SPQ Module 4 – Very Cold Dinosaurs

It might help Ray, Richard and Kevin beat the speed record to the South Pole if they were pursued by a 25 foot carnivorous dinosaur. Although this seems like a crazy idea, it is not as crazy as one might think.

The story starts in 1912 with a man in Germany named Alfred Wegener (1880 – 1930) who made a bold suggestion. Wegener theorized that all the continents had once been joined together in a single land mass or super continent, which he called Pangaea. He suggested that the modern day continents had been formed when they broke off from Pangaea and drifted apart. This was called the theory of Continental Drift. As often occurs to original thinkers few took him seriously.

Figure 1: Alfred Wegener (1880 - 1930), German meteorologist and important contributor to the theory of continental drift, in the winter of 1912-1913 at Greenland (source: Bildarchiv Preussischer Kulturbesitz, Berlin)

Meanwhile, the very same year, Amundsen and Scott were returning from their successful bids to reach the South Pole. Scott and his party, much weakened after many months of travel labored down the Beardmore Glacier toward the Ross Ice Shelf. Even though they were starving and would soon freeze to death, they collected geological specimens from the rock face alongside the glacier – 30 pounds of rock that they planned to take back to England for scientific analysis. They dragged this rock until they could go no further. It was found – still loaded on a sledge, when a search party located their frozen bodies in November of 1913.

Figure 2: Beardmore Glacier – Antarctica (source: Antarctic Photo Library, U.S. Antarctic Program)

What made these rocks so precious to Scott's company was that there are few opportunities to collect such specimens in a land that is 98% covered in ice. Committed to the scientific purpose of their expedition they chose to keep the rocks even though they weighed down their sledges. These rock specimens did ultimately make it back to England and were used to help establish the age of the Antarctic continent.

Did You Know?

Since Roald Amundsen stood at the geographic South Pole in 1911 the land on which he stood has moved toward the Atlantic Ocean by about a meter because of the movement of the Antarctic plate.

Scarcely could Scott and his companions have imagined that the very area from which they collected their rock specimens had once been home to a variety of dinosaurs and reptiles. Indeed the fossil record revealed in the rock beside the Beardmore Glacier and along the Transantarctic Mountain Range has been instrumental in proving Alfred Wegener's theory of the single supercontinent of Pangaea. However it took many years to find the evidence.

During the Antarctic summer of 1969-70 the paleontologist Edward Colbert and his team found the fossil of a reptile called Lystrosaurus at Coalsack Bluff in the Transantarctic Mountains. Similar fossils of Lystrosaurus had already been found in Africa and India. Lystrosaurus was a pig sized reptile, much too small to have

swum across the oceans that separate India from Africa, and Africa from Antarctica. How could this little reptile exist simultaneously in three geographically distinct continents? The answer could only be that these continents were once all joined together. Alfred Wegener's theory was vindicated.

figure 3; Lystrosaurus Murrayi skeleton, Muséum National d'histoire naturelle, Paris (source: Funk Monster, Wikimedia Common).

figure 4: *Lystrosaurus murrayi*, a dicynodont from the Early Triassic of South Africa, India and Antarctica (source: Arthur Weasley, Wikimedia Common).

Other fossil evidence has also been gathered to support the theory that the present day continents are gradually moving. This fossil record has revealed plants and animals distributed across disparate land masses that were once joined together. These records support that Antarctica was once squeezed between South America, Africa, India and Australia. However more recent geological studies suggest that 750 million years ago that Eastern Antarctica lay next to the West Coast of North America.

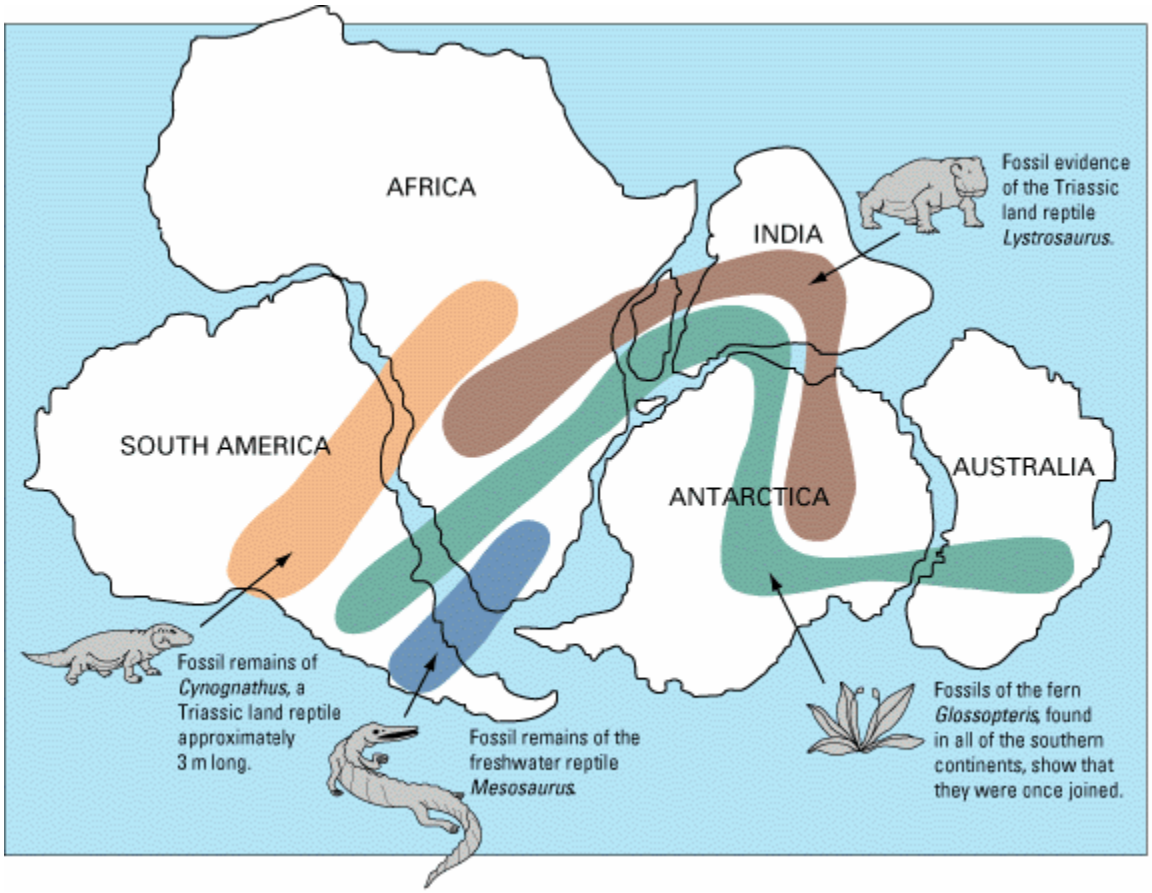

figure 5: Continental drift fossil evidence. As noted by Alfred Wegener, the locations of certain fossil plants and animals on present-day, widely separated continents would form definite patterns (shown by the bands of colors), if the continents are rejoined (source: United States Geological Survey).

The theory that explains the gradual movement of the continents is call plate tectonics. According to the theory, sections of the Earth's crust called tectonic plates form the outer layer of the planet. This outer layer is called the lithosphere. There are 7 major (and many minor) plates which move around relative to each other. Antarctica sits on a plate of its own called the Antarctic Plate. Earthquakes, volcanic activity, mountain building and ocean trench formation occur along plate boundaries. The movement of the plates is typically at speeds of 50 – 100 mm a year.

The Antarctic plate is still moving an estimated I cm a year toward the Atlantic Ocean. Given that Ray, Richard and Kevin will be approaching the South Pole from the Atlantic side this means that when they rest at night the true South Pole will be getting a little further away from them by about .00135 centimeters!

Did You Know?

That Antarctica has drifted all the way from the equator where it was located about 500 million years ago. At that time the land that makes up Antarctica was lush with vegetation and animals.