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TRILOBITES

Drilling Into the Chicxulub Crater, Ground Zero of the Dinosaur Extinction

By Nicholas St. Fleur

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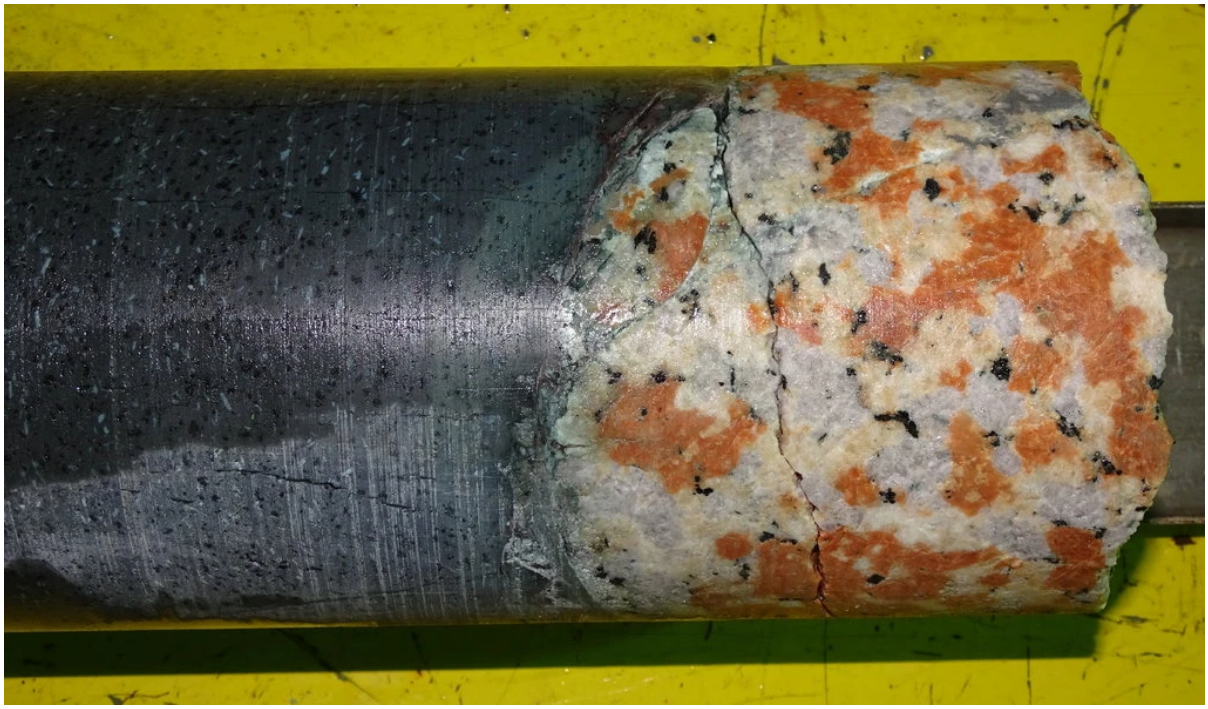
Some 66 million years ago an asteroid crashed into the Yucatán Peninsula in Mexico, triggering the extinction event that obliterated the dinosaurs and nearly extinguished all life on Earth. It struck with the same energy as 100 million atomic bombs, and left behind a 100-mile-wide scar known today as the Chicxulub crater.

Now, a team of geophysicists has drilled into the gigantic cavity under the Gulf of Mexico, targeting a circular series of hills called a peak ring located at its center. What they discovered illustrates that powerful impacts can catapult materials buried deep in a planet's crust much closer to its surface.

"Chicxulub is the only crater on Earth with an intact peak ring that we can go sample, the next intact peak ring would be on the moon," said Sean P. S. Gulick, a marine geophysicist from the University of Texas at Austin. "It's ground zero of the Cretaceous extinction event."

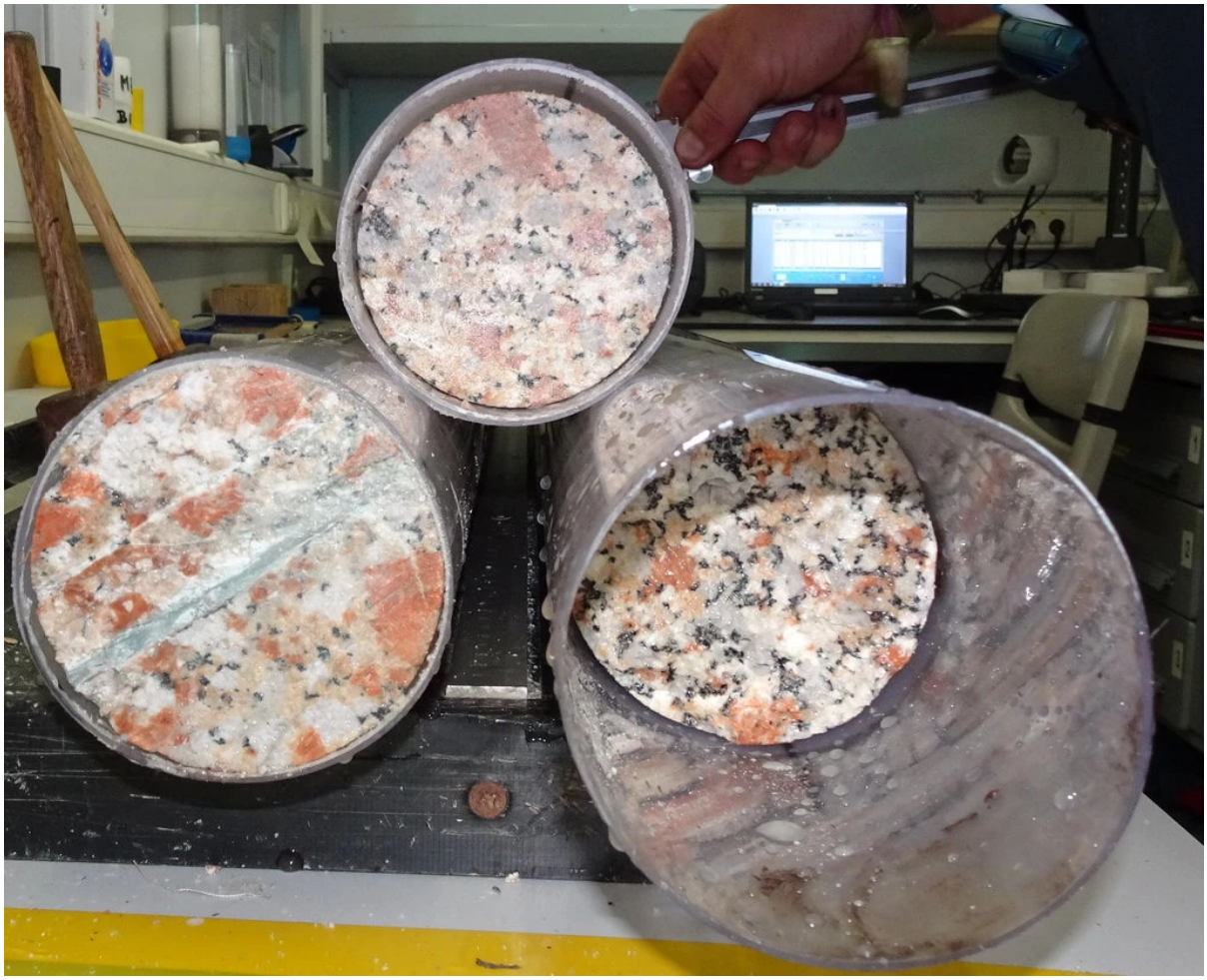


After collecting core samples filled with limestone and remnants of broken and melted rock, the team suddenly retrieved cores with pink granite.
D. Smith/European Consortium for Ocean Research Drilling

Dr. Gulick and his colleague Joanna Morgan, a geophysicist from Imperial College London, led a team of more than 30 researchers representing 12 countries to drill into the Chicxulub crater. By drilling into stone beneath the ocean's surface, they discovered that the peak rings were made of granite, which is usually found much deeper in Earth's crust. They concluded that the asteroid impact was so strong it lifted sediment from the basement of Earth's crust several miles up to its surface.

"These rocks behaved like a fluid for a short period of time, and rocks don't tend to do that," said Dr. Morgan. "It's a very dramatic process when you form a large crater."

The team's results, which were published Thursday in the journal Science, may help end a debate over how the Chicxulub crater formed in the minutes following the colossal collision. Their research could lend support to the dynamic collapse model theory, which suggests that the asteroid impact was so powerful it shocked the rocks deep in Earth's crust and caused them to shoot up before collapsing down to the surface to produce peak rings. Their findings pose a challenge for another model that suggests that the peak rings were formed from the melting of the upper parts of the crust.



Core samples recovered from the Chicxulub crater showing that its peak rings were made of granite that most likely originated deep in the Earth's crust.
D. Smith/European Consortium for Ocean Research Drilling

"The other model can't be correct given what we've found," said Dr. Gulick. He said the theory may also explain how large craters found on the moon, Mercury and Venus formed.

The Chicxulub crater is buried beneath 66 million years of sediments, and if you were to look at it today you would see that half of it is underwater and the other half is covered by rain forest. The team conducted their work aboard a boat that was converted into a drilling station that was about 40 feet above the Gulf of Mexico, standing on three pillarlike legs.

In order to get to the peak ring, the team needed to drill through about 60 feet of water and then through about 2,000 feet of limestone and other sediment that had accumulated since the impact. As they dug into the crust they collected drill cores, which were 10-feet-long cylindrical samples of rock pulled up by the drill. For a while, the team kept pulling up drill cores filled with limestone and remnants of broken and melted rocks called breccia.

"It was limestone, limestone, limestone, breccia. And then suddenly pink granite!" said Dr. Gulick. "It was exhilarating, it looks like your classic pink granite countertop."

They reached the peak ring's granite around 2,500 feet below sea level, but they think it may have originated from crust that may have been more than 25,000 feet deep before the impact.

"That was the big find because that says that this peak ring didn't come from something shallow at all," said Dr. Gulick. "It had to come from deep because it's made of deeply buried crustal rocks now at the surface."

The team made another find during their dig. They noticed that the granite samples they recovered were weaker and lighter than normal granite; some even crumbled in their hands. One of the team's next steps is to figure out how exactly the rocks got to the point where they were so weak they could behave like a fluid.

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