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# Scientists discuss survival of Darwin's theory

FULLERTON (AP) - The theory of evolution through natural selection is coming under fire again - 60 years after the famous 1925 Scopes Monkey Trial established it in school curricula and public consciousness.

But it wasn't a group of Biblical fundamentalists that attacked Charles Darwin's theory at a conference last weekend - it was a gathering of prominent biologists, physicists, chemists and biochemists from the United States, Canada and Britain.

The conference at California State University at Fullerton was an attempt to resolve gaps between Darwin's mid-19th Century theory and the laws of physics, genetics and mathematics, said organizer and biologist James Dale Smith.

Neo-Darwinists, who refined Darwin's theory in the 1940s, contend that a giraffe, for example, evolved a long neck because it was best suited for foraging among the tall trees of the African plain.

But the new skeptics of the scientific community point out the theory offers no explanation for antelope, deer and other foragers in the same area that did not develop long necks.

The problem, said University of Maryland biologist Eric Schneid-

er, is that physics and mathematics are quantifiable, predictable sciences. But the theory of evolution is not - partly because of the scientific and technological limits of Charles Darwin's time.

"This conference is about connecting life with laws of nature," said biochemist Jeffrey S. Wicken of Behren College at Pennsylvania State University. "We are trying to show that the same laws which govern the physical universe also govern the origin and evolution of

life."

Daniel R. Brooks, a zoologist from the University of British Columbia at Vancouver, and collaborator Edward O. Wiley, of the University of Kansas' Museum of Natural History, presented their theory that evolution is caused more by internal changes than by forces in the external environment.

Schneider disagreed, saying external forces such as the environment do "pick the winner."

# Scientists get whiff of old, old air

New York Times News Service

PHOENIX — Tiny bubbles trapped in amber for 80 million years have given scientists their first direct look at the Earth's atmosphere in the time of the dinosaurs, a mix of gases that appears dramatically different from the air we breathe today.

A preliminary analysis suggests that the ancient atmosphere may have been 50 percent richer in the oxygen that sustains the animal life of the planet. That finding, to be presented here today at the annual meeting of the Geological Society of America, is sure to astonish experts on global climate and the evolution of life. They had assumed that the air then differed little from today's.

Until now, the oldest known samples of air were far younger, the product of a 160,000-year-old core of polar ice that was painstakingly drawn over the last five years from its resting place a mile below the Antarctic surface. But by crushing bits of amber and analyzing the faint breath of gas that escapes, researchers appear to have opened an unexpected new window onto the history of the atmosphere and the creatures it nourished.

As the technique is refined, the researchers, Robert A. Berner of Yale University and Gary P. Landis of the United States Geological Survey in Denver, hope through the study of other amber samples to assemble a detailed picture going back even farther. Microscopic air bubbles are not unusual in amber, the resin from pine trees that has hardened into yellowish translucent lumps. Some amber has been preserved for 200 million to 300 million years.

"It's very exciting," said James C.G. Walker of the University of Michigan, an authority on the development of the Earth's atmosphere and oceans. "I think it's a tremendously promising technique."

The researchers emphasize that their analysis is still tentative, particularly the surprising dis-

covery of excess oxygen. But they believe that they have ruled out every possible alternative and that the amber bubbles reflect the composition of ancient air, folded into resin that oozed from the coniferous trees of the Cretaceous era.

Oxygen now makes up 21 percent of the atmosphere; the rest is mainly nitrogen, with a fraction of a percent of carbon dioxide and traces of many other gases. The Cretaceous amber, found in northern Manitoba, suggests an oxygen content as high as 32 percent. The rest is mainly nitrogen, as in the atmosphere today.

If confirmed, the discovery of an oxygen-rich atmosphere in the planet's past would intrude on the debate over a wide range of problems.

Extra oxygen would have been a great boon to animals trying to develop more efficient versions of the energy-generating chemistry of life. A given species might have been able to get by with smaller lungs, for example, and similar economies might have benefited organisms in many other ways.

A decline in oxygen content, on the other hand, would surely have affected species accustomed to a richer atmosphere. Some scientists speculated today that paleontologists studying the history of evolution may be tempted to look to the new research as a possible influence on the mass extinctions, including that of the dinosaur, that closed the Cretaceous era.

The primordial Earth, before the origin of life, had an atmosphere with no oxygen at all. It took billions of years for early organisms to free the oxygen that was bound to iron oxide and other minerals in the planet's surface.

That increase in oxygen over eons has been the only such trend that scientists have known. A higher oxygen content than today's has seemed unlikely, and some scientists have even argued that a level as high as 30 percent would have set off a global conflagration, vast forest fires burning in the enriched air.

"I can't believe we're living that close to the edge," Walker said. "If you get too much oxygen in the air, the world would become highly flammable, but I think the threshold is probably higher."

Oxygen continuously enters and leaves the atmosphere and oceans through a host of chemical and biological processes. Scientists have only recently begun to appreciate the complexity of this cycle of enrichment and depletion, and the role of living creatures in helping to regulate the atmosphere's content.

Geologists have had to deduce the composition of the atmosphere from chemical clues buried in the earth, like layers of decayed organic material. Berner, acting on a suggestion by Edwin Roedder of the U.S. Geological Survey, decided to test amber, known mainly as a preserver of intact insects.

Bubbles in amber range from the size of a pinhead to a diameter of 10 microns, far too small to see with the naked eye. A 10-micron bubble contains barely a billion molecules of gas.

Besides the amber from Canada, the researchers have analyzed 25 million-year-old Dominican amber and 40 million-year-old Baltic amber. As a check on their technique, they have also tested modern resin from New Zealand. Unlike the oldest samples, the Dominican and Baltic ambers appear to match the composition of the modern atmosphere, although those results, too, are preliminary.

Many of the samples, both modern and ancient, share a peculiarity, a huge excess of carbon dioxide. Berner believes that some process of breathing, either plant or animal, replaces molecules of oxygen one for one by molecules of carbon dioxide.

The result is that the actual levels of oxygen and carbon dioxide vary unpredictably from sample to sample, but the total of the two gases remains constant.

# Dinosaur theory may face extinction

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## Fossils found in Alaska 26 years ago raise questions

From News Services

WASHINGTON — What were believed to be bones of mammoths found in Alaska 26 years ago have turned out to be dinosaur fossils, raising new questions about a theory that says dinosaurs were wiped out when an asteroid smashed into Earth 65 million years ago.

Geologist Elizabeth Brouwers of the U.S. Geological Survey in Denver said in a report released yesterday that these are the first remains of dinosaurs found so far north — where there is winter darkness for weeks or months at a time.

The increasingly accepted asteroid theory suggests that a globe-girdling cloud of dust and smoke from a catastrophic collision blacked out the sun

for weeks or months, lowering temperatures and killing the vegetation that fed the giant reptiles.

"Our point here is that darkness and cold alone can't explain the extinction of dinosaurs because here we've got large numbers of dinosaurs living under fairly cold and, in the wintertime, dark conditions," she said in a telephone interview.

Brouwers said scientists have found strong evidence that the Arctic dinosaurs were not migratory but lived in the region. And while the arctic weather was milder then, scientists reason that some dinosaur species must have been able to survive long periods of darkness, very cold temperatures, and sparse food supplies.

"I don't think it rules out the meteorite idea," said Brouwers. "It certainly lessens the idea that cold and dark wiped out the dinosaurs. If that were the only effect, then it simply didn't do it. If there were other effects from the meteorite, such as wiping out the ozone layer or another catastrophe, then that may have caused the extinction."

The analysis of the fossils, collected this summer, was reported in the current issue of the journal *Science* by a group led by Brouwers and William A. Clemens, of the University of California at Berkeley.

The dinosaur bones were first found in 1961 in sediments along

See Dinosaurs on Page A-18

Continued from A-1

Alaska's North Slope by an oil company geologist who believed they were fossils of mammoths, the now-extinct, elephant-like creatures known to live in cold climates, Brouwers said. The fossils were stored in a warehouse until 1984, when they were sent to USGS geologists in Denver who were studying fossils from the North Slope.

It then was recognized that the fossils were actually those of dinosaurs that lived 66 million to 76 million years ago, at the end of the Cretaceous period. All dinosaurs are believed to have become extinct 65 million years ago, at the boundary of the Cretaceous and Tertiary periods.

Once they realized the Alaskan fossils were from dinosaurs, Brouwers and associates located the site — near the Colville River on the North Slope — where they were found and collected more fossils. She said 95 percent represent hadrosaurs, duck-billed creatures that ate plants and grew as big as 30 feet long. The others are from carnivorous dinosaurs.

The scientists estimate these dinosaurs lived as much as 1,000 miles farther north than the fossil record previously indicated dinosaurs had lived. And, Brouwers said, magnetic

data indicate that the land that now makes up the North Slope of Alaska was once farther north.

The primary clue that they were not migratory, scientists said, was the presence of many bones of young animals. Clemens, a paleontologist, said in a telephone interview that it was unlikely that young animals could have kept up with an adult group migrating many hundreds of miles from a southern region.

"If the North Slope dinosaurs were not migratory," the scientists wrote, their occurrence at high northern latitudes "provides direct evidence of the ability of some species to tolerate up to several months of darkness and to cope with cold air temperatures. Thus, some of the proposed effects of impacts of an asteroid or comets, increased volcanism, or related hypotheses may not have been the direct cause of the demise of the dinosaurs."

An examination of pollen and plant fossils in the same sediments showed that the environment was relatively mild, although frosts probably occurred in the Arctic's winter darkness. The area was a river delta with a predominance of deciduous forests.

The absence of plentiful evergreen

vegetation, the scientists said, "would result in an annual period of stress for herbivorous hadrosaurids, during which they had to cope with a greatly reduced food supply." They said the dinosaurs might have survived the cold period of darkness through a kind of semi-hibernation.

Clemens said further explorations near the Colville River would emphasize "general prospecting" for fossils of animals that were the dinosaurs' contemporaries. Finding remains of turtles, crocodiles or other reptiles of the period would help establish that the dinosaurs were not migratory, he said. Such remains are usually found in permanent dinosaur habitats.

The theory that a large object crashed into the Earth to destroy the dinosaurs was advanced in 1979 by Luis W. Alvarez, a Nobel Prize-winning physicist, and his son Walter, a geologist. Both are affiliated with the University of California, at Berkeley.

Support for the theory is strong among geologists who keep finding possibly extraterrestrial chemical clues in 65-million-year-old sediments around the world. But paleontologists, while agreeing that the impact may have occurred, have been skeptical about linking the disaster and the dinosaur extinctions.

# Geologist says earth eruptions triggered demise of dinosaurs

United Press International

WASHINGTON — The mass extinction of dinosaurs 65 million years ago was the consequence of disturbances triggered deep within the earth rather than asteroids crashing into Earth, a geologist said.

Anthony Hallam, a professor of geology at the University of Birmingham in England, summarized in an article in the journal *Science* a number of pieces of evidence that he believes are inconsistent with the "impact hypothesis."

The popular hypothesis holds that widespread extinction of species of dinosaurs, plants, microscopic sea life and other creatures was the result of the impact of asteroids striking the earth, or the fires, global dust cloud and climate change that resulted from the disaster.

Hallam called the impact hypothesis a "brilliant success" for stimulating "an immense amount of fruitful research" since it was proposed in 1980 by Luis W. Alvarez, his son, Walter Alvarez, and other geologists at the University of California, Berkeley.

However, Hallam said that when the impact hypothesis is judged by

scientific criteria, "there exist legitimate grounds for doubt that it will survive even in a modified form."

Hallam said the absence of a big enough crater on earth undermines the impact hypothesis, and he added that some species extinctions were too gradual or too selective to have been caused by a global dust cloud.

He acknowledges a massive sudden extinction of species of plankton, or microscopic ocean animals and algae, but believes this was caused by acid rain and a sudden change in the chemistry of the ocean.

The acid rain was just one consequence of the disturbance that Hallam believes caused the massive extinctions on earth that occurred at the end of the Cretaceous period.

Citing magnetic evidence of disturbances at the base of the mantle of Earth, Hallam proposes that thermal forces drove "mantle plumes" of heat and molten rock upward toward the surface, causing volcanoes on a scale that has never been recorded in historic time.

He said the mantle plumes may also have boosted the tectonic plates on which the continents ride, causing sea levels to drop.

"Sea-level fall would ... have caused seasonal extremes of temperature on the continents to increase, thereby increasing environmental stress on the dinosaurs," Hallam wrote.

The massive volcanoes would have caused acid rain, global atmospheric cooling and ozone layer depletion, Hallam said, and could explain the varied extinction patterns and the distinctive chemistry of the layer of earth laid down in many parts of the globe during the period.

Michael Rampino, a geologist at New York University, said Hallam's hypothesis was "not a new idea" but just the latest volley in what has been an ongoing battle between "two camps — the volcano people and the impact people."

"I don't think this is going to convince the impact people that volcanism did in the dinosaurs," Rampino said in a telephone interview.