

Growing Mountains _By Trista L. Pollard

¹ If you see them from a distance, you believe they are stationary. Even up close, you could not detect movement. However, an amazing fact of nature is that some of our mountains are growing.

² The Earth's mountains are the result of extreme deformation. Without the forces on the surface and inside the planet, these majestic landforms would not exist. Once one of our most famous growing mountains is Mount Everest. It's the forces inside the Earth that cause it to grow taller each year. Scientists have classified our mountains into **mountain ranges**, **mountain systems**, and **mountain belts**. Mountain ranges are groups of adjoining mountains. These mountains are related in shape and in structure. The Cascade Range includes Mount St. Helens, which is a volcanic mountain. Mountain systems are groups of adjacent mountain ranges. On the eastern coast of the United States lies the Appalachian Mountain system. This system includes the Green Mountains, the Blue Ridge Mountains, the Cumberland Mountains, and the Great Smoky Mountains. There are two major mountain belts on our planet. Located around the Pacific Ocean in the form of a ring is the circum-Pacific belt. The Eurasian-Melanesian belt does not form a ring. It begins in the Pacific Islands and runs through Asia, southern Europe, and ends in northwestern Africa. Geologists have found that these belts are located along active convergent plate boundaries. Based on this evidence scientists believe that most mountains are formed after the collision of tectonic plates. There are some mountains that are not located along active convergent boundaries. The Appalachian Mountains is one example. Scientists believe the boundaries where these and other mountains formed were once active plate boundaries.

³ As with other forms of deformation, different types of collisions form different types of mountains. When oceanic lithosphere collides with continental lithosphere, it subducts beneath the continental lithosphere. As a result, mountains are uplifted, and there is partial melting of overlying mantle and crust. This partial melting causes magma to form. Volcanic mountains may form in this area once the magma erupts on the surface. The Cascade Mountain Range and the Andes Mountains in South America were formed through this type of collision. Mountains may also form from terranes. During plate collision and subduction, terranes may be scraped off the oceanic lithosphere and become part of the continent.

⁴ Some mountains form from the collision of plates within the oceanic crust. When two plates with edges made of oceanic crust collide, volcanic mountains are produced. As with the previous collision type, one oceanic plate subducts under the other oceanic plate. During this subduction, fluids are produced by the subducting plate. These fluids cause partial melting of overlying crust and mantle. The rising magma breaks through the oceanic lithosphere causing eruptions that begin mountain building. The Mariana Islands started as volcanic mountains on the ocean floor. Now their peaks rise above sea level.

⁵ Our planet's largest mountain ranges were formed through the collision of continents. Remember, scientists believe based on evidence that our continents once combined to form a supercontinent. The collision of these continents formed our mountain ranges. When India broke away from Africa and Antarctica 100 million years ago, it became a separate continent. This Indian Plate moved slowly north towards Eurasia. As the Indian Plate approached Eurasia, the oceanic lithosphere from this plate subducted under the Eurasian plate. Eventually, this subduction caused India's continental lithosphere to collide with Eurasia's

continental lithosphere. Both continents have dense lithosphere, so the subduction did not continue. However, the continent continued to collide. Thanks to this process, we now have the Himalaya Mountains which are growing taller each year. Remember Mt. Everest? It is part of the Himalayan range.

⁶ Now that we know how mountains are formed, let's look at the different types of mountains. **Folded mountains** usually form after the collision of mountains. They are also the highest mountain ranges in the world. As the continents collide, the rock layers are squeezed together into accordion-like folds. The Appalachians, the Ural Mountains in Russia, and the Alps are folded mountains. In fact, these mountains contain very large and complex folds. **Plateaus** are also formed from the same tectonic forces that form folded mountains. These landforms are large flat areas of rock above sea level. The reason this landform remains relatively flat is the uplifting. The thick horizontal rock layers in plateaus have been slowly uplifted so that the layers do not fault or fold. Another way plateaus form is from hardened layers of molten rock that have been piled up on the surface. Erosion of large areas of rocks may also produce plateaus. Want to see a plateau in person? They are usually located near mountain ranges like the Colorado Rockies. That is where you will find the Colorado Plateau.

⁷ **Fault-block mountains** form when the crust has been stretched and broken into large blocks. The blocks may tilt and change position in relation to other blocks due to faulting. It's the blocks that are positioned higher which form these mountains. There are fault-block mountains located in the Sierra Nevada range in California. **Grabens**, which also form from the same type of faulting, are long narrow valleys. As steep faults cause the crust to break into blocks, one block slips downward in relation to the other blocks. Since they form from similar stresses, grabens and fault-block mountains are usually located together. In

the western United States, the Basin and Range Province contains fault-block mountains separated by grabens.

⁸ The Black Hills of South Dakota are classified as **dome mountains**. These types of mountains are rare. They form when rising magma pushes through the crust and raises rock layers above the magma. The result is a mountain that has a circular structure with gently sloping rock layers. These layers slope away from the mountain's central point. Tectonic forces may also form dome mountains as they gently uplift rock layers.

⁹ The last type of mountains are **volcanic mountains**. Magma that travels toward the Earth's crust eventually reaches the surface and erupts. When this occurs, volcanic mountains are produced. Scientists have found these mountains most often form along convergent boundaries. Mount St. Helens and Mount Rainier are two volcanic mountains that are part of the Cascade Range in the U.S. As mentioned earlier, volcanic mountains have been formed near the mid-ocean ridge along divergent plate boundaries. In fact the mid-ocean ridge is a volcanically active area. Some of these mountains grow to a height where the peaks rise above sea level. The North Atlantic Azores are volcanic mountains that rise above sea level.

¹⁰ Along the ocean floor there are also **hotspots** or volcanically active areas not near tectonic plate boundaries. Magma has risen from inside this area to the lithosphere. Volcanic islands, like the Hawaiian Islands, have formed from hotspots. Hawaii's main island, which is a hotspot volcanic island, has a base that is about 160 kilometers wide and a height of about 90 kilometers above the ocean floor. Just when you thought mountains simply appear, now you know the tectonic forces it takes to grow a mountain.

Answer the following questions on separate paper.

1. Some of the largest volcanic mountains are located along convergent plate boundaries. True/False
2. What are the two ways that plateaus can form?
3. How do scientist classify mountains?
4. What are grabens and how are they formed?
5. What type of mountains commonly form when edges of oceanic lithosphere collide?
6. Pacific and Eurasia-Melanesian mountain belts are located along divergent boundaries. True/False
7. Compare mountain ranges, mountain systems, and mountain belts.
8. Effect: Pieces of crust called terranes are scraped off oceanic lithosphere. The terranes become part of the continent and may form mountains. What is the cause?