

Abrupt extinctions at end of Triassic

As the Triassic period closed, about 200 million years ago, large families of animals started dying off in record numbers, forever changing the character of life on earth and paving the way for the age of the dinosaurs. Scientists previously had thought that these extinctions occurred gradually over the course of 15 million to 20 million years. However, an analysis of fossil finds in Nova Scotia now suggests that they happened quite suddenly and may have resulted from the impact of a large meteor.

Paul E. Olsen of the Lamont-Doherty Geological Observatory in Palisades, N.Y., and his colleagues report in the Aug. 28 *SCIENCE* that "the disappearance of dominant Triassic forms was abrupt, occurring in less than 850,000 years." Indeed, according to coauthor Neil H. Shubin from the University of California at Berkeley, "That's an absolute max. Our gut feeling is [that it was] a lot less."

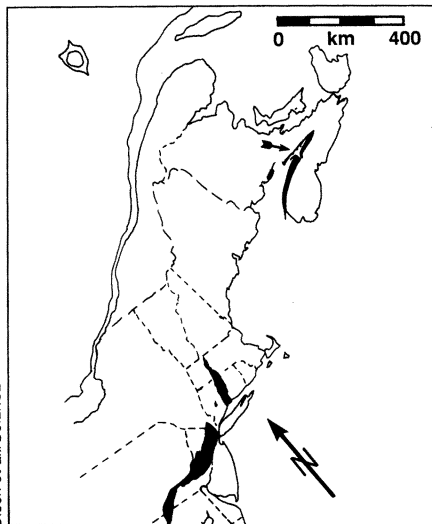
Olsen's group is basing its conclusions on four groups of fossils found two years ago in the McCoy Brook Formation along the Bay of Fundy (SN: 2/8/86, p.86). These fossil assemblages of tetrapods, or four-legged creatures, date to the earliest years after the end of the Triassic and the beginning of Jurassic period and have proved extremely valuable in measuring the duration of the extinctions, says Shubin.

The tetrapod remnants are unusually abundant and were discovered in a diverse range of environments including lake beds, lake shores and sand dunes. Olsen's group found that many Triassic animals were conspicuously absent from the fossil assemblages, which means that they had already disappeared by this early date in the Jurassic.

These conditions — rich groups of fossils found in different environments — help assure researchers that the absence of certain species actually represents an extinction rather than a fluke of fossilization. "It gives you a lot of confidence," says Shubin.

The lake environments will also help scientist refine the dates and duration of the extinctions. Because cycles of the earth's orbit affect the rates of sedimentation in large lakes, scientists can actually resolve the ages of sedimented layers down to 20,000 years. Using these lake cycles, Shubin hopes to demonstrate that the extinctions happened over a much shorter period than 850,000 years.

Berkeley geologist Mark H. Anders, another coauthor of the paper, is currently seeking to determine whether the sudden mass extinctions at the end of the Triassic are related to the roughly contemporaneous impact of a meteorite, which punched a 70-kilometer-wide hole



Arrow in Nova Scotia shows location of fossils, in part of a rock formation known as the Newark Supergroup (shaded areas). A nearby impact crater (upper left) may be related to Triassic extinctions.

in the ground of nearby Quebec. In the last decade, geologists and paleontologists have debated whether an extraterrestrial impact caused a later bout of mass extinctions at the end of the Cretaceous period, about 66 million years ago (SN: 5/16/87, p.309).

Olsen's group believes that the Triassic-Jurassic boundary provides an excellent opportunity to conduct a general test of the impact theory. They reason that the impact in Quebec must have left some marks in the well-preserved stratigraphic record in the McCoy Brook Formation and elsewhere. If the researchers find shocked quartz or other evidence of an impact directly prior to the disappearance of many species, this would provide those who are tracking the cause of the extinctions with a so-called smoking gun. However, a null result would not necessarily disprove the impact theory.

While many hail the Nova Scotia finds as significant contributions to the sketchy fossil record for this time, some paleontologists are reserving judgment on the duration of the Triassic mass extinctions. "It's quite possible," says Berkeley paleontologist Kevin Padian, "that the extinctions along the East Coast [of North America] occurred fairly quickly, but whether that has general applications around the world is still an open question."

East Coast extinctions might be unique because this area was experiencing intense geologic upheaval at the end of the Triassic, notes Padian. At this time, all the continents of the earth were part of one large supercontinent that was in the process of breaking apart. As North America began to tear away from North Africa, volcanic activity and extensive faulting ripped open a valley in between — a valley that later developed into North America's East Coast. — R. Monastersky

Bringing back fading memories

There are both joyous and sad memories. And there are those lost as a person ages — a loss that is exacerbated if the person has Alzheimer's disease. An inability to recall recent events can be disabling and frightening, and researchers are seeking ways to halt such age- and disease-related failures of short-term memory. Scientists in Sweden and the United States report this week that a substance called nerve growth factor may help improve impaired memory.

A protein produced by nerve cells, nerve growth factor was isolated in the early 1950s. Later, scientists observed that degenerative changes in the brains of Alzheimer patients occur in the same regions as those affected by the growth factor. On the basis of this relationship, researchers at the University of Lund in Sweden and the University of California at San Diego recently tested the effects of infusing nerve growth factor into the aging brain, by studying changes in memory retention among aged rats.

As described in the Sept. 3 *NATURE*, the scientists repeatedly placed 2-year-old rats in a tank of water made opaque by a white powder, and observed the length of time it took for each rat to swim to a submerged platform on which it could stand. The "water maze task" is an established measure of how well rats retain prior knowledge of the platform's location, Anders Bjorklund of Lund told *SCIENCE NEWS*. He says that inability to learn the task is directly related to the degree of atrophy seen in the cholinergic system of a rat's brain. The network of cholinergic nerve cells — which release the chemical acetylcholine during message transmission between cells — is also affected in Alzheimer patients.

Two months before taking the water maze test, aged rats had been placed in the tank and categorized by whether or not they could memorize the platform's location. Those that could not were placed in the "impaired" group. About half the rats in this group were implanted with pumps containing nerve growth factor, while the remaining impaired rats served as controls, receiving a common blood protein as a placebo. After implantation, the rats were tested twice during a 28-day infusion period: about one week, and then three weeks, after nerve growth factor (or placebo) therapy began.

There was no change during the first week, but by the third week of therapy, performance of the rats given nerve growth factor was as good as that of the nonimpaired group, say the authors. They attribute this to "improved retention" of information learned during the first week's test. Along with the improved memory among the treated rats, the