Benjamin Davidson

Section C-Blue

December 5, 2008

The Surface

A one-year-old infant's cradle rolls around, a lamp crashes to the floor, and a thunderous boom rocks a small suburban house in San Jose, California. Fifteen seconds later, bridges are broken, homes are torn, and people are frightened after the earthquake subsides. As noted in 1915 by Alfred Wegener, the earth is always drifting beneath us. What seems a well known fact now was the subject of a grand debate until 1928, when Arthur Holmes proposed a viable means for the geographical phenomenon he called drift. His theory of seafloor thinning, backed with fossil records and coastline shapes, countered the accepted notion that there was not a sufficient force to move continents that were weaker than seafloor material (Frankel, 1978). To my one-year-old brother, however, it seemed certain that the earth was moving beneath him.

In fact, since the 1960s, Holmes' theory has been generally accepted and has led to many new discoveries in the field of geology. Geological research by Robert S. Dietz, Bruce Heezen, Harry Hess, and J. Tuzo Wilson gained the theory of continental drift worldwide recognition and promoted research in geology (Frankel, 1978). Geographers found that the Earth had fifteen major three-billion-year-old plates that apparently float on top of magma. Plate movement can be described as divergent, in which two plates move away from each other and create new oceanic crust and/or volcanoes; convergent, in which two plates move toward each other and cause

seduction, volcanoes, and mountains; and lateral, in which two plates rub against each other and cause earthquakes (Col, 2008).

Volcanoes, which are ruptures of the crust of the Earth, can produce some of the most dangerous natural disasters known to man. Hotspots, a type of volcano that is found worldwide, are eruptions of magma through thin regions of the crust of the Earth. While the magma of the Earth is stationary, the mantle is not; therefore, as the mantle sluggishly moves, the hot spot remains in the same location. A five-million-year-old example is the Hawaiian archipelago. Common in Iceland, shield volcanoes, which are not known to erupt catastrophically, are volcanoes with gentle slopes that are formed by low-viscosity lava. The most generally known volcanoes, the lava domes, are formed by the slow eruption of high-viscosity lava. Submarine volcanoes, which are fast-erupting volcanoes under the sea level, often form very steep slopes due to the rapid cooling of lava under water (Tilling, n.d.).

Perhaps the most devastating volcano, the supervolcano is a hot spot of vast proportions. In addition to approximately one hundred miles of deadly lava flow, a supervolcano produces a barrier of an immense amount of sulfur and ash that obstructs the sun and in turn cools the temperature of the Earth. The result of the eruption of a supervolcano is the death of numerous people in addition to the termination of ninety-five percent of plant life. Numerous volcanologists and residents alike are concerned with the supervolcano in the Yellowstone National Park due to its potential devastation and overdue eruption, but there are three other potentially catastrophic supervolcanoes: Valles Caldera in New Mexico, Lake Toba in Sumatra, Indonesia, and Lake Taupo in New Zealand (Hurwitz, n.d.). Magmatic

activity is the result of the magma layer under the mantle. Thus, the moon does not have volcanic activity because it does not have a layer of magma under its surface. Supervolcanoes show that volcanoes are clearly a major destructive force.

In addition to volcanoes, mountains also dominate the landscape of the Earth. An oceanic plate is considered a softer material than the hard continental plate, and a mountain is only formed when like-material plates converge. However, oceanic mountains do not always form as a result of a convergent boundary between two oceanic plates; sometimes one oceanic plate is forced under another. Mountains are not formed at the convergent boundary between an oceanic and continental plate due to the process known as seduction, in which the softer material is forced under the harder material. Mountains are not simply large elevated masses. They are a threat because of the possibility of an avalanche, a large mass of snow or ice that rapidly slides down a slope. A loose-snow avalanche occurs when a small mass of snow is dislodged and causes snow beneath to dislodge as well. Dislodging similarly to dry sand, a loose-snow avalanche will widen as it slides down a slope. A slab avalanche occurs when a distinctive slab releases and slides due to excessive stress. Avalanches occur with both wet and dry snow; in fact, wet snow avalanches have much more destructive force than dry snow avalanches because of the weight of water in wet snow. Throughout the history of mountaineering, people have tried to prevent the threat of an avalanche by constructing supports, making obstructions such as trees or walls, artificial release using explosives, and by analyzing weather patterns (Armstrong, n.d.). Mountains clearly dominate the landscape of the earth

Even though it is evident that plate tectonics facilitate destructive forces such as earthquakes, volcanoes, and avalanches, the world would likely not be habitable without the process. After the destruction of one of these forces, renewal is found. In the ocean, new seafloor is produced; at the base of volcanoes, rich, fertile soil is found; and at the site of an earthquake, dangerous pressure is released. It is essential that mankind pays close attention to both the destructive and revitalization forces due to earthquakes, volcanoes, and avalanches.

Literature Cited

Armstrong, R. L. Avalanche. Retrieved from AccessScience@McGraw Hill database (10.1036/1097-8542.065600).

Tilling, R.I. Volcano. Retrieved from AccessScience@McGraw Hill database (10.1036/1097-8542.735200).

Frankel, H. (1978). Arthur Holmes and Continental Drift [Electronic version]. The British Journal for the History of Science, 11 (2), 130-150.

Hurwitz, S. Yellowstone Supervolcano. (n.d.) Retrieved December 7, 2008, from http://www.solcomhouse.com/yellowstone.htm

Col, J. Continental Drift. (2008) Retrieved December 7, 2008, from http://www.enchantedlearning.com/subjects/dinosaurs/glossary/Contdrift