

h23 The iridium anomaly < Alvarez dinosaur-impact-extinction-hypothesis >

If it weren't for frost, nothing new could ever grow. —Washington Irving.¹



Mammals and birds, in the absence of dinosaurs and pterosaurs, diversified to occupy the ecological niches they now occupy and most of these within the first 10 million years of the Cenozoic (CZ) Era, which began 65.5 million years ago. The dinosaurs and pterosaurs, and many marine reptile species, did not survive the mass extinction event that defines the end of the Cretaceous Period. The Paleogene (E) - Cretaceous (K) periods boundary is also the moment of a catastrophic meteorite impact-explosion (bolide event). The record for this is an iridium (trace element) anomaly in a thin (a few cm thick) clay-layer that physically marks the E-K boundary. The initial finding of this layer at Gubbio, Italy,² by geologist **Walter Alvarez**, is recounted in his book *T. rex and the Crater of Doom*, 1997.³ Fallout iridium-rich clay of this event is now known from some 150 sites around the world.⁴

In 1980, physicist Louis W. Alvarez and Walter (his son) announced their discovery that the “K-T” (“E-K”)⁵ boundary is marked at several widely separated places (as at Iridium Hill, Garfield County, Montana) by an unusually high concentration (as much as a thousand times so) of iridium, an element that is normally rare (10 to 20 parts per trillion) in crustal rocks. Because iridium is comparatively common in stony meteorites, an extraterrestrial source was offered, along with a media attention grabbing “impact winter” hypothesis to explain by a “nuclear-winter” TTAPS⁶ analogy the extinction of the dinosaurs. Likely so, is the present consensus (mindful of some fifty alternative hypotheses).

Meteorites do fall ⁷

David Rabinowitz who has considered the spread of all incoming particles (energies) calculates a killing strike for a human in a lifetime to be 1 in 20,000, similar, but more clumped for populations, to the likelihood of being killed in an airplane accident.⁸ On March 23, 1989, an asteroid (named 1989 FC), with a diameter about 0.3 miles and a kinetic energy of over 1,000 one-megaton hydrogen bombs, passed nearer than twice the distance to Moon (it was observed leaving not arriving). June 30, 1908, 1,000 square kilometers of Siberian pine forest was blown flat when a 70 m (estimated) diameter asteroid, friction heated by the air, vaporized (exploded) over Tunguska, with the force of 10 megatons of TNT. Peter G. Brown in 2002, from satellite records of bolide detonations, estimated that events of this magnitude occur, on average, every thousand years. Over Shanxi Province, China, 1490, a meteor in its passage though the atmosphere fragmented and killed with its “falling stones” 10,000 people. Prehistoric impact events are recorded by surviving impact craters.⁹

The Alvarez's hypothesis is that 65.5 million years ago darkness caused by dust thrown into the stratosphere by a large (10 km diameter meteorite) bolide event caused years (later revised to months) of darkness, chilling, and a collapse of the photosynthesis-based ecology. Starvation-extinction of the dinosaurs ensued.

For this dinosaur-impact-extinction hypothesis, a favorable finding would be to show that dinosaur lineages were vigorous right up to the iridium boundary, but not beyond. A corollary is that dinosaurs adapted to the cold and dark, such as those described by Vickers-Rich (1993) from what was a polar region of southern Australia, were already extinct before the end of the Cretaceous as, presumably, these would not have succumbed to a few-months-long bolide related winter.¹⁰

To date, an ongoing effort to find dinosaur fossils ever-closer up to the E-K boundary has met with some success. □