Earth Sciences

Cheryl Simon reports from Indianapolis at the annual meeting of the Geological Society of America

Bloody end for mastodons?

For nearly 15 million years after the mastodons crossed the Bering Straits from Siberia, the giant herbivores enjoyed the good life on the North American continent. Then, some ill fortune befell them; 10,000 years ago the last one disappeared. Archeologists and paleontologists long have assumed that the demise of the mastodons occurred when the Paleo Indians arrived in North America, by the same route as the mastodons, about 11,000 years ago. Examples of bones of dismembered, presumably butchered, mastodons abound. (The bones bear marks made by stone tools, and other injuries suffered during dismemberment.) Until now though, there has been no way for scientists to demonstrate that hunting by humans at the end of the last glaciation actually brought the mastodons to ruin. If the humans had simply butchered animals that were dead or nearly dead, says Daniel Fisher of the University of Michigan in Ann Arbor, the extinction would have been from natural causes rather than from hunting. By analyzing the layers of seasonal laminations that build up each year on mastodon tusks and molars, Fisher and colleague Paul L. Koch were able to identify when individual mastodons died, to within two weeks to one month of the year. They found that all the mastodons that died in the fall had been butchered, and also noted that those mastodons that died in the spring died of natural causes. Fisher suggests that sick animals were more likely to die during or shortly after winter—the time of high stress. Having survived that hardship, there was no reason for the mastodons to die in the fall when conditions were good. The healthy mastodons would have appealed to the hunters, Fisher surmises. Fall probably was hunting season, during which the Paleo Indians amassed their winter stores. The second, possibly more significant factor, he says, is that quality of meat was all-important. The healthy mastodons, well-fed on the summer's bounty, provided crucial fat the humans needed for metabolizing protein during the frigid winter months. Fisher says that the extinction may have occurred in 100 to 1,000 years, following the rapid increase in human population. "Populations of large mammals are especially vulnerable," Fisher says. Modern elephants, for example, do not bear their first young until age 10 or 12, he says, and their gestation period is nearly two years. Herds of mastodons, diminished by the hunters but not exterminated, would have been unable to recover.

Data bank reveals eruption patterns

The data bank of volcanic activity compiled by the Smithsonian Institution in Washington, D.C., over the past twelve years not only provides summaries of volcanism during the last 10,000 years (SN: 8/27/83, p. 139) but also is enabling scientists to identify patterns of eruptions. Tom Simkin of the Smithsonian demonstrated an application of the data bank as he attempted to provide a global perspective on the world's eruptions. On earth, eruptions occur in one of three settings. By far most eruptions occur along the length of the 60,000 kilometers of spreading centers that slash through the seafloors. These submarine volcanoes yield 67 to 75 percent of the molten rock, or magma, that escapes to the earth's surface each year. Other eruptions, which supply up to 13 percent of the magma to the surface, take place above the sea surface along the 33,366 km where slabs of crust are drawn back into the mantle, or subducted; and at mid-plate volcanoes (such as Kilauea in Hawaii), which deliver 14 to 18 percent of the total magma each year. Though subduction zone volcanoes, which cover less than one percent of the earth's surface, are not the earth's dominant volcanoes, they are by far the most visible and accessible. They account for 84 percent of the world's known eruptions since record-keeping began, and for 88 percent of eruptions known to cause fatalities.

Simkin focused his analysis on these subduction zone volcanoes. He found that data for the 32 volcanic belts along subduction zones offer some general explanations for the "large variation in volcanic vigor" in the active volcanic belts of the world. One factor, he says, may be the thickness of the overriding crustal plate. Plates thinner than 20 km are marked by relatively quiet volcanism, while some, though not all, belts of vigorous activity are on crust 25 to 35 km thick. Crustal age seems to figure in, too. Very young crust seems to offer weak volcanism, as in the southern portion of Chile, while the eruptions in that nation's northern end, where the crust is much older, are far more vigorous. However, Simkin says, no correlation is apparent for crust older than 20 million years. A final factor may be earthquake activity and the rates of crustal movement. Simkin described other research that has shown that volcanism is strong where the crust slips without earthquakes but weak in areas where great quakes occur as crustal plates converge.

Search goes on for elusive crater

Ever since Luis Alvarez of the Lawrence Berkeley Laboratory in Berkeley, Calif., and colleagues proposed that an asteroid hit the earth about 65 million years ago (SN: 10/14/81, p. 314), researchers have been searching for a crater that might help prove that the idea is correct. There is said to be a 70 percent chance that the crater still exists on land or beneath the sea. John McHone Jr. and Robert S. Dietz of Arizona State University in Tempe, have studied known or suspected impact craters. Several are the right age but are too small to have caused the global effects the Alvarez group predicts. The impact scar most likely to have been caused by an impact at that time, McHone and Dietz suggest, is the Kara crater in the Soviet Union. In fact, the crater, dated 60 million years old give or take 5 million years, consists of two craters, one 60 kilometers wide and the other 25 km wide. A closely spaced impact by two smaller asteroids (known as a doublet) or cluster of asteroids, would release more energy than one larger one. It is believed that doublets form in space when a projectile breaks up. In space the rocks are held together loosely by their own gravity but are pulled apart as they approach the earth's much stronger gravity field.

Dinosaur story: Who found the tooth?

In 1822 while her husband Gideon Mantell visited a patient in Cuckfield, England, Mary Ann Mantell took a fateful stroll. As legend has it, she ambled along a country road in the Sussex region, spied a stone glinting in the sunlight, and saved it to show to her fossil-collecting mate. That tooth was a remnant of Iguanodon, which Mantell concluded was an extinct plant-eating reptile — the first known dinosaur. The tale is well-known by dinosaur buffs. It is included with minor variations in nearly every dinosaur history book, but it perpetuates some substantial errors, says Dennis Dean of the University of Wisconsin in Kenosha. In conducting research for his forthcoming biography of Dr. Mantell (who was not in fact a medical doctor, but a lawyer who practiced medicine and was trained in surgery), Dean has found evidence that the tooth was found in 1820. Mrs. Mantell *may* have found the tooth, but there is no direct proof; in his journal and in early published accounts of the discovery, Dr. Mantell credits Mrs. Mantell with the finding. After Mrs. Mantell left her husband in 1839, Dean says, Dr. Mantell claimed *he* found the tooth. Despite Mantell's selective memory and haphazard ways with dates and facts, his scientific contributions were considerable and should not be underrated, Dean says. Mantell was stigmatized because he was born to a low social class, but he popularized the concept of the "Age of Reptiles" and promoted a much more advanced and accurate vision of a possibly bipedal Iguanodon than the clumsy, four-footed creature with a rhino-like horn that came to be accepted at the time.