

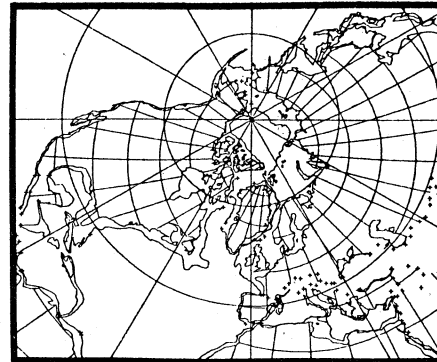
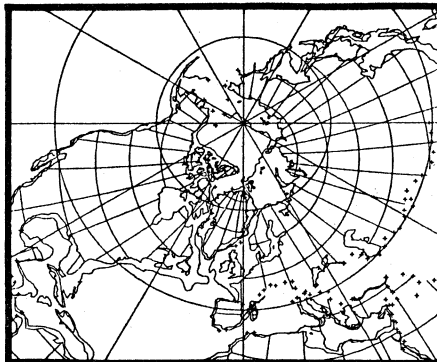
Mass Extinction: More Theories

Nearly 65 million years ago, dozens of species of marine organisms and land animals — including dinosaurs and flying reptiles — disappeared in a geologic instant. Try as they might, scientists have yet to explain the mass extinctions. Now, on the heels of an extraterrestrial explanation (SN: 6/2/79, p. 356), comes a more down to earth theory.

According to Stefan Gartner of Texas A & M University, the extinctions were caused by the spillover of a once-isolated, fresh water Arctic Ocean, which flooded the world's oceans, reduced their salinity and killed susceptible marine species. And, in a geological double play, the flush of fresh, freezing water altered the world's climate sufficiently to put the death squeeze on less adaptable land animals. Unlike other models, Gartner's theory explains both the land and marine extinctions using a single mechanism.

Gartner first developed his theory based on deep sea cores from the North Sea. At the point in the cores marking 65 million years ago, Gartner and John Keany of the Phillips Petroleum Co. found, as expected, that the planktonic plants and animals of the Cretaceous period (136 million to 65 million years ago) were wiped out and replaced by species characteristic of the Tertiary period (65 million to 1.8 million years ago.) In what should be the Tertiary part of the core, however, the Cretaceous organisms suddenly reappeared. The older fossils persisted until again, this time permanently, they were replaced by Tertiary plankton.

To Gartner and Keany, this sequence indicated that whatever catastrophe occurred was highly selective — it seemed not to permanently harm the Tertiary species — and that, in the North Sea at least, it happened twice. In a paper published last year (GEOLOGY, v.6, no. 12), they explained their proposed mechanism. According to Gartner, during the Late Cretaceous (about 80 million years ago), the Labrador Sea, the Baffin Bay and the Bering Strait had not opened. The Arctic Ocean, as a result, was completely isolated from the rest of the world's oceans. Fresh water runoff from Europe, Asia and North America into the Arctic Ocean greatly reduced its salinity. About 65 million years ago, a passage temporarily opened between Greenland and Norway and some of the fresh water spilled into the North Sea. This event is marked by the abundance of Tertiary-type species, the researchers say, which could survive the lower salinity. When the opening became permanent, all of the less salty Arctic Ocean spilled into the Atlantic and made its way to the Pacific, eventually covering all the oceans with a layer of brackish



Smith and Briden/Gartner

Continental position around Arctic Ocean 80 million years ago (right) shows how ocean may have been isolated. Later flooding could have altered other oceans (left).

water. In a "triple whammy," says Gartner, the marine organisms died: some due to an intolerance of low salinity, others from depletion of dissolved oxygen and still others from disruption of the food chain.

Gartner gave the second installment of the theory — the consequences for land animals — at the recent meeting of the Geological Society of America in San Diego. With Texas A & M meteorologist James P. McGuirk, Gartner outlined the climatic effects of the Arctic spillover model: An isolated Arctic Ocean was probably 15°C colder than the rest of the Cretaceous oceans, they say. Based on their model of the global circulation patterns of the Cretaceous, a sudden rush of cold water of the volume of the Arctic Ocean would cause a world ocean temperature drop of nearly 10°C. The colder water and consequently colder air would cause a decline in precipitation—possibly by as much as 57 percent, they say. The resulting intense drought, temperature drop and greater seasonality would cause the lush tropical vegetation of the high latitudes to disappear. And when the food supply disappeared, the researchers say, so did the more susceptible, less adaptable animals.

Like all theories of the Cretaceous ex-

tinctions, however, this one has its problems. Detractors disagree primarily with the theory's basis — the North Sea cores. Some researchers interviewed by SCIENCE NEWS felt that the Cretaceous species' reappearing act is due to a disruption and resettlement of the sediments, which caused the record to be misinterpreted. Gartner, however, disputes redeposition, saying the section in question is too thick — 180 feet — to have been redeposited and that mixing is not seen elsewhere in the cores. Further, Gartner says, recent research by two separate groups has found oxygen and carbon isotope evidence that appears to indicate the presence of a fresh water layer in the Cretaceous-Tertiary oceans. Gartner admits, however, that he lacks direct evidence that the Arctic Ocean was indeed fresh; cores have yet to be recovered there and critics are skeptical that so large a body of water could become fresh water in such a relatively short time span. For now, like other explanations of the extinctions, it remains unproved. And as one researcher said: "It was an elegant model based on the evidence. Now, the evidence has been undercut but the model still seems to work. And it's the only one we really have that explains the whole thing." □

T cells' complicity in autoimmunity

It used to be thought that autoimmune diseases were the result of antibodies erroneously attacking parts of the body rather than viruses, bacteria or some other foreign enemy. But now it appears that certain immune cells, suppressor T cells, also play a role in autoimmune diseases. The fine interactions between autoantibodies and suppressor T cells in various autoimmune diseases are still not totally understood, but the complicity of suppressor T cells in autoimmune diseases may offer a new strategy for treating such diseases.

In 1975, a Japanese researcher reported that defective suppressor T cells are present in patients with systemic lupus erythematosus, a chronic disease that is characterized by fever, malaise, skin rash and arthritis, and that sometimes fatally attacks the kidneys. Patients with lupus also have been found to have antibodies formed against genes in their kidney cells; so it may be that both defective suppressor T cells and autoantibodies are implicated in this disorder. In 1978, Anthony J. Strelkauskas and co-workers at Harvard Medical School reported that patients with

active juvenile rheumatoid arthritis, another suspected autoimmune disease, have antibodies directed against suppressor T cells (SN: 11/18/78, p. 342). Now Ellis L. Reinherz of the Sidney Farber Cancer Institute in Boston and his team report in the Nov. 8 NEW ENGLAND JOURNAL OF MEDICINE on an anemic patient who had antibodies directed against her red blood cells plus a lack of suppressor T cells. In her case, a lack of suppressor T's may have let antibodies form against red blood cells.

The complex interaction between suppressor T cells and autoantibodies in various autoimmune diseases has not been fully explained, but the role of suppressor T cells in such disorders has led to a possible therapy for such diseases. Thoracic duct drainage of disordered T cells, for instance, has been shown to decrease disease activity in both lupus patients and in patients with adult rheumatoid arthritis (another suspected autoimmune disease). But such drainage is a major surgical procedure that requires prolonged hospitalization. Now S. Slavin of the Hadassah-Hebrew University in Jerusalem reports on irradiation of autoimmune patients' lymphoid tissues in an attempt to wipe out disordered T cells. He tested the idea on rats with autoimmune polyarthritis, and it brought about disease remission. Then he tested it on a small group of mice with experimental lupus, and as he reports in the October PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, it reduced their disease and increased their survival significantly compared with control mice. So "total lymphoid irradiation should be further investigated as a new approach for immunoregulation of autoimmune disorders," Slavin concludes. □

First commercial SNG

Approval to build the nation's first commercial-scale coal-gasification plant by a consortium of five interstate gas-pipeline companies was given November 15 by the nation's gas rate setting body, the Federal Energy Regulatory Commission. Using a relatively costly process, the plant would manufacture 125,000 cubic feet of synthetic natural gas per day from lignite and water.

Key among terms of the 150-page FERC order was an agreement to let the pipeline companies average in the price of the synthetic gas — expected to cost between \$5.56 and \$8.62 per thousand cubic feet (mcf) — with the price charged their customers for natural gas, now about \$1.20 per mcf. Roughly one-third of the nation's gas customers would be affected.

Plans call for constructing the plant — now estimated to cost more than \$1 billion — beside lignite strip mines in Beulah, N.D. The consortium has been planning and seeking regulatory approval for the plant for more than five years. □

A seven-foot 'hole-in-one'

About 1.5 million years ago, someone strolled among the hippopotamuses and large birds that populated the northeast shore of what is now Lake Turkana in northern Kenya. Such a scene was probably not uncommon at that time in history, but what makes this particular walk so significant is that it was etched permanently in the muddy, lakeside soil.

In what researchers are calling an archaeological first, seven of the footprints were accidentally discovered during the digging of a geological trench. And if the prints were indeed made by *Homo erectus*, as scientists believe, then they would constitute the oldest footprints yet found of a creature in the same genus as man. The creature may also have been *Australopithecus africanus* — a creature more indirectly related to human beings — "but the case is stronger for *Homo erectus* because its fossil bones are preserved in

nearby strata, but not the bones of *Australopithecus*," says Anna K. Behrensmeyer, co-leader of the expedition and currently at Yale University.

The footprints were uncovered in a bed of volcanic rock dated at 1.5 million years. The research team, which included co-leader Leo F. LaPorte of the University of California at Santa Cruz (where Behrensmeyer is also affiliated) also found fossil footprints of hippos and heron-like birds in the same area. All the prints were made in mud, which then hardened.

Behrensmeyer says the human-like prints, all made by the same individual, were about 10.5 inches long and 3.5 inches wide. She estimated the person was between 5 and 5.5 feet tall and weighed about 120 pounds. Glynn L. Isaac, project supervisor from UC-Berkeley, characterized the find as "a paleo-anthropological hole-in-one." □

Footprints, believed to have been made by Homo erectus, were found next to larger prints of ancient hippopotamuses along the shore of Lake Turkana in Kenya. Sharp-edged tools, characteristic of those found at other Homo erectus sites, were uncovered in nearby sedimentary beds by the research team, which was funded by the National Science Foundation and was part of a larger project of the National Museum of Kenya. A 600-pound cast of the footprints has been made at the museum in Nairobi.



Wide World Photo

Monkey see, monkey say

Distinguishing among the many varieties of African eagles is difficult for the human eye, but routine for the eyes of vervet monkeys. They give alarm calls only when they sight members of the two eagle species that prey on vervet young. This sophisticated appraisal of the surroundings goes beyond simple instinct, argues Peter Marler of Rockefeller University. He describes work by colleagues Dorothy Cheney and Robert Seyfarth indicating that, as a young vervet monkey matures, it sharpens its perceptions and responses to its environment.

The vervet monkey uses three different alarm calls in response to three classes of

predators, and each call evokes a particular behavior in other monkeys. Tape recordings of the calls, played when no predator is in sight, also trigger the characteristic behavior. A "snake call" for instance, makes the monkeys jump up on their hind legs and scrutinize the grass; an "eagle call" makes them rush for dense cover and a "leopard call" sends them scurrying up into the trees.

The calls of monkeys seem to be symbols for objects, according to a convention understood by other members of the species. Recent experiments in which scientists played recorded calls to monkeys in a laboratory showed that two species of