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Meteor blamed for second mass extinction

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Washington — A massive asteroid may have collided with the Earth 251 million years ago and killed 90 per cent of all life, an extinction even more severe than the meteorite impact that snuffed out the dinosaurs 66 million years ago.

A new study, based on meteorite fragments found in Antarctica, suggests the Permian-Triassic event, the greatest extinction in the planet's history, may have been triggered by a mountain-sized space rock that smashed into a southern land mass.

"It appears to us that the two largest mass extinctions in Earth history … were both caused by catastrophic collisions" with meteoroids, the researchers say in their study appearing this week in the journal Science.

Asish Basu, a professor of Earth sciences at the University of Rochester, said proof of a massive impact 251 million years ago is in the chemistry found in rocky fragments recovered on Graphite Peak in Antarctica. He said the fragments were found at a geological horizon, or layer, that was laid down at the start of the Permian-Triassic extinction. Analysis shows the fragments have chemical ratios that are unique to meteorites.

"The only place you would find the chemical composition that we found in these fragments is in very primitive, 4.6-billion-year-old meteorites, as old as our Earth," said Dr. Basu, the first author of the study.

Dr. Basu said the Permian-Triassic asteroid was probably bigger than the almost-10-kilometre-wide space rock that is thought to have killed the dinosaurs.

Such an impact could cause a huge fireball and send billions of tonnes of dust into the atmosphere, enough to darken the sun for months. It also would have laid down a layer of

dust bearing the same chemical composition as the meteorite.

The dinosaur-killing asteroid left a thin layer of the element iridium across the globe. But Dr. Basu said iridium was not found in the fragments recovered from the Antarctica, suggesting the earlier Permian-Triassic asteroid had a different composition.

Dr. Basu said specimens recovered from Permian-Triassic rock formations in China, however, have a chemistry that matches that of the meteorite fragments found in Antarctica, a discovery that supports the impact theory. Also, shocked quartz, a telltale sign of an asteroid impact, has been found at both sites, he said.

At the time of the Permian-Triassic event, Africa, South America, India, Australia and Antarctica were joined in a giant continent called Pangea. Just where the asteroid hit in that land mass is uncertain, Dr. Basu said, but it could have been near what is now western Australia.

Life on Earth 251 million years ago was far different from what it is now or what it was when dinosaurs lived.

"There were no large animals then, but there were lots of species living on the land and in the sea, and there were plants," said Dr. Basu. The most dominant plant, which is found commonly in fossil beds from the Permian-Triassic, was a giant fern called glossopteris. In the geological layers following the impact, that fern is absent from the fossil record.

"That was the last blooming of that plant," said Dr. Basu. "After that, it was gone forever from the planet."

Massive outflows of lava, called flood basalt, occurred around the time of both the Permian-Triassic and the dinosaur extinctions. The outflow continued for thousands of years and thickly covered hundreds of kilometres. Dr. Basu said it is possible that asteroid impacts triggered both eruptions of lava, but the connection has yet to be proven.

Some experts are skeptical that Dr. Basu and his co-authors have found 251-million-year-old meteorite metals, although nobody questions that the material did come from outer space. The surprise is that the specimens survived the weathering on Earth for so long.

"Nobody has even seen anything like this before," said Jeffrey Grossman, a researcher with the United States Geologic Survey in Reston, Va. "It is incredibly fresh and that is astonishing."

David Kring, a planetary geologist at the University of Arizona, said it is clear that material found by Dr. Basu and his team is from an asteroid, "but it is unlike the debris we have seen in other impact ejecta."

As a result, said Sr. Kring, "there are enough questions … that I don't think one can say that an impact is conclusively linked to the Permian-Triassic extinction. We need to go back and test the hypothesis."