



## Asteroid that wiped out dinosaurs was just a baby One twice as big hit 3.5 billion years ago, creating gigantic tidal waves, scientists say

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[Keay Davidson, Chronicle Science Writer](#)

Imagine a big, big rock -- a few miles wider than San Francisco -- plunging from the sky at an incredible speed and striking the Earth hard enough to gouge out a crater tens or hundreds of miles wide.

That's what happened 3.47 billion years ago, and the colossal impact generated tidal waves more than a mile high around the world, scientists report in today's issue of Science.

The asteroid was probably about 12 miles wide, twice the diameter of the falling rock that supposedly wiped out the dinosaurs 65 million years ago, said Donald Lowe, a Stanford University geologist who co-authored the article.

"This is the oldest record of an asteroid impact ever found on Earth," said another co-author, geologist Gary Byerly of Louisiana State University. Previously, the most ancient known terrestrial impact crater was 1.9 billion years old.

In recent years, such research findings have convinced space scientists that asteroids frequently clobbered the newborn Earth. Our planet emerged from a primordial cloud of dust and gas about 4.6 billion year ago.

### EARTH CRATERS HAVE BEEN ERODED

Scientists have long known that asteroids hit the moon and Mars: Extremely old craters are still visible on the surfaces of those worlds. Earth was repeatedly clobbered billions of years ago, too. But almost all its craters have been worn away by wind, rain and the crustal movements known as plate tectonics.

Indeed, there is no sign of the crater formed by the object that hit Earth 3.5 billion years ago, Lowe says. The continents were just beginning to form at that time. Hence, the asteroid almost certainly plunged somewhere in the primordial ocean, generating tsunamis "many kilometers high," he said.

At that time, the only terrestrial "inhabitants" were bacteria. Any bacteria in the vicinity of the blast would have been fried by the impact. However, bacteria are genetically so diverse that many or most "bugs" thousands of miles from the impact likely survived it. (Some types of bacteria even thrive within nuclear reactors.)

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Lowe and his colleagues' conclusions are based on their analysis of geological data from South Africa and Australia. There they found debris from the impact -- specifically, rich deposits of iridium (an element that is commonly found in meteorites) and tiny, spherical, BB-size particles called "spherules."

They found this debris at two of the oldest places in the terrestrial crust:

the Kaapvaal Craton of South Africa and the Pilbara Craton of Australia. In both sites, the asteroidal debris is exactly the same age -- 3.47 billion years. This convinces them that the debris at both sites comes from the same primordial impact event.

They dated the samples by measuring the radioactive decay of zircon samples in the debris.

The impact generated an immense plume of water vapor and debris that swept around Earth.

## AN ASTEROID'S ROCK VAPOR

An asteroid "passes through the atmosphere in about one second, leaving a hole -- a vacuum -- behind it, but air can't move in fast enough to fill that hole," Lowe explained. "When the meteor hits the surface, it instantaneously melts and vaporizes rock, and that rock vapor is sucked right back up the hole into the atmosphere.

"It spreads around the Earth as a rock vapor cloud that eventually condenses and forms droplets that solidify into spherules, which rain back down onto the surface."

Lowe added jokingly that the vapor cloud might have been bright enough to be visible through telescopes on the nearest planets, Mars and Venus, had they been inhabited back then.

Byerly is the article's lead author. Besides Lowe, the other authors are Xiaogang Xie, also at Louisiana State, and J.L. Wooden of the U.S. Geological Survey in Menlo Park.

The work is inherently exciting, Lowe said.

"I'll bet I have one of the best jobs on Earth," he observed. "I'm out there, eating a sandwich, sitting on rocks that are 3 1/2 billion years old, and picking up rocks that allow me to look into the past. It's terribly exciting."

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