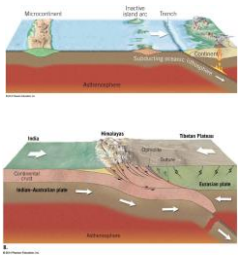
Plate Tectonics (Part 3)

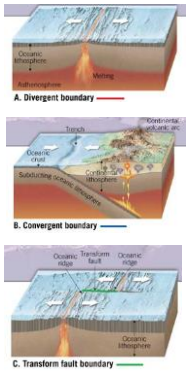
- Three Types of Plate Boundaries
- Convergent Plate boundaries
- Parts of a Subduction Zone
- Accreted Terranes
- Driving Forces of Plate Tectonics
- Convection Models
- Breakup of Pangaea



1

Three Types of Plate Boundaries

- Divergent (constructive):
  - Two plates move apart from one another
- Convergent (destructive):
  - Two plates collide with one possibly subducting beneath the other
- Transform (lithosphere conserved):
  - Two plates slide laterally past one another



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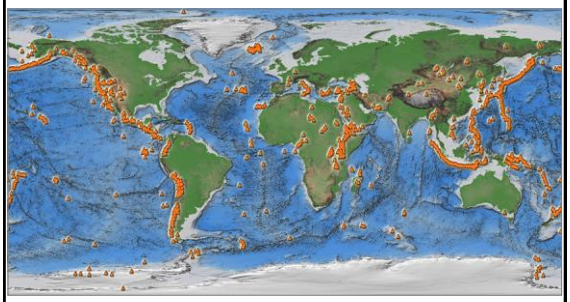
Active Volcanoes



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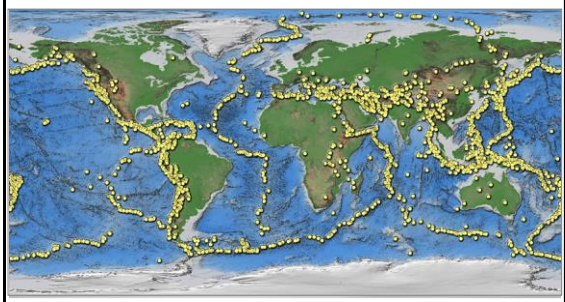
3

Recent Earthquakes



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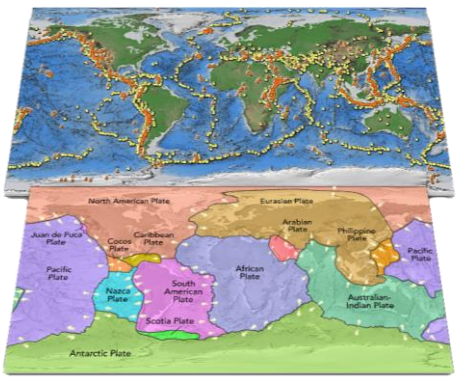

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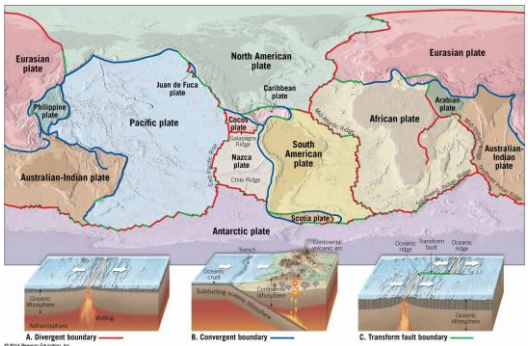
Three Types of Plate Boundaries



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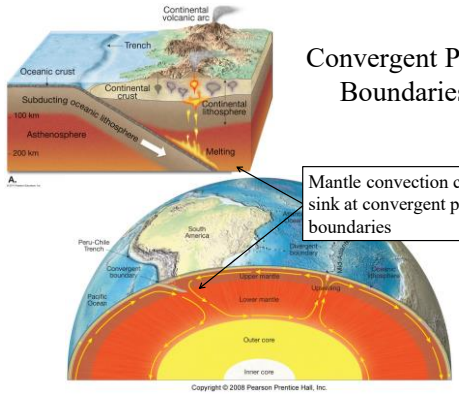
Convergent Plate Boundaries



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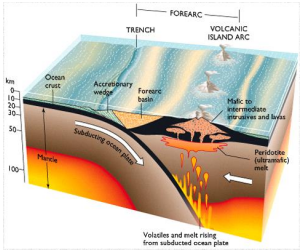
Parts of a Subduction Zone

- Trench
- Accretionary Wedge or Prism
- Forearc Basin
- Volcanic Arc



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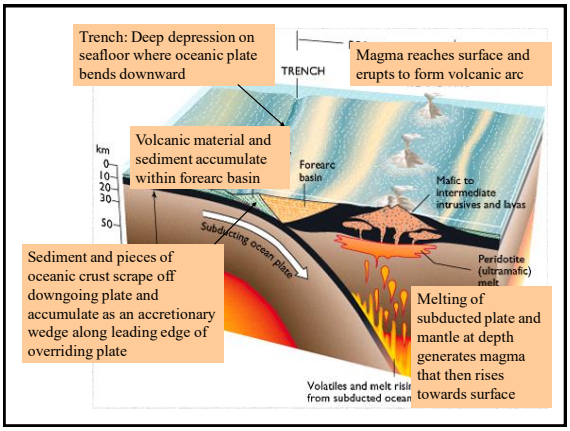

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Three Types of Convergent Plate Boundaries

- **Ocean-ocean convergence:**
  - **Oceanic lithosphere subducts beneath another oceanic plate**
- **Ocean-continent convergence:**
  - **Oceanic lithosphere subducts beneath continental lithosphere**
- **Continent-continent convergence:**
  - **Two continental plates collide**

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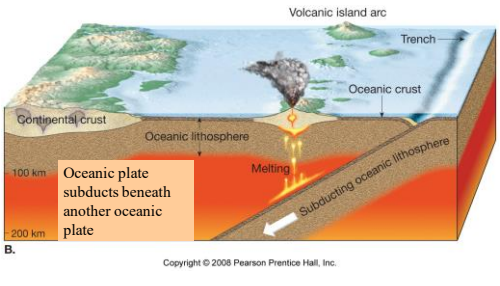
Ocean-Ocean Convergence



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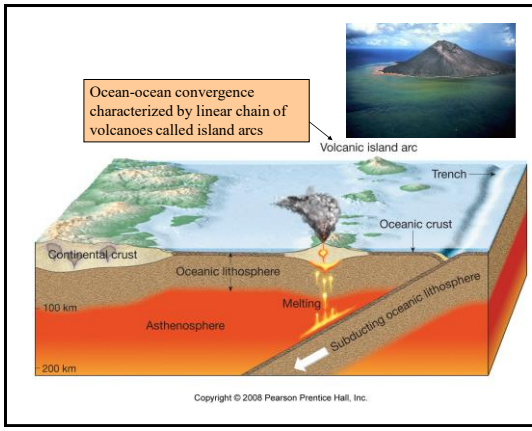

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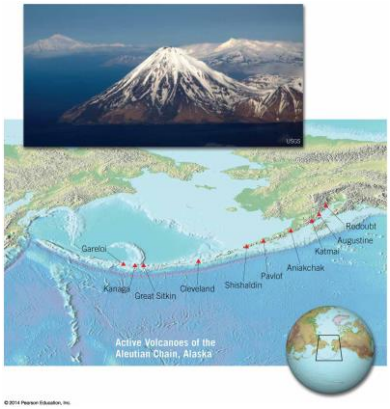
Active Volcanoes of the Aleutian Islands



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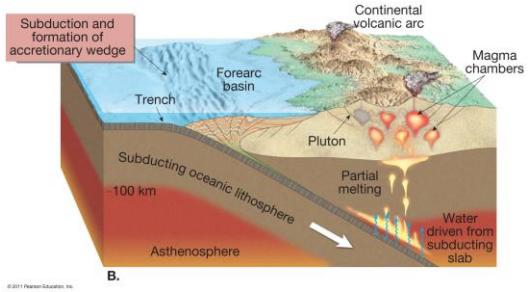
Ocean-Continent (Andean-Type) Convergence



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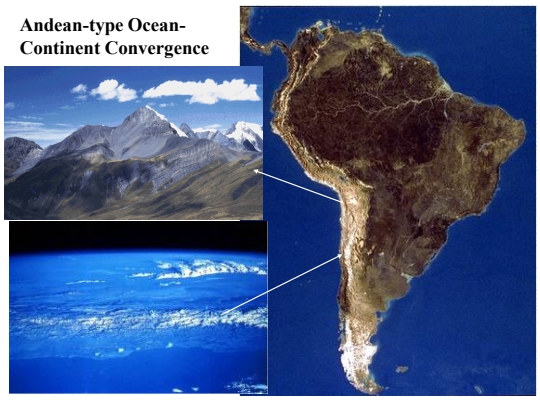
Andean-type Ocean-Continent Convergence



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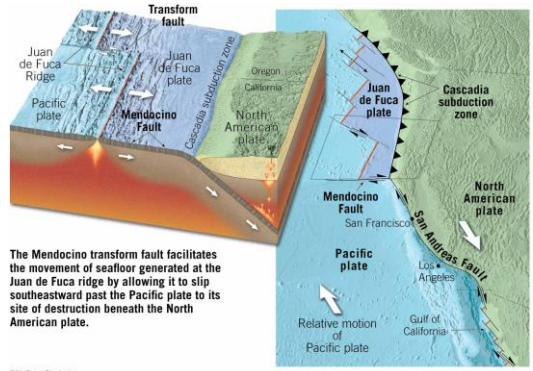

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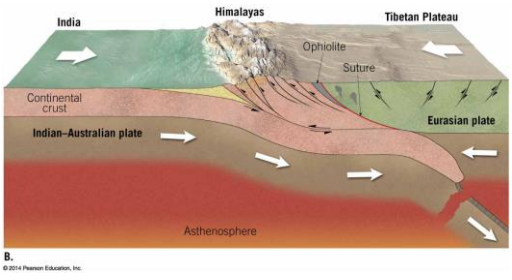
Continent-Continent Convergence



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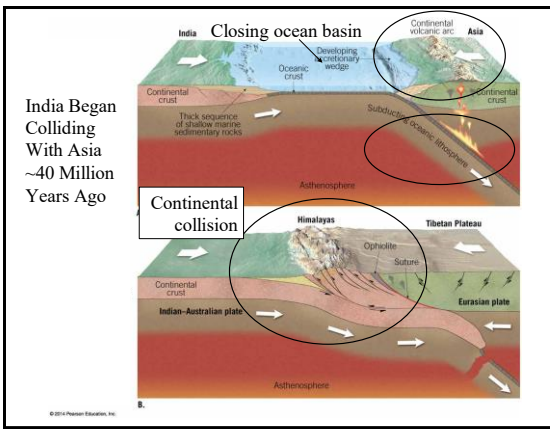
India Began Colliding With Asia ~40 Million Years Ago



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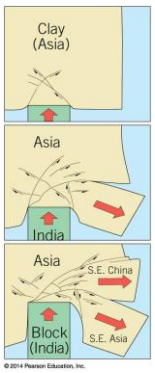

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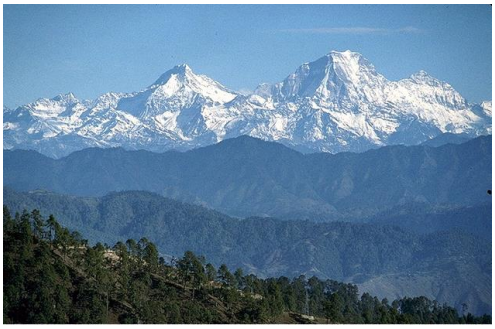
Himalayan Mountains



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Mount Everest

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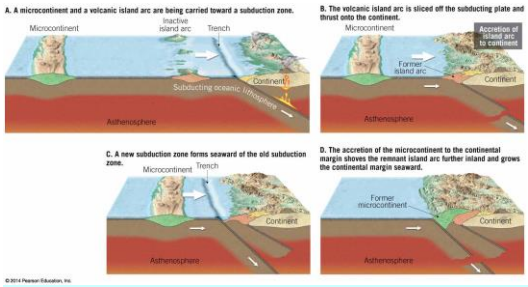

Collage Tectonics and Accreted Terranes

A collage is an assemblage of micro-continents, volcanic arcs, and other crustal fragments (collectively called accreted terranes) that accreted along the edge of a continent at a convergent plate boundary

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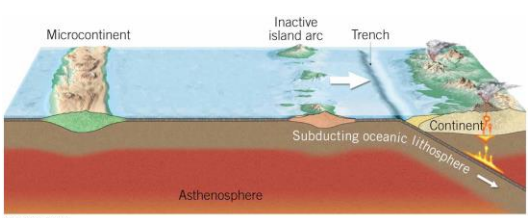
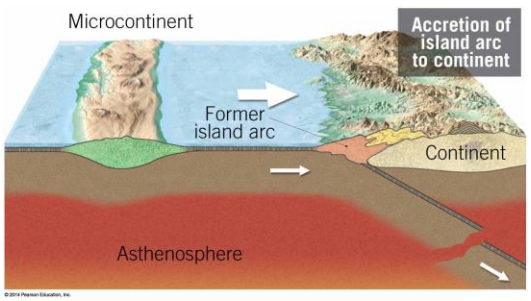
A microcontinent and inactive volcanic island arc are carried by the oceanic plate toward a convergent plate boundary (subduction zone)



23

The volcanic island arc is sliced off the subducting plate and thrust onto the continent; Subduction becomes locked and deeper part of slab breaks off



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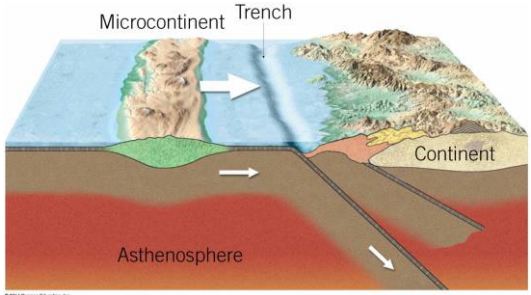
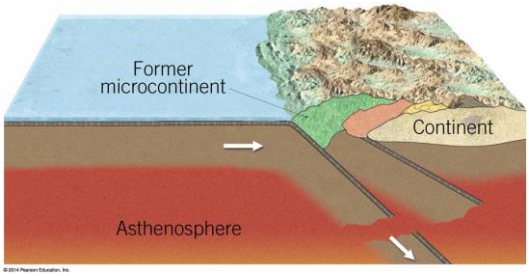
A new subduction zone forms seaward of the old 'locked' slab and subduction resumes



25

Accretion of the microcontinent shoves the remnant island arc further inland and grows the continental margin while subduction is again jammed



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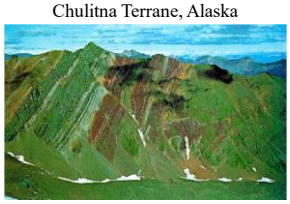
Chulitna Terrane, Alaska



Mt. McKinley, Alaska

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Driving Forces for Plate Tectonics

- There are several models proposed that drive plate tectonics:
  - Slab Pull
  - Ridge Push
  - Whole-mantle convection
  - Layer-cake convection

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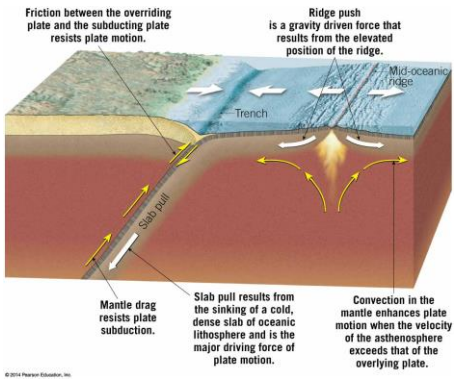

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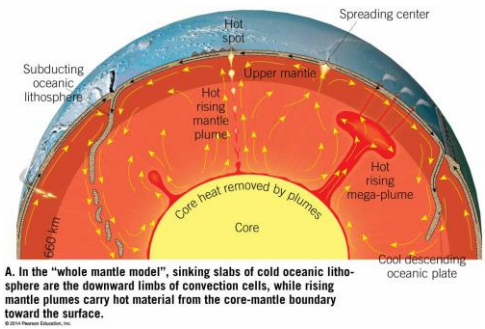
Whole-Mantle Convection Model



A. In the "whole mantle model", sinking slabs of cold oceanic lithosphere are the downward limbs of convection cells, while rising mantle plumes carry hot material from the core-mantle boundary toward the surface.

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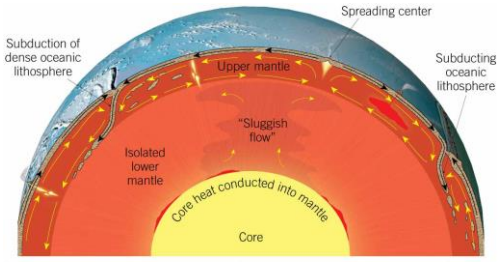
Layer-Cake Convection Model



B. The "layer cake model" has two largely disconnected convective layers. A dynamic upper layer driven by descending slabs of cold oceanic lithosphere and a sluggish lower layer that carries heat upward without appreciably mixing with the layer above.

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A. 200 Million Years Ago

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B. 150 Million Years Ago

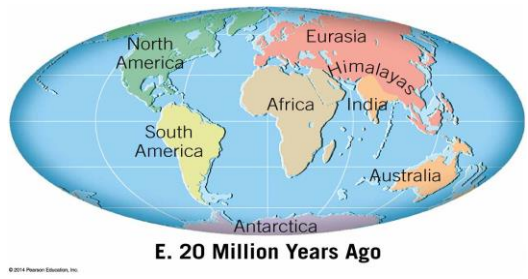
33

C. 90 Million Years Ago

34

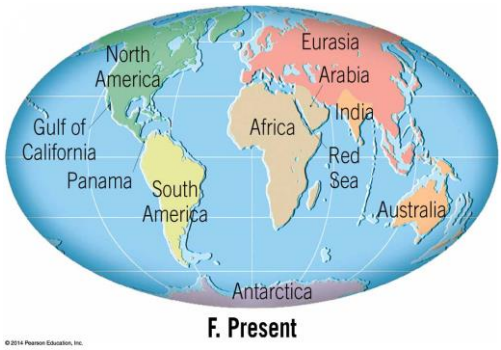
D. 50 Million Years Ago

35



E. 20 Million Years Ago

36



F. Present

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Match The Items On The Left With The Appropriate Plate Boundary Or Other Feature

1. East Pacific Rise
2. Andes of South America
3. Lateral strike-slip motion
4. Creation of new oceanic lithosphere
5. Red Sea
6. Hawaiian Islands
7. San Andreas Fault
8. Accreted terranes
9. East Africa

A. Transform plate boundary
B. Mid-ocean ridge
C. Convergent plate boundary
D. Mantle plume/hot spot
E. Rifting stage
F. Linear sea stage

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