Earth Science

K-T catastrophe: No place to hide

When a wave of extinctions swept Earth 65 million years ago, it left no region unscathed, according to two paleontologists who have completed a comprehensive analysis of fossil clams, oysters, and other bivalves. Their findings contradict a long-held assumption that this mass extinction and others in Earth's history hit the tropics harder than other regions. David M. Raup and David Jablonski, both at the University of Chicago, describe their work in the May 14 SCIENCE.

The mass extinction, at the boundary between the Cretaceous (K) and Tertiary (T) periods, wiped out 60 to 80 percent of living species, including the last remaining dinosaurs. Although more severe die-offs wracked the planet in earlier times, the K-T extinctions have captured widespread interest in the dozen years since researchers found evidence linking them to the impact of a huge asteroid or comet. Growing evidence suggests that such an object crashed into the northern Yucatán, where geophysicists have found a large, crater-like formation. Along with the prevailing assumptions about mass extinctions, this find intensified the belief that the tropics suffered most.

To assess the extinction pattern, Raup and Jablonski analyzed the distribution of 340 genera of bivalves living at 106 sites around the globe during the last 8 million years of the Cretaceous period. The researchers chose bivalves because they played an important role in the Cretaceous seas and because they went extinct at the same rate as other animals, on average.

Looking at all genera, Raup and Jablonski found that bivalves living in the tropics did tend to die off more than those in temperate and polar regions. But they discount that total number because it includes a group of 46 reef-building genera called rudists, which suffered much greater losses than other animals. Because most rudists lived in the tropics, their die-offs give the impression that the K-T catastrophe focused there, says Raup. When he and Jablonski analyzed the 294 other bivalve genera, they found that all regions suffered equally.

Such results will not end debates over what sparked the extinctions, because either of the main suspects—an impact or a climate change — would have had global effects, he says.

A shot at gumshoe seismology

What's the difference between an earthquake and a gunshot? Not much, decided seismologist John Lahr when he started hearing loud reports around his house in early 1992. Knowing that the local police were having trouble locating the source of the gunfire, Lahr decided to find out whether the earthquake technology he used at work could pinpoint the shots.

Lahr — then with the U.S. Geological Survey in Menlo Park, Calif., and now at the Alaska Volcano Observatory in Fairbanks — set up a network of four microphones around his neighborhood and one at his house. Each of the four neighborhood microphones connected to an amplifier and a radio transmitter. Back home, a personal computer continually monitored the microphones, storing any loud noises heard at three or more sites through a process developed for earthquake recognition. Lahr then plugged that information into a second personal computer, which located the origins of the noises through triangulation. Although he never ran a controlled experiment—which would have involved firing a gun at a known spot—Lahr says he could trace a shot to the nearest couple of meters. He located many shot-like noises, including automatic weapon blasts coming from a variety of sites. This didn't lead to any arrests, however.

Lahr had to scrutinize the data to determine when noises first reached each microphone. But he says it should be possible to automate that process—something the Menlo Park police would like to pursue.

Science & Society

Daniel Pendick reports from Mississippi Beach, Miss., at the International Science and Engineering Fair

Young scientists explore local universe

At its grandest level, science is the ongoing attempt of humans to make sense of the universe. However, many young scientists exhibiting their research at this year's fair, May 9 to 15, found inspiration for their work right around the corner—in their own schools and neighborhoods. Two examples:

• Jason Oraker, 15, a ninth-grader at Irving Junior High School in Colorado Springs, Colo., surveyed fellow students at four area junior high schools. He found that students who feel physically attractive—and therefore acceptable to their peers—are more likely to also feel a general sense of psychological well-being, "the perception someone has that their life is fulfilling, meaningful, and pleasant," says Oraker.

He began his study in response to a November 1992 broadcast of the television program "Prime Time Live," in which hidden cameras showed students in one Colorado Springs school playing catch in class, lighting fires in trash bins, and generally creating chaos. The program offered this behavior as a sign of a public school system in decline, he explains.

Oraker didn't buy it. He chose to look at the problem from a student's perspective. "I began to wonder if the kids in the video hadn't had enough attention at home, or something like that, and they felt the need to gain attention in some other way," he says. Oraker did some reading and came across the concept of psychological well-being. He combined several published psychological tests into a survey and used it to measure 305 students' perceptions of themselves.

Oraker's research suggests that many of his fellow students may indeed suffer from a significant lack of well-being, in part, his data indicate, because they feel physically unattractive. For example, 68 percent of seventh-, eighth-, and ninth-graders surveyed said they felt so restless in class they couldn't sit still, 71 percent said they were bored, and 40 percent reported feeling depressed at the time of the survey.

Ultimately, Oraker speculates, these feelings of discontent may trace to messages conveyed by television and other media, which encourage children to value wealth, beauty, and conformity over individual achievement. To counteract this influence, adults should encourage students to develop their unique talents, he says.

Oraker won a third-place award in the behavioral and social sciences category for his project.

• Ednaly Ortiz, a 17-year-old senior from José S. Alegría School in Dorado, Puerto Rico, looked outside the classroom—and centuries back in time—in her research. With the help of classmates, Ortiz excavated archaeological sites minutes from her home, unearthing pottery fragments from two pre-Columbian peoples, the Elenoide and the Chicoide.

In the latest phase of her four-year study, Ortiz has used chemical and archaeological analysis to identify the specific areas in which these cultures mined clay for their pottery and how that pottery, once buried, affected soil layering and composition. In doing so, she wants to show that "archaeology is not only [recovering] the fragments, the things past cultures leave behind," says Ortiz, whose project earned a second-place award in the earth and space sciences category. "I want to show people that archaeology can be mixed with chemistry, geology, and topography" to both reconstruct past cultures and document their effects on the soil.

Ortiz determined the concentrations of various elements such as copper, iron, and calcium in excavated pottery fragments. She then fired ceramic samples from local clays, using the same open-bonfire method practiced by indigenous peoples who inhabited Puerto Rico between 900 A.D. and 1500 A.D. Analysis of these test samples enabled Ortiz to match historical pottery fragments with local clay deposits.