The alvarez hypothesis hits scientific convictions with the strength of a giant a...

Entertainment, Games

The fossil record indicates that dinosaurs roamed the Earth for more than 180 million years before suddenly disappearing sometime around 65 million years ago. Scientists were puzzled by the sudden disappearance of dinosaurs and various competing theories were offered. The Alvarez hypothesis, named after scientists Luis and Walter Alvarez, offered a controversial explanation that involved a giant asteroid that impacted the Earth and caused a mass extinction event that killed off the dinosaurs. After compelling evidence was found to support the Alvarez hypothesis, it is now the leading hypothesis for the cause of the extinction of dinosaurs.

The Cretaceous–Paleogene (K–Pg) boundary is marked by a layer of clay found in sedimentary layers all over the world. This clay layer marked the end of the Cretaceous period and the start of the Cenozoic Era 65 million years ago. In the 1970s, geologist Walter Alvarez traveled to Gubbio, Italy to conduct research on the clay layer that marked the K-Pg boundary. He discovered that foraminifera, a common ocean plankton that leaves fossilized shells in the sediment layers when they die, were present in the sediment layers older than 65 million years ago, but were not present in the sediment layers that came after the clay layer formed. It led Alvarez to believe that something major had occurred 65 million years ago, which also coincided with the disappearance of the dinosaurs.

Walter Alvarez consulted his father Luis, a Nobel Laureate in physics, and together they began investigating what could of occurred 65 million years ago that saw dinosaurs go extinct and the foraminifera to disappear from the sedimentary layers after the K-Pg boundary. Alvarez began with trying to

figure out whether the formation of the clay layer was a gradual or sudden event. He decided to use iridium, a rare element found in meteorites, which fall to the Earth at a relatively constant rate. Larger amounts of iridium found in the clay layer would have meant a longer formation time. If the clay was deposited over a period of thousand of years, Alvarez expected to get a result of . 1 atoms per billion of iridium in the clay. When they tested the clay from Gubbio, the results found that 3 atoms per billion of iridium in the clay sample. The results astonished Alvarez and they needed further confirmation from a separate site. They found a K-Pg boundary site in Denmark and clay samples from the Danish site confirmed the results of the Gubbio clay.

Now the question was why was there such high levels of iridium in the clay at the K-Pg boundary? The results appeared to have supported an existing hypothesis that the dinosaurs went extinct due to the radiation from a supernova. To confirm the supernova hypothesis, the team tested the clay for plutonium-244, which would have been released alongside iridium by the supernova. The results came back and there was no plutonium-244 found in the sample and it was unlikely that a supernova was the cause of the Cretaceous–Paleogene extinction event. This led to the next hypothesis of an asteroidal impact. Asteroids contain high levels of iridium and this could explain the large amount of iridium found in the clay samples. Luis Alvarez hypothesized that a sufficiently large asteroid that impacted Earth would have caused massive amount of dust and debris to enter the atmosphere and literally block out the sun. This would have prevented plants from acquiring the energy from the sun it needed to grow and this would have

meant herbivores would of lost their food supply. This effect would have trickled up to carnivores and all large animals would have perished as a result.

If the Alvarez hypothesis was true and the clay layer was formed by dust and debris caused by a major asteroidal impact, there needed to be evidence of an asteroidal impact somewhere on Earth. Luis Alvarez predicted that an asteroid that could have caused a global ecological disaster would have needed to be extraordinarily large to the tune of being at least 200 kilometers across. Many impact craters had been discovered at the time, but none of them fit the mold of being 65 million years old or sufficiently large enough. In 1991, scientists connected the Chicxulub impact crater to the Alvarez hypothesis. The reason it had not been discovered earlier was the crater was buried underneath the Yucatán Peninsula. Years earlier, an oil company has discovered the crater, but it had not made significant rounds in the media or the scientific community. Additional evidence scientists found were shocked quartz and spherules at K-Pg boundary locations. Shocked quartz is a deformed rock where minerals are displayed in a criss-cross pattern that is caused by a massive impact. Spherules are glass like beads that form as small droplets of vaporized rock that solidifies and falls back to the Earth. Vaporized rock comes about as the result of a large impact such as an asteroidal impact. In 2010, a group of 41 researchers published a study in Science that supported the Alvarez hypothesis and dismissed other leading hypotheses like the volcanism hypothesis.

The K-Pg boundary offered clear evidence of a massive extinction event that occurred 65 million years ago, but it remained a mystery of what caused this extinction event. Walter and Luis Alvarez found high levels of iridium in the clay samples from the hallmark clay layer that marks the K-Pg boundary. This led to the Alvarez hypothesis that a massive asteroid impacted Earth and led to the demise of the dinosaurs. While further evidence of a major impact was observed in shocked quartz and spherules found at the K-Pg boundary, the missing piece of the puzzle was the impact evidence itself. In 1991, scientists became aware of a large crate buried underneath the ground in the Yucatán Peninsula. Scientists found that the crater was sufficiently large enough to create a global ecological disaster and was dated back to around 65 million years ago. In 2010, a group of researchers supported the Alvarez hypothesis and it is not the leading hypothesis that explains the disappearance of the dinosaurs and the K-Pg boundary extinction event.