

Building the Appalachians

Walk and Talk at McIntosh Reserve Park with Dr. Tim Chowns

November 19, 2022

During a walk along the proposed McGarity trail around Council Bluff, Tim Chowns explained the way in which continents grow by accreting mountain belts like the Appalachians.

Every time a volcano erupts light material is transferred from the Earth's interior to the surface. This includes liquid lava, water vapor and other volcanic gasses. Based on density these contribute to the Earth's crust (70 percent basalt), oceans and atmosphere. Repeated cycles of melting and differentiation eventually produce the rock we call granite which goes to make up the great rafts we call continents. Because of relatively low density and greater thickness these granitic rafts rise-high to form land, while basaltic crust is flooded by sea water.

Driven by heat-convection currents circulating in the Earth's mantle these granite rafts drift slowly (inches per year) over the Earth's surface. At present North America is drifting westwards, ploughing into the basaltic crust of the Pacific. Something has to give, and because granitic crust is thicker and lighter than basaltic crust it overrides the basalt, which is forced downwards, heated and melted to form volcanoes like Mt. St. Helens and Mt. Rainier. The granite crust is also behaving like a bulldozer scraping up anything light it encounters (sediment, island fragments of continental crust) and incorporating them into coastal mountain ranges. North America is enlarging and will continue to grow larger until the west coast collides with some other continent (perhaps Australia) and the Pacific Ocean is closed.

500 million years ago, when the geography of the world was quite different from today, North America was drifting eastwards. Instead of mountain building in the west, the collision of granitic with basaltic crust was leading to volcanism and mountain building in the Appalachians. Over a period of about 250 million years an ocean basin we call Iapetus was gradually closed up until North America collided with Europe and Africa building a magnificent mountain range rivalling the modern Himalayas (formed by the collision of India with Asia).

The Appalachians we know today are remnants of that mighty chain. The opening of the Atlantic Ocean, which began about 200 million years ago, has torn the mountains apart, with fragments in Scandinavia, Scotland and West Africa; erosion has stripped peaks that were 5 miles high down to less than 1 mile and transported the debris to the Coastal Plain and beyond. When we study the mangled rocks that make up Council Bluff we are seeing granitic rock that originated deep in the roots of the Appalachians and added to the continent through mountain building.