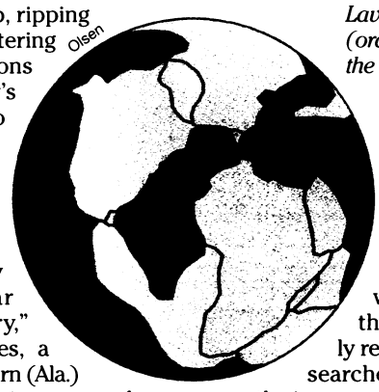
Eruptions Cleared Path for Dinosaurs

In a geologically brief catastrophe 200 million years ago, massive rivers of lava oozed out of fissures in the ground and paved over a continent-size swath of land, reports an international team of researchers. This eruptive outpouring—the largest known in Earth's history—may have killed off much of the planet's life and led to the coronation of the dinosaurs as rulers of the Jurassic period.

The volcanic crisis hit at the end of the Triassic period, when all of Earth's continents huddled together in a single landmass called Pangaea. Within the short span of a few million years, black basalt erupted along the central spine of this supercontinent, eventually spreading over an area nearly the size of Australia. Soon thereafter, in the Jurassic period, the Atlantic Ocean opened up, ripping apart Pangaea and scattering these basaltic formations across four of today's continents, according to Andrea Marzoli of the University of Geneva in Switzerland and his colleagues.



Lava from giant eruptions (orange) created a crisis at the end of the Triassic period.

"It's something so extraordinary that it may have been a singular event in Earth's history," comments Willis Hames, a geochronologist at Auburn (Ala.) University who is studying some of these volcanic rocks in the U.S. Southeast.

Geologists have known for over a century about eruptions dating to the boundary of the Triassic and Jurassic periods. For example, New York City sits just across the Hudson River from a set of basaltic cliffs called the Palisades, which formed as part of this volcanic episode. Only recently, however, have researchers started to recognize the immense extent of the eruptions.

Marzoli and his colleagues dated a series of volcanic rocks from Brazil that scientists had not formerly considered part of the Triassic-Jurassic eruptions. They also recalibrated the previously reported ages of volcanic rocks from North America, Africa, and Europe to compare the entire set. The Brazilian basalt formed at precisely the same time as the basalt on the other continents, indicating that the eruptions covered 7 million square kilometers, the scientists report in the April 23 SCIENCE.

Much of the original rock from these eruptions has eroded away or been buried, making it hard for geologists to patch together the pieces. "The whole extent of this [volcanic] province has never been appreciated until now," says Paul R. Renne of the Berkeley (Calif.) Geochronology Center, who led the work.

The timing of the volcanic emissions has captured the attention of paleontologists because it appears to coincide with one of the largest known mass extinctions, when more than half of Earth's species disappeared. Among the victims were the then-reigning carnivorous reptiles. Soon after their disappearance, meat-eating dinosaurs took over as the top predators.

The lava could have released so much carbon dioxide that it knocked the climate off kilter. Indeed, preliminary evidence suggests that carbon dioxide concentrations surged at the end of the Triassic. Plant fossils from this time have unusually few leaf pores, an adaptation to increases in carbon dioxide, says Jennifer C. McElwain of the University of Sheffield in England.

Geologists have yet to examine carefully whether the eruptions took place before the mass extinction. At some sites, the reverse seems to be true, suggesting that at least some of the eruptions postdated the die-offs, says paleontologist Paul Olsen of the Lamont-Doherty Earth Observatory in Palisades, N.Y. —*R. Monastersky*

Self cells ease Parkinson's in monkeys

When a portion of the brain fails to produce its normal yield of the message transmitter dopamine, Parkinson's disease can result. A shortage of dopamine keeps brain cells from consistently firing messages to nerves that reach the muscles, resulting in the tremors and rigidity that characterize this condition.

Scientists report in the April NEURON that monkeys with Parkinson's disease regained partial control of their movements and recouped fine motor skills after surgery that transplanted cells from another part of their body into their brain.

The cells came from the carotid bodies, two tiny glands in the neck that sense when oxygen in the blood is running low. They respond by releasing dopamine and other substances that signal the brain to boost blood pressure, heart rate, and breathing. Because the glands produce dopamine prodigiously, they make good candidates for Parkinson's disease repair, says coauthor José López-Barneo, a physiologist at the University of Seville in Spain.

To test this novel source of cells, he and his colleagues gave two cynomolgus macaques a drug known to induce Parkinson's disease. After 3 to 5 months, the researchers transferred cells from the monkeys' carotid bodies to the putamen, an area of the brain damaged in Parkinson's. Although they didn't multiply, many of the carotid cells survived and produced dopamine. They also appeared to make growth-inducing chemicals that stirred brain cells into resuming dopamine production.

Within a few weeks, the animals showed striking gains in their ability to do tasks, the scientists report. Postmortem examination of the monkeys' brains, 3 or 5 months after the transplant, revealed that many brain cells had functioned throughout the experiment.

Research has shown that transplantation of human fetal brain cells or pig cells into Parkinson's patients can produce some improvement. However, the recipient's immune system often must be suppressed in these operations, and even so the grafted cells are sometimes rejected. Moreover, use of fetal tissue raises difficult ethical questions. Transplanting tissue from animals carries risks of cross-species viral infection.

These difficulties make self-transplants appealing. However, experiments that moved dopamine-making cells in patients from the adrenal glands to the brain have shown poor results because most of the cells died, says Paul R. Sanberg, a neuroscientist at the University of South Florida in Tampa.

More carotid body cells survived in the recent experiment on monkeys, López-Barneo says. The cells spring into action when oxygen is low, a trait that may make them better able to withstand the rigors of transplantation, he suggests.

The monkeys' brains eventually harbored more cells producing dopamine than the researchers had put there, notes Greg A. Gerhardt, a neuroscientist at the University of Colorado Health Sciences Center in Denver. Thus, the apparent manufacture of growth factors by carotid body cells is "the diamond in the rough in this study," he says. —*N. Seppa*