridges and Seafloor Spreading

• **Oceanic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are continuous elevated zones on the floor of all major ocean basins. The rifts at the crest of ridges represent divergent plate boundaries.

• **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are deep faulted structures found along the axes of divergent plate boundaries. They can develop on the seafloor or on land.

• **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **spreading** produces new oceanic lithosphere.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **Rifts**

• When spreading centers develop within a continent, the landmass may split into two or more smaller segments, forming a rift.

**Convergent Boundaries**

**◆** A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **zone** occurs when one oceanic plate is forced down into the mantle beneath a second plate.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** -**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

• Pockets of magma develop and rise.

• **Continental \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **arcs** form in part by volcanic activity caused by the subduction of oceanic lithosphere beneath a continent.

• Examples include the Andes, Cascades, and the Sierra Nevadas.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** -**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

• Two oceanic slabs converge and one descends beneath the other.

• This kind of boundary often forms volcanoes on the ocean floor.

• **Volcanic island arcs** form as volcanoes emerge from the sea.

• Examples include the Aleutian, Mariana, and Tonga islands.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** -**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

• When subducting plates contain continental material, two continents collide.

• This kind of boundary can produce new mountain ranges, such as the Himalayas.

**Transform Fault Boundaries**

**◆** At a transform fault boundary, plates **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** past each other without destroying the lithosphere.

**◆** Transform faults

• Most join **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** segments of a mid-ocean ridge.

• At the time of formation, they roughly **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the direction of plate movement.

• They aid the movement of oceanic crustal material.

**Evidence for Plate Tectonics**

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the natural remnant magnetism in rock bodies; this permanent magnetization acquired by rock can be used to determine the location of the magnetic poles at the time the rock became magnetized.

* **Normal polarity**—when rocks show the same magnetism as the present magnetism field
* **Reverse polarity**—when rocks show the opposite magnetism as the present magnetism field

**◆** The discovery of strips of alternating polarity, which lie as mirror images across the ocean ridges, is among the strongest evidence of seafloor spreading.

**◆ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** Patterns

* Scientists found a close link between deep-focus earthquakes and ocean trenches.
* The absence of deep-focus earthquakes along the oceanic ridge system was shown to be consistent with the new theory.

**◆** Ocean **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* The data on the ages of seafloor sediment confirmed what the seafloor spreading hypothesis predicted.
* The youngest oceanic crust is at the ridge crest, and the oldest oceanic crust is at the continental margins.

**◆** Hot Spots

* A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a concentration of heat in the mantle capable of producing magma, which rises to Earth’s surface; The Pacific plate moves over a hot spot, producing the Hawaiian Islands.
* Hot spot evidence supports that the plates move over the Earth’s surface.

**Causes of Plate Motion**

**◆** Scientists generally agree that **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** occurring in the mantle is the basic driving force for plate movement.

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **flow** is the motion of matter resulting from changes in temperature.

**◆** Slab-Pull and Ridge-Push

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is a mechanism that contributes to plate motion in which cool, dense oceanic crust sinks into the mantle and “pulls” the trailing lithosphere along. It is thought to be the primary downward arm of convective flow in the mantle.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** causes oceanic lithosphere to slide down the sides of the oceanic ridge under the pull of gravity. It may contribute to plate motion.

**◆** Mantle Convection

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are masses of hotter-than-normal mantle material that ascend toward the surface, where they may lead to igneous activity.
* The unequal distribution of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** within Earth causes the thermal convection in the mantle that ultimately drives plate motion.