# 65-million-year-old asteroid impact triggered a global hail of carbon beads

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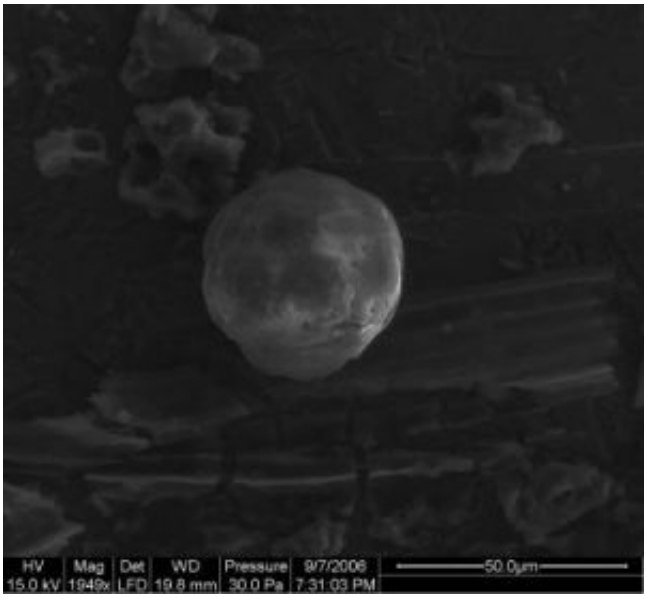


Carbon cenospheres are tiny, carbon-rich particles that form when coal and heavy fuel are heated intensely. Scientists have now learned that cenospheres can form in the wake of asteroid impacts, too. Credit: Mark Harvey

The asteroid presumed to have wiped out the dinosaurs struck the Earth with such force that carbon deep in the Earth's crust liquefied, rocketed skyward, and formed tiny airborne beads that blanketed the planet, say scientists from the U.S., U.K., Italy, and New Zealand in this month's *Geology*.

The beads, known to geologists as carbon cenospheres, cannot be formed

through the combustion of plant matter, contradicting a hypothesis that the cenospheres are the charred remains of an Earth on fire. If confirmed, the discovery suggests environmental circumstances accompanying the 65-million-year-old extinction event were slightly less dramatic than previously thought.

"Carbon embedded in the rocks was vaporized by the impact, eventually forming new carbon structures in the atmosphere," said Indiana University Bloomington geologist Simon Brassell, study coauthor and former adviser to the paper's lead author, Mark Harvey.

The carbon cenospheres were deposited 65 million years ago next to a thin layer of the element iridium -- an element more likely to be found in Solar System asteroids than in the Earth's crust. The iridium-laden dust is believed to be the shattered remains of the 200-km-wide asteroid's impact. Like the iridium layer, the carbon cenospheres are apparently common. They've been found in Canada, Spain, Denmark and New Zealand.

But the cenospheres' origin presented a double mystery. The cenospheres had been known to geologists only as a sign of modern times -- they form during the intense combustion of coal and crude oil. Equally baffling, there were no power plants burning coal or crude oil 65 million years ago, and natural burial processes affecting organic matter from even older ages -- such as coals from the 300-million-year-old Carboniferous Period -- had simply not been cooked long or hot enough.

"Carbon cenospheres are a classic indicator of industrial activity," Harvey said. "The first appearance of the carbon cenospheres defines the onset of the industrial revolution."

The scientists concluded the cenospheres could have been created by a new process, the violent pulverization of the Earth's carbon-rich crust.

Geologists do believe the Earth burned in spots as molten rock and super-hot ash fell out of the sky and onto flammable plant matter. But the charcoal-ized products of these fires only appear in some places on Earth, and are more often found near the asteroid impact site of Chicxulub Crater, just west of Mexico's Yucatan Peninsula. Some geologists had thought all carbon particles resulting from the impact was ash from global scale forest fires, but the present research strongly contradicts that assumption.

The scientists examined rock samples from eight marine locations in New Zealand, Italy, Denmark and Spain. They also examined carbon-rich particles from five non-marine locations in the U.S. and Canada. Following chemical and microscopic analysis, the researchers concluded the particles were carbon cenospheres, similar to the ones produced by industrial combustion.

The scientists also found that the farther the sample site was from the Chicxulub Crater, the smaller the cenospheres tended to be. That observation is consistent with the expectation that particles were produced by the asteroid impact, since once the particles are ejected, heavier particles should fall back to Earth sooner (and travel shorter distances) than lighter particles.

Last, the scientists estimated the total mass of carbon cenospheres ejected by the asteroid collision, assuming a global distribution, to be perhaps as much as 900 quadrillion kilograms. Whether or not the carbon cenospheres are truly ubiquitous, however, needs further corroboration.

"There are still clues to unravel about the events occurring around the time of the impact," Brassell said. "And there are aspects of the Earth's natural carbon cycle that we didn't previously consider."

Harvey is interested in the unique properties of the cenospheres themselves. "Perhaps we can generate and study carbon cenospheres to better understand them," he said. "We also need to look for the cenospheres in other parts of the world and also around the time of other extinction events."

Source: Indiana University