

Schemes to Save Planet Earth Belittled

(2-10-91)

Geophysicists skeptical about large-scale engineering plans for preserving the ozone

By Charles Petit

Chronicle Science Writer

Scientists at an international meeting in San Francisco gave failing grades yesterday to a host of daring, planetary-scale environmental engineering schemes to save Earth from mankind.

F. Sherwood Rowland, an atmospheric chemist at the University of California at Irvine and one of the first scientists to sound warnings about ozone layer deterioration, described a Russian proposal last week to restore the ozone layer by firing cannon shells full of chemicals 50 miles into the stratosphere.

With a skeptical shake of his head, Rowland said, "Some of these ideas just slide right off the scale into science fiction."

Rowland appeared on a panel at the annual meeting of the American Geophysical Union, which for the past three decades has been pondering worldwide climate change. The scientists are especially concerned with the "greenhouse effect," the several-degree rise in world temperature resulting from growing concentrations of heat-trapping carbon dioxide and other gases.

Richard Turco, a UCLA researcher and an organizer of the

session, said that the number of grandiose ideas to block such environmental damage is growing.

"What we have seen is that some of these suggestions have not been well thought out, or were incompetent or were even fairly silly," said Turco, who was prominent in the early 1980s among scientists warning that the smoke of burning cities hit by atomic bombs could trigger a "nuclear winter."

Preventing Damage

Some proposals to prevent or diminish damage resulting from the depleted ozone layer include:

- **Lofting millions of small balloons** into the stratosphere to reflect sunlight back into space.

- **Dumping thousands of tons of tiny droplets of carbonyl sulfide** into the stratosphere worldwide to reflect sunlight.

- **Putting giant parasols in space**, each covering hundreds of square miles, to partially shade the planet.

- **Pouring 2 million tons of iron compounds** into the Antarctic Ocean to cause a huge growth of plankton in the nutrient-rich but iron-poor waters there. The biological frenzy, some calculations suggest, might deplete carbon dioxide from the ocean which would, in

turn, soak up some of the excess from the atmosphere.

Restorative Measures

Ideas to restore the ozone layer include:

- **Pumping ozone from near the ground**, where it forms smog and is a health threat, into the stratosphere where it is needed to shield the Earth's surface from ultraviolet radiation.

- **Using a fleet of high-flying jets to dump 50,000 tons of propane** into the stratosphere over Antarctica every year to soak up the pollutants that are attacking the ozone layer.

Although the scientists on the panel said that none of these ideas seems to hold up to close scrutiny, they all agreed that humanity is showing an ability to change the climate, but in unpredictable ways.

"The epoch of natural climate has already ended," said James Hansen, of NASA's Goddard Institute for Space Studies in New York, and prominent among researchers who think that an increase in volume of gases caused by the greenhouse effect already are warming the earth. "We are changing it," he said, "but we don't know how to control it."

Hansen said that decreasing the amount of emissions of carbon dioxide and ozone-attacking chemicals is the only sensible course to take.

Tinkering Dividends

Panelists said big ideas for deliberate tinkering with climate may pay real scientific dividends, even if no shortcut to saving the planet is found.

Jorge Sarmiento of Princeton University described small-scale tests planned for mid-1993 in the Pacific Ocean. The experiments are inspired by a hypothesis put forth by John Martin, an oceanographer at Moss Landing Marine Station near Santa Cruz. Martin theorizes that an increase in iron fertilization in the Antarctic Ocean could reduce the amount of carbon dioxide escaping to the atmosphere.

Martin, reached by telephone yesterday, said that his notion that iron could blunt the greenhouse effect has fared poorly so far. "I put it out there to get kicked around, and mostly it got kicked apart," he said. The forthcoming tests, however, could reveal how natural processes in the ocean work.

How Dinosaurs May Have Helped Make Earth Warmer

Associated Press

10-23-91

Los Angeles

Fossilized dinosaur dung contains evidence that flatulence from the giant creatures may have helped warm the Earth's climate millions of years ago, scientists said yesterday.

The researchers detected chemical signs of bacteria and algae in known and suspected dinosaur droppings. That indicates that plant-eating dinosaurs digested their food by fermenting it, a process that gives off methane.

Methane is a "greenhouse gas," like the carbon dioxide exhaled by all animals and emitted by smokestacks. Such gases trap solar heat in the atmosphere, warming the planet just as glass traps heat inside a greenhouse.

"It appears plant-eating dinosaurs may have utilized fermentation to aid their digestion," said Indiana University geochemist Simon Brassell, a co-author of the

dinosaur dung yesterday during the Geological Society of America's annual meeting in San Diego.

He said that if scientists eventually prove that dinosaurs contributed to an ancient greenhouse effect, it would support the theory that modern global warming is aggravated by methane belched up by cattle, sheep and other livestock that ferment their food.

Researchers at Washington State University are conducting a three-year study for the U.S. Environmental Protection Agency to determine how much methane enters the atmosphere when cows belch.

Brassell said the study does not imply that gas from dinosaurs was the initial cause or the major contributor to global warming during the Cretaceous period. Extensive volcanic eruptions and other factors that increased atmospheric carbon dioxide levels are believed to be major factors.

But the study suggests that gas from dinosaurs helped maintain or warm the existing tropical climate during the late Cretaceous period, when flowering plants and plant-eating dinosaurs proliferated, said Karen Chin, the study's chief author and a geologist at the University of California at Santa Barbara.

Others were more skeptical.

"I wonder whether or not there were enough dinosaurs to make that substantial a contribution to atmospheric chemistry," said Eric J. Barron, a Penn State climatologist.

The study involved fossils collected in north-central Montana by Chin and the study's third author, Robert Harmon of Montana's Museum of the Rockies.

The fossils contained stems, other plant fragments and organic chemicals indicating bacteria and algae.

He said more fossils are needed for studies meant to prove conclusively that the bacteria were used in fermenting food, rather than being ingested on food or growing on droppings after they were excreted.

Fossilized dung shows signs of a digestive process that would have produced methane

study. "The methane produced could have contributed to ancient climate warming."

Other scientists said the new study provides evidence that herbivorous dinosaurs fermented their food and added methane to the atmosphere, but they questioned whether it had significant impact on global warming.

"It's conceivable that methane from dinosaurs was a minor contributor to the greenhouse effect in the Cretaceous (period)," which lasted from 144 million to 65 million years ago, said Pennsylvania State University geochemist Michael Arthur. He called the research a "delightful study."

Brassell presented the study of 75 million- to 80 million-year-old

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