

No, seriously. What killed the dinosaurs?

The more scientists look, the more complicated the answer becomes



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By Michael Reilly

[DiscoveryNews](#)

updated 8/30/2010 10:09:35 AM ET

Seems like an easy one to answer: an asteroid around six miles wide slammed into the Yucatan Peninsula. Continent-wide firestorms, planet-enshrouding dust cloud, massive plant death, toxic ozone, carbon monoxide poisoning ... and that's it: one resounding mass extinction all wrapped up in a pretty, hellish package and explained by a big hole in southeastern Mexico, right?

Well, the more scientists look, the more complicated the answer becomes. For starters, there were a series of truly enormous volcanic eruptions in what is now western India around the same time. Collectively, the Deccan Traps spewed enough noxious gas that some say *it* was the cause of the extinction.

Then there's a weird crater-looking structure right next door to the Deccan Traps. If that turns out to be from an asteroid impact, it would be the largest crater found on Earth. Ever. And just this week, a study in the journal *Geology* reported there may have been yet another impact, in the Ukraine.

For those keeping track at home, that's three possible asteroid impacts and one long-lived supervolcano all clustered around roughly the same moment in geologic history.

On its own, the newly discovered Boltys crater in central Ukraine isn't much to write home about — measuring just 15 miles in diameter, it isn't enough to ruin dinosaurs' day throughout Europe, let alone around the globe.

What it does do is make the case that Earth was hit by an asteroid shower around 65 million years ago, rather than a single space rock. On average, a crater the size of Boltys or bigger should hit Earth once every million years or so. But according to David Jolley of King's College in Aberdeen, U.K. and a team of researchers, Boltys slammed into the planet less than 5,000 years before the giant Chicxulub impact in Mexico.

The odds of the two rocks being part of a binary system is small — if they were, they should have hit simultaneously. But they're still suspiciously close together, suggesting that perhaps some great collision in the solar system sent a scatter-shot of space rocks headed our way.

Meanwhile, we still have to contend with the Shiva structure, a 500 km-wide gouge in the planet off India that could be the scar left by an asteroid several times bigger than the one that caused the Chicxulub crater.

But some crucial evidence is still missing. For one thing, such a large impact should have thrown out huge quantities of superhot ejecta. Near the Mexican crater, the pile of melted material is several feet thick. But nothing like that has been found in India.

Then there are the Deccan Traps. For several hundred thousand years, western India was home to volcanic eruptions far larger than anything that has occurred in human history. These epic floods of molten rock are thought to have spanned 200,000 square miles (the size of California, New Mexico, Arizona, And Colorado combines), and in some places they are close to two miles thick.

One theory suggests the Deccan lavas spewed immense amounts of poisonous sulfur dioxide gas into the atmosphere. The gas would have the dual effect of choking air-breathing animals and preventing sunlight from reaching Earth's surface. What dinosaurs didn't succumb directly to the gas would've surely perished in the long winter that followed.

It's even been suggested that the Chicxulub impact *caused* the Deccan Traps to erupt, by way of a huge earthquake that rippled through the planet.

Such ideas may sound a little ludicrous, but that doesn't mean they're wrong. Life is, generally speaking, very resilient, and dinosaurs were no exception. It would have taken a huge cataclysm — maybe even several in quick succession — to end their over 150-million-year reign on Earth.

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