Chapter 11 Mountain Building

Summary

11.1 Forces in Earth's Crust

- The factors that affect the deformation of rock include temperature, pressure, rock type, and time.
- Deformation is any change in the original shape and/or size of a rock body.
- Stress is the force per unit area acting on a solid. When rocks are under stresses greater than their own strength, they begin to deform.
- The change in shape or volume of a body of rock as a result of stress is called a strain.

- The three types of stress that cause deformation of rocks are tensional stress, compressional stress, and shear stress.
  - When rocks are squeezed or shortened, the stress is compressional.
  - When rocks are pulled in opposite directions, the stress is tensional.
  - When a body of rock is distorted, the stress is shear.

- Because of isostasy, deformed and thickened crust will undergo regional uplift both during mountain building and for a long period afterward.
  - The concept of a floating crust in gravitational balance is called isostasy.
  - The process of establishing a new level of gravitational balance is called isostatic adjustment.

11.2 Folds, Faults, and Mountains

- The three main types of folds are anticlines, synclines, and monoclines.
  - An anticline is formed by the upfolding, or arching, of rock layers.
  - Often found in association with anticlines are downfolds, or troughs, called synclines.
  - Monoclines are large, step-like folds in sedimentary strata.

- The major types of faults are normal faults, reverse faults, thrust faults, and strike-slip faults.
  - The rock surface just above the fault is called the hanging wall, and the rock surface below the fault is called the footwall.
  - In a normal fault, the hanging wall moves down relative to the footwall.
  - In a reverse fault, the hanging wall moves up relative to the footwall.
  - Thrust faults are reverse faults with dips of less than 45°.
  - Faults in which the movement is horizontal and parallel to the trend, of the fault surface are called strike-slip faults.
Chapter 11 Mountain Building

The major types of mountains include volcanic mountains, folded mountains, fault-block mountains, and dome mountains.

- Geologists refer to the collection of processes involved in mountain building as orogenesis.
- Mountains that are formed primarily by compressional stresses, which create folds in the rock layers are called folded mountains.
- Compressional stress is the major factor that forms folded mountains.
- Fault-block mountains form as large blocks of crust are uplifted and tilted along normal faults.
- As the crust is stretched along a normal fault, a block called a graben, which is bounded by normal faults, drops down.
- Grabens produce an elongated valley bordered by relatively uplifted structures called horsts.

Up-and-down movements of the crust can produce a variety of landforms, including plateaus, domes, and basins.

11.3 Mountains and Plates

- The convergence of two oceanic plates mainly produces volcanic mountains.
  - The result of this collision is the formation of a volcanic island arc.
- The convergence of an oceanic plate and a continental plate produces volcanic mountains and folded mountains.
  - During subduction, sediment is scraped from the subducting plate. The sediment forms a large mass called an accretionary wedge, which becomes attached to the overriding crustal block.
- At a convergent boundary, a collision between two plates carrying continental crust will form folded mountains. This happens because the continental crust is not dense enough to be subducted.
- The mountains that form along ocean ridges at divergent plate boundaries are fault-block mountains made of volcanic rock.
  - These mountains are elevated because of isostasy.
- Volcanic mountains at hot spots, as well as some upwarped mountains and fault-block mountains, can form far from plate boundaries.
- The process of accretion enlarges continental landmasses and forms mountains along the edges of continents.
  - When fragments of crust collide with a continental plate they become stuck to or embedded into the continent through accretion.
  - A terrane is any crustal fragment with a distinct geologic history.