

Yucatan Killer Impact Gaining Support

Scientists in search of the impact crater behind 65-million-year-old extinctions are focusing on southeast Mexico

Houston—"I'LL GIVE YOU 5-TO-1 ODDS that this is the biggest of the impact structures identified so far," says Eugene Shoemaker of the U.S. Geological Survey in Flagstaff. If he's right, the 10-year search for the crater that marked the end of the age of the dinosaurs will be over. The structure he's talking about, which is buried beneath the north coast of Mexico's Yucatan Peninsula, is 180 kilometers across—easily large enough to have been the site of the comet or asteroid blast thought to have caused the mass extinction 65 million years ago. But almost as intriguing is a new notion: The Chicxulub structure, as it is called, would have had a little help from one or more additional impacts that hit at the same time.

The crater search did not look so promising only 6 months ago. Just last October, when Alan Hildebrand of the University of Arizona first presented evidence for a huge Yucatan crater, many geologists were skeptical (*Science*, 23 November 1990, p. 1081). Hildebrand based his claim in part on the discovery of a buried debris layer just outside the Chicxulub structure that he said contained quartz grains bearing the classic signs of impact shock. But not everyone agreed. Virgil Sharpton of the Lunar and Planetary Institute in Houston, for one, could find precious little quartz in samples from the same drill hole and none of it had the classic markings of impact shock—sets of parallel striations called lamellae.

What's helping to change people's minds now is a new analysis of samples from inside the Chicxulub structure presented by the Arizona group at the Lunar and Planetary Science Conference held here last month. Petrologist David Kring and cosmochemists Hildebrand and William Boynton reported that one sample contains quartz grains that are crisscrossed by up to eight sets of parallel lamellae; only shock-damaged minerals have that many. And an ample 30% of the grains examined bear signs of shock. "We feel very confident of the identification," says Kring.

The shocked grains might have no connection to the underlying Chicxulub structure; they could be part of the worldwide debris laid down by the impact that ended the dinosaur era, wherever it was. But Kring argues against that. The grains are embed-

ded in melted rock like that found just under the Chicxulub debris layer, he says. The Arizona group suggests that the rock was melted by the heat and pressure of the impact and that the impact debris, including the shocked minerals, fell back into and mixed with the molten rock in the newly formed crater. None of the shocked grains of the same age that have been found at other sites is embedded in an impact melt, Kring notes.

Not everyone is giving as good odds as Shoemaker is for Chicxulub being an impact crater. Several geologists said they want to get those mineral grains under their own microscopes to verify that they are the products of an impact. Beyond that, the crater's age is a major concern. Two independent datings of the sediments overlying the Chicxulub structure show that it is not too old to qualify. But isotopic dating of the melt rock, which could pin down its age

within a span of 2 million years, is not yet complete, Kring says.

If Chicxulub proves to be a 65-million-year-old impact crater, that will mean there are at least two. The 36-kilometer-wide Manson crater, which lies buried under central Iowa, has been dated at 66 million years (plus or minus 1 million or 2 million years) and is near the impact ejecta strewn across western North America. But the relative sizes of the two structures mean that the creation of Chicxulub by impact would have released 200 times more energy than Manson did, making the proposed Yucatan impact the dominant force in any extinctions.

According to Piet Hut of the Institute for Advanced Study, the existence of two large impacts and only one global debris layer could reveal something about exactly what hit Earth. Given two or more simultaneous impacts, the most likely scenario is that they were caused by a 10-kilometer-wide icy comet nucleus that broke up near the sun, he told the planetary science meeting. The pieces would spread enough to hit the Iowa and Yucatan sites less than 5 minutes apart. Were there other impacts as well? Possibly. There are some candidate craters in the high Arctic of the Soviet Union, an area that could have been struck at the same time if the comet pieces hit during summer in the Northern Hemisphere. Talk about having a bad summer. ■ **RICHARD A. KERR**

Mysterious Celestial Object Found

What's completely dark, more massive than the Milky Way, yet squeezed into one ten-thousandth the volume of our beloved galaxy? Scientists will be working on that riddle for some time, thanks to Joss Bland-Hawthorne of Rice University, Andrew Wilson of the University of Maryland, and R. Brent Tully of the University of Hawaii, who discovered the mystery object about 3,000,000 light-years away, in the galaxy NGC6240.

The astronomers speculate that the object, which they detected by observing the consequences of its immense gravitational pull on surrounding stars, could be a black hole—but at 100 billion solar masses, it outweighs any posited black hole by a factor of 10 to 100. That raises a particularly intriguing conundrum: There hasn't been enough time in the history of the universe for a black hole to have grown that big, if the theories of the well-known Cambridge cosmologist Stephen Hawking are correct. But say it is a massive black hole. Bland-Hawthorne speculates that it could be the remains of one of the bright-burning quasars that once populated the early universe. Alternatively, says Cambridge theorist Martin Rees, the object might be a tight collection of very dim but ordinary stars.

Astronomers hope to solve the mystery of the new object by probing it with a battery of instruments, from the Gamma Ray Observatory launched on April 13, to the Very Large Array radio observatory. But the most definitive evidence may come from a repaired Hubble Space Telescope.

■ **FAYE FLAM**

