# Anti-impactors have their day in K-T court

Although ever-increasing evidence supports the theory that a huge meteorite or comet slammed into Earth 65 million years ago, impact skeptics launched a counterattack last week to keep alive their position that an extraterrestrial crash did not wipe out the dinosaurs and decimate the rest of life then existing.

Pro-impact and anti-impact teams traded volleys in Cincinnati at a meeting of the Geological Society of America, where they met to discuss new findings about the cataclysmic events at the boundary between Earth's Cretaceous (K) and Tertiary (T) periods.

While the K-T debate has raged since the late 1970s, researchers in the last two years have found considerable evidence that a meteorite hit the northern Yucatán peninsula. In addition to identifying a purported crater buried there, geologists have discovered unusual deposits on the Mexican mainland, Haiti, and elsewhere that they suggest represent sediments deposited in the days following a crash (SN: 8/15/92, p.100; 1/25/92, p.56).

However, representatives of several research groups presented evidence disputing the idea that the Mexican deposits formed as a result of an extraterrestrial collision. In a trip to Mimbral, Mexico, earlier this year, Gerta Keller of Princeton University and her colleagues examined the deposits and brought back samples for analysis.

The Mimbral story began a year ago, when a group led by Walter Alvarez of the University of California, Berkeley, reported finding glassy spherules at that site. The researchers proposed that the spherules formed when an impact sent up a shower of molten rock droplets that cooled into tiny spheres – or spherules – on their descent.

Alvarez and his colleagues also discovered thick layers of disturbed sediments lying above the spherules. They suggested that the layers formed when huge, impact-triggered waves washed over the Mimbral region, then part of the ocean floor. The waves would have ripped up the seafloor and pulled rocks and vegetation from near the shore into deeper water, creating the Mimbral deposits.

Contrary to the Alvarez team's finding, Keller reported that two U.S. labs and two European labs could not detect any spherules made of glass from Mimbral or any other Mexican site. "We have spent a lot of time looking, and we simply cannot find any," she told SCIENCE NEWS.

Keller and geologists from Dartmouth College in Hanover, N.H., believe the spherules found in Mexico were not created during an impact, but rather reflect more mundane processes. Some appear to be algal cysts that filled with calcium carbonate. Others apparently formed when minerals precipitated in layers around tiny organisms called foraminifera. A third class contains minerals associated with volcanic eruptions, she says.

Keller and her colleagues also dispute the theory that huge, impact-generated waves deposited the layers of disturbed sediments above the spherule bed. The evidence indicates that these layers were laid down over a much longer period than just a few days, says Keller, who suggests they formed when large currents of debris – called turbidites – flowed repeatedly down from the continental shelf and into deeper water at Mimbral.

Although some of her colleagues believe no impact occurred at this time, Keller doesn't discount the possibility. "I think it's very likely that there was an impact. I don't know if it was at Yucatán. That's what we're trying to find out." If the crash did occur so close to the Mexican mainland, it should have left some glaring evidence at Mimbral and other sites, but Keller says she has yet to see any.

Impact supporters responded by attacking Keller's turbidite explanation for the Mimbral section. Jan Smit of the Free University of Amsterdam argued that turbidites could not have formed such deposits because the sediments preserve signs of currents that ran in several different directions – more in keeping with the idea that impact-triggered tsunami waves sloshed back and forth in the Gulf of Mexico. Successive turbidites would have produced currents with similar orientations, he says.

In an ironic turn of events, researchers who favor the impact theory presented evidence that may aid the anti-impactors. Nicola Swinburne, a Berkeley geologist who works with Alvarez, reported finding glass spherules and high concentrations of the element iridium within 61-million-year-old rocks in West Greenland. When researchers detect such evidence in rocks of K-T boundary age, they often interpret it as a sign of an impact.

Swinburne and her co-workers, however, found the materials in volcanic rocks, raising the possibility that an eruption created the spherules and the iridium layer. If so, that would help Charles Officer of Dartmouth, who has long argued that volcanic eruptions produced much of the K-T material attributed to an extraterrestrial crash.

The evidence may not play into Officer's hands, though. The Greenland volcanic rocks contain large chunks of nickel-iron metal, a principal component of some meteorites. That finding has caused Swinburne and others to wonder whether an impact occurred on top of this volcanic area. She says further work should help clarify the origin of the problematic Greenland deposit. – *R. Monastersky*

# Vessel residue taps into early brewing

Sit back, relax, and enjoy Old Sumerian, the beer that archaeologists dig. It undoubtedly tastes a bit flat – only a yellowish residue of the beverage remains inside an ancient storage vessel – but consider that this brew has aged for more than 5,000 years.

"This is the earliest definite chemical evidence for beer drinking," asserts archaeological chemist Patrick E. McGovern of the University of Pennsylvania in Philadelphia.

McGovern, working with University of Pennsylvania chemist Rudolph H. Michel and archaeologist Virginia R. Badler of the University of Toronto, studied the remains of a fragmentary piece of pottery from an Iranian site called Godin Tepe. The artifact dates to between 3500 B.C. and 3100 B.C.

An outpost of the Sumerians, who founded the world's first major civilization (SN: 3/3/90, p.136), Godin Tepe has also yielded the earliest chemical evidence of wine drinking (SN: 5/4/91, p.279).

The Sumerians grew barley, from which beer can be made, and Sumerian writings indicate that beer served as their "preferred fermented beverage," McGovern says.

Badler noticed that a crisscross pattern of long incisions sporting a pale, yellowish residue ran along the inside of the double-handled jar, which resides at the Royal Ontario Museum in Toronto. This piqued her interest, since the Sumerian written sign for "beer" shows a jar bearing lines in the same pattern.

Chemical analysis identified an oxalate salt – probably calcium oxalate – in the yellowish deposits, the scientists report in the Nov. 5 NATURE. The brewing of beer from barley produces a sediment along the sides of fermentation and storage tanks that consists mainly of calcium oxalate, they point out.

Additional chemical tests on scrapings from the inside of an approximately 3,300-year-old Egyptian beer container and a modern brewer's vat yielded evidence of the same oxalate salt as that found in the Sumerian vessel, the researchers say.

No evidence of a brewery or other vessels with oxalate residue has turned up at Godin Tepe, McGovern notes.

Beer brewing probably originated in Mesopotamia, where Sumerian civilization arose, since barley was first cultivated there, he maintains. "We suspect even earlier chemical evidence for beer consumption exists," McGovern says. – *B. Bower*