Death Swept Earth at End of Permian

Geologic detectives are running out of time, literally, as they investigate the biggest mass murder in life's long history—the crisis at the end of Earth's Permian period 250 million years ago.

Researchers had long believed that these devastating extinctions dragged on for many millions of years. Now, precise dating of Chinese rocks reveals that they took place in less than a million years, perhaps even more quickly, reports a team of geoscientists.

"This is the first reliable constraint on the duration of the event," says Douglas H. Erwin, a paleobiologist at the National Museum of Natural History in Washington, D.C. "It turns out that I've been wrong for 10 years, that the extinction is far more rapid than many of us had thought," says Erwin, who collaborated with team leader Samuel A. Bowring of the Massachusetts Institute of Technology and others. Their report appears in the May 15 SCIENCE.

At the boundary between the Permian and Triassic periods, more than 85 percent of ocean species died out, as did more than 70 percent of land vertebrates. The event decimated once-dominant groups such as certain corals and the anchored echinoderms, early relatives of starfish that grew on long stalks. Other prominent losers were the brachiopods, two-shelled animals that superficially resembled clams. On land, so many plants succumbed that fungi ruled the continents for a brief span.

Bowring and his colleagues pinpointed the timing of the extinctions by dating 172 samples of volcanic ash layers from three sites in southern China and a location in Texas. The ash contains grains of zircon—prized by geochronologists because it incorporates uranium into its crystalline lattice during formation. Over millions of years, the radioactive uranium decays into lead. By measuring the amount of uranium and lead in the zircon, researchers can calculate when the grains formed.

Volcanic layers above and below the extinctions bracket the event like bookends, revealing that the most pronounced loss of species took place between 252.3 million and 251.4 million years ago, report Bowring and his colleagues. Both dates, they say, are accurate to within 300,000 years.

"This is a tour de force of geochronology. It's a spectacular volume of data," comments Paul R. Renne of the Berkeley (Calif.) Geochronology Center, who studies the Permo-Triassic crisis.

Paleontologist David Jablonski of the University of Chicago says that geochronologists must now examine whether the extinctions occurred simultaneously at other ocean and land sites. "It's dangerous to rely on a single region to try to capture the complexities of an extinction event," he says.

The new dating hints that key incidents in the Permian crisis spanned far less than a million years. In the last decade, for example, researchers have documented a profound drop in the ratio of heavy carbon to light carbon in the oceans around the time of the Permo-Triassic boundary. Bowring and his colleagues calculate that this carbon isotope spasm lasted no more than 165,000 years and perhaps as little as 10,000 years.

Early investigations into the extinctions tended to favor gradual explanations, such as plate tectonic rearrangements that lowered sea levels and eliminated marine habitat. "That idea doesn't hold water now," says Paul B. Wignall of the University of Leeds in England.

Researchers have proposed many other possible triggers, but none can easily explain the speed of the extinctions, the isotopic shift, and other observations, says Erwin. For instance, a massive series of volcanic outpourings appears to have paved much of Siberia at the same time that species were vanishing, but these eruptions alone could not have caused the chemical transformation in the oceans.

Bowring, Erwin, and their colleagues offered three complex killing scenarios. In one, the Siberian eruptions warm the climate enough to release methane gas locked in icelike deposits under the seafloor. This could have stirred the oceans and brought up water laden with toxic amounts of carbon dioxide (SN: 2/1/97, p. 74). In another scenario, the extinctions themselves cause the shift in ocean carbon chemistry by wiping out photosynthesis in surface waters.

The third scenario invokes a carbon-rich comet striking Earth after volcanic eruptions and other factors had drastically weakened life. Lacking any direct evidence of a shot from heaven, however, many researchers prefer to look to Earth for answers. —*R. Monastersky*

Studying California's fastest drummers

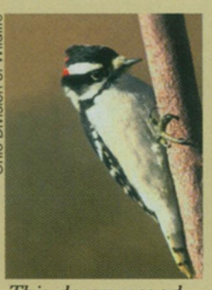
Is a woodpecker's drumming as distinctive as its call?

An ambitious statistical analysis of more than 3,000 recordings of California woodpeckers seems to have dashed that long-debated idea. Researchers found no consistent difference between the drumming of certain species such as ladder-backed and hairy woodpeckers.

These California soundalikes tend to live in different habitats, however, so they may be identifiable by their drumming, say Robert D. Stark of Ohio State University in Columbus and his colleagues. Among woodpeckers likely to live in oak woodlands, for example, drumming distinguishes species with 94 percent accuracy.

Birders have heard most of the world's 214 woodpecker species drum, slamming their bills into trees, aluminum siding, and other hard surfaces to create a rapid-fire pattern of loud strikes. These birds do not seem to be hammering out a tree cavity, searching for food, or doing anything except making a lot of noise. California's speed drumming champ, the ladder-backed woodpecker, bangs out some 28 beats a second. "It sounds like a machine-gun going off," Stark says.

Previous studies have suggested that drummers are flirting with potential mates or proclaiming territorial boundaries, but recording enough drumming for a statistical analysis has been a daunting task. "I'd never recommend one person do it [alone] because they'd end up throwing the recording equipment off the mountainside," says Stark's colleague Danielle J. Dodenhoff. While Stark sat with the equipment, she dashed toward the sound, trying to spot the woodpecker.



Ohio Division of Wildlife

This downy woodpecker looks much like the hairy species, but their drumming styles differ.

Analyzing such variables as number of beats per second and length of a drumming session, the researchers found no differences between male and female birds, they report in the May CONDOR.

R. Haven Wiley of the University of North Carolina at Chapel Hill notes that field ornithologists have wondered whether they could recognize all species just by the drumming. "Most people feel like they can't," he says. —*S. Milius*