SCIENCE NEWS of the week

Volcanic Suspect in Global Murder Mystery

The greatest extinction in Earth's history—a profound biological crisis that set the stage for the world of the dinosaurs—may trace to a series of massive volcanic eruptions, according to new geologic evidence.

Life on Earth has passed through several mass extinctions, including those that wiped out the dinosaurs at the end of the Cretaceous period. But the widespread die-offs at the boundary between the Permian and Triassic periods stand out above all others in the fossil record. By some accounts, 96 percent of the ocean species vanished altogether, and the dominant land animals suffered remarkably. Such drastic winnowing of Permian organisms allowed new forms to rise in prominence, ultimately leading to the ascendance of the dinosaurs. Indeed, paleontologists use the Permo-Triassic event as a dividing line to separate the Paleozoic ("old life") era from the Mesozoic ("middle life") era.

"This big extinction has long been of interest because it was so severe. But it has never been explained satisfactorily," says paleontologist Steven M. Stanley of the Johns Hopkins University in Baltimore.

Now, two scientists provide a possible answer: climate-disrupting outpourings from huge volcanic eruptions in Siberia.

Paul R. Renne of the Institute of Human Origins in Berkeley, Calif., and Asish R. Basu of the University of Rochester in New York used high-precision techniques to pin down the age of vast deposits of volcanic basalts, known as the Siberian Traps, that cover 340,000 square kilometers in the northern Soviet Union. In the July 12 SCIENCE, they report that the massive eruptions occurred within a very short geologic span some 248 million years ago — coincident with the widespread Permo-Triassic extinctions.

In previous work, Soviet researchers had dated the eruptions to well after the extinctions, precluding any relationship between the two. But Renne and Basu used a more sophisticated process, called argon-40/argon-39 dating. This technique determines age by calculating how much radioactive potassium has decayed to argon over millions of years.

"We have really nailed it down very, very precisely. It is Permo-Triassic age," says Basu. The finding reopens the possibility that the eruptions caused the extensive extinctions.

The Siberian Traps, which rank among the world's largest eruptions, spewed out roughly 1.5 million times as much rock as the Mount St. Helens blast of 1981. Gases lofted into the atmosphere by the Siberian outpourings could have devastated life at the time by altering the global climate, says Basu.

While the new work points to the Siberian Traps as a prime suspect, the biggest murder mystery in Earth's history will not yield to a solution overnight. Scientists continue to debate the age of the Siberian Traps. In the May GEOLOGY, Ajoy K. Baksi of the Louisiana State University in Baton Rouge and a coworker report using the argon technique to date the eruptions to 238 million years ago. If correct, that would rule out the Traps as the cause of the die-offs.

However, says Baksi, "the geologic pedigree of my samples is a little suspect," because he received them third-hand, years after Soviet researchers collected them. He is now checking his results for any analytical errors. Researchers with the U.S. Geological Survey are currently using the argon method to date yet another set of samples from the Traps.

The topic of eruptions and extinctions heated up this spring when scientists reported new evidence linking India's Deccan Traps with the infamous Cretaceous extinctions. Geologists have spent the last decade arguing whether that die-off resulted from a meteorite impact or from volcanic eruptions, but the latest findings suggest that both types of disaster may have hit at the same time in a double whammy of bad luck.

At the spring meeting of the American Geophysical Union in Baltimore, researchers from the USGS and Oregon State University presented argon-dating results indicating that the Deccan Traps erupted over a very short geologic span about 65 million years ago, emitting a substantial burst at roughly the same time as the purported meteorite impact.

— *R. Monastersky*

Hot prospects for quelling cluster headaches

A chemical that gives hot peppers their bite, activating pain sensors in the mouth, helps extinguish the pain of "cluster" headaches, a new study suggests. Researchers described this peppery paradox, along with several other novel strategies for treating cluster headaches, at last week's Fifth International Headache Congress in Washington, D.C.

"Cluster is the most excruciating form of headache known," says Ninan T. Mathew, who directs the Houston Headache Clinic and served as the conference's organizing chairman. This neurovascular disease, characterized by recurring bouts of pain concentrated around one eye, plagues an estimated 1 percent of the world's population. For unknown reasons, roughly five times as many men as women develop the condition. Each "attack cluster" brings one to 20 headaches daily for months — and sometimes for a year or longer. Between attacks, observes Mathew, "patients live in mortal fear of the next one."

Earlier research with the hot pepper compound, capsaicin, suggested it might selectively stimulate, then block, a class of sensory nerve cells responsible for recognizing or transmitting pain. Capsaicin "depletes the nerve endings of the chemicals which induce pain," Mathew explains. Repeated applications — until the treated tissues no longer "burn" on contact with the compound — eventually deaden the nerves to pain.

The new study, led by Bruno M. Fusco at the University of Florence, Italy, involved 23 men and six women suffering from cluster headaches. The researchers gave each volunteer a squirt of a capsaicin-containing solution each day, spraying the solution into only one nostril: the one on the same side as the headache pain in 16 patients, and the one opposite the painful side in 13 others. The treatment period lasted "several days," Fusco says.

Sandoz Pharmaceuticals 1990

Artist and headache sufferer Christine Lamb-Toubeau depicts eye pain in "Roger Reacts to the Light."

Throughout the 60-day follow-up period, 11 of the 16 people in the same-side group reported a total cessation of cluster headaches. Two others reported a 50 percent reduction in the number of attacks, and the remaining three reported no relief. No patient treated through the nostril opposite the pain reported any relief.

Mathew took another tack, developing