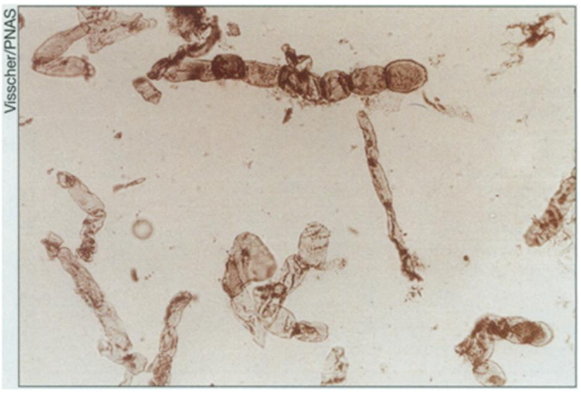
Global Crisis: The Fungi Stand Alone

Life in the oceans had a close call at the end of the Permian period, 250 million years ago, when 90 percent of marine animal species went belly-up for reasons unknown. This mass extinction, the greatest ever recorded, also decimated land animals and eventually cleared the way for the ascension of the dinosaurs. Paleobiologists, however, thought that land plants had held their ground, weathering the late Permian crisis without much loss.

New research reveals that continental vegetation did, in fact, suffer along with the rest of the globe. So many trees died at the Permian's close that fungi inherited the land for a brief geologic span, feeding on the tremendous amount of dead wood covering the planet.

Such is the scenario proposed by paleobotanist Henk Visscher of Utrecht University in the Netherlands and his colleagues, who describe their theory in the March 5 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

"It was really a phenomenal event," says co-author David L. Dilcher, a paleobotanist at the University of Florida in Gainesville. "There was something that killed an awful lot of woody plants because there was a very powerful spike in wood-rotting fungi."



Fungal fossils from the end of the Permian.

Evidence for the massive tree death comes in the form of fossil fungi preserved in sediments dating from the boundary between the Permian and Triassic periods. During most periods, plant pollen and spores outnumber fungal remains in sedimentary rocks. However, research in the Alps and in Israel by Visscher and his colleagues shows that fungi proliferated wildly, nourished by dead wood, at the end of the Permian.

They document a similar feeding frenzy among fungi on at least five continents. Searching through the geologic literature, they found references to simultaneous fungal peaks in Siberia, Australia, India, Asia, and north and east Africa.

The fungal evidence for plant death squares with recent work by Gregory J. Retallack of the University of Oregon in Eugene. Last year, Retallack reported that 97 percent of Permian leaf species in southeastern Australia went extinct at the end of the period.

In the past, paleobotanists had misdated these Australian plant extinctions, placing them earlier than the Permian-Triassic boundary, says Retallack. He claims, however, that the vegetation crisis there coincided with the boundary.

"All of this is pointing to something rather dramatic happening at that time. The big question is what," says Retallack.

The new recognition of plant die-offs and fungal domination should help scientists weed out some of the myriad potential killing scenarios proposed in the past. "It eliminates mechanisms which only operated in the oceans," says paleontologist Douglas H. Erwin of the Smithsonian's National Museum of Natural History in Washington, D.C. For instance, some researchers had suggested that a drop in sea level precipitated the marine extinctions.

Visscher and his colleagues place their bets on a series of massive volcanic eruptions in Siberia, which occurred at nearly the same time as the extinctions. In a million years or less, the Siberian volcano belched out so much molten basalt that it could have paved the entire Earth with a 6-meter-thick layer. Carbon dioxide and acidic gases from that outpouring could have caused extinctions by warming the globe and poisoning the air and water.

Erwin cautions that geologists do not know whether the eruptions occurred at the exact time of the extinctions. In any case, the search for the Permian perpetrators is heating up. — *R. Monastersky*

Allergies to this soy would be nutty

Hoping to improve the nutritional value of a protein supplement for hogs and poultry, agricultural scientists spliced a gene from Brazil nuts into soybeans. The gene codes for production of a protein rich in methionine, an amino acid important for livestock growth but produced in only small quantities by soy.

While the research proved "very promising," notes Tim Martin of Pioneer Hi-Bred International, in West Des Moines, Iowa, his company has just killed plans to develop the new soy. The reason is that a study Pioneer financed shows that the transferred protein is one of the major allergens in Brazil nuts. While posing no risk to livestock, this protein could trigger life-threatening reactions in susceptible people if it ever reached the dinner table.

"We knew that one of the proteins in Brazil nuts was probably allergenic. But we had no idea which," says Steve L. Taylor, of the University of Nebraska at Lincoln. So he tested the protein Pioneer had used against blood from nine people allergic to Brazil nuts.

The protein, extracted directly from nuts, bound like an allergen to antibodies in the blood from eight of the allergic individuals. When taken from transgenic soy, the same protein bound to antibodies in seven of those eight people, Taylor's team reports in the March 14 NEW ENGLAND JOURNAL OF MEDICINE. The group then confirmed the allergenicity of the new soy in skin-prick allergy tests on three volunteers with Brazil nut allergies.

Ironically, while this study was underway, other scientists published animal data suggesting the protein is not a major allergen. Concludes Taylor, "this just emphasizes why we cannot rely exclusively on animal-based tests for these determinations."

Four years ago, the Food and Drug Administration instructed companies that were developing transgenic crops to test their new products for allergenicity if they carry genes from a material, such as nuts, to which many people have allergies. Taylor says his new data now suggest "that the FDA policy was pretty prudent."

That policy is also too limited, perhaps dangerously so, argues Marion Nestle of New York University, in a commentary accompanying the new study. "The real problem," she told SCIENCE NEWS, "is that most of the transgenic work being done in food doesn't involve known allergens. It involves substances that haven't been in the food supply before." And, she notes, FDA doesn't require testing the allergenicity of these.

For now, Martin says Pioneer will look at redirecting its genetic engineering program to boost soy's methionine content with proteins from other cereals and grains already in the food supply. — *J. Raloff*