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Meteor Likely Caused Earth's Greatest Extinction Event

The "Great Dying," a time of earth's greatest number of extinctions, appears to have been caused by the impact of a large meteor, according to a research team that includes Luann Becker, a scientist with the Institute for Crustal Studies in the Department of Geology at the University of California, Santa Barbara.

The theory, recently published by the team in the journal Science (Nov. 21, 2003), explains that this extinction event, which occurred approximately 251 million years ago, is much earlier than the demise of the dinosaurs, which is estimated at approximately 65 million years ago and is also believed to have been caused by a large meteor impact.

The evidence is the most convincing yet for an impact at the "end-Permian," a time commonly referred to as "The Great Dying," when life was nearly erased from the earth, explained Becker. She is currently working in Antarctica with a team searching for more "impact tracers," the geological markers that show evidence of large meteors hitting the earth. Becker has made several research trips to Antarctica and in July 2001 she received the National Science Foundation Antarctic Service Medal.

Her article "Repeated Blows," published in the March 2002 issue of Scientific American, describes the evidence for many past collisions with asteroids and how geologists are able to find the evidence for these collisions and to date them.

In her overview she states:

· "About 60 meteorites five or more kilometers across have hit the earth in the past 600 million years. The smallest ones would have carved craters some 95 kilometers wide.

· "Most scientists agree that one such impact did in the dinosaurs, but evidence for large collisions coincident with other mass extinctions remained elusive -- until recently.

· "Researchers are now discovering hints of ancient impacts at sites marking history's top five mass extinctions, the worst of which eliminated 90 percent of all living species."

Becker's current research at the Graphite Peak in the Central Transantarctic Mountains, Antarctica, described in the recent Science article, has revealed several meteoritic fragments, metallic grains, in a thin claystone "breccia" layer. Becker and the research team believe this to be strong evidence for a large impact that appears to have triggered the Great Dying. Breccia is ejected debris that resettled in a layer of sediment. The metallic grains also appear in the same layer (end-Permian) in Meishan, southern China. They also resemble grains found in the same strata in Sasayama, Japan. (The earth was a single continent at the time of the impact.)

The team also found "shocked quartz" in this same layer in the Graphite Peak. In the Scientific American article Becker explained, "Few earthly circumstances have the power to disfigure quartz, which is a highly stable mineral even at high temperatures and pressures deep inside the earth's crust." Quartz can be fractured by extreme volcanic activity, however, only in one direction. Shocked quartz is fractured in several directions and is therefore believed to be a good tracer for the impact of a meteor.

The researchers are somewhat surprised that they have not found the strong presence of the mineral iridium in the Graphite Peak work. In an e-mail from Antarctica Becker stated, "Interestingly, we do not see a strong iridium anomaly (the impact tracer that marks the Cretaceous-Tertiary boundary or the dinosaur extinction event)."

As she explained in Scientific American, "The first impact tracer linked to a severe mass extinction was an unearthly concentration of iridium, an element that is rare in

rocks on our planet's surface but abundant in many meteorites.... From this iridium discovery (in 1980) came the landmark hypothesis that a giant impact ended the reign of the dinosaurs --- and that such events may well be associated with other severe mass extinctions over the past 600 million years." The discovery was strongly debated around the world and scrutinized by geologists.

The increased attention brought about the discovery of more impact tracers, including extraterrestrial fullerenes found in the Graphite Peak boundary layer. These tracers are carbon molecules called fullerenes for their soccer-ball shape. They trap extraterrestrial gases in space and travel to the earth in the meteor.

The team concludes the Science article by saying, "These observations lead us to believe that continued research on such materials from additional Permian-Triassic boundary samples will finally lead to a resolution of the long-sought and contentious issue of a catastrophic collision of a celestial body with the Earth at the end-Permian. In light of the new evidence presented here, this is a reasonable interpretation of the global extinction event at the Permian-Triassic boundary."

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