Coal and Climate: A Yellow Light on CO_2

A National Academy of Sciences committee has concluded that of the three by-products of energy production and consumption—particulate matter, heat and gases—the warming due to the greenhouse effect from carbon dioxide produced by burning fossil fuels poses by far the greatest threat to global climate. In fact, the effect is so potentially serious that it concludes, "The climatic effects of carbon-dioxide release may be the primary limiting factor on energy production from fossil fuels over the next few centuries."

Or as Roger Revelle, chairman of the Panel on Energy and Climate, puts it, for the next 20 or 30 years it will be all right to use coal—as long as we don't get committed to it. "But we will have to be prepared to go to other sources of energy than coal within a finite time, about 50 years .... We will have to kick the fossil fuel habit by 2050."

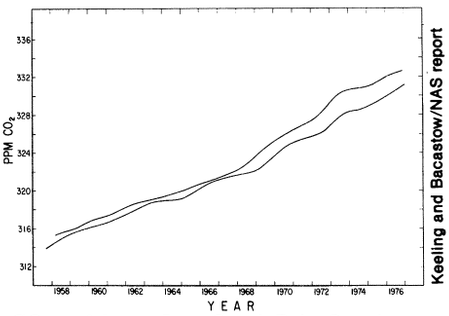
In the meantime, an extensive worldwide program of research is recommended to try to resolve the "profound uncertainties" regarding carbon dioxide and the atmosphere-ocean-biosphere system, plus climate, future population changes, and energy demands, and expected effects on food production.

The two-and-a-half-year Academy study involved not only climatologists and energy specialists on the panel but also a group of prominent geophysicists on the parent Geophysics Study Committee, co-chaired by Philip H. Abelson and Thomas F. Malone. Until now, statements of concern about carbon dioxide and climate have mainly come from individual scientists, such as Columbia University geochemist Wallace S. Broecker (SN: 6/4/77, p. 356). Now for the first time a major scientific body has expressed strong concern. According to the study leaders, the federal agencies involved with climate and with energy policy have shown serious interest in the report's implications.

Panel scientists at first thought that the direct production of heat and of particles from the generation of energy might represent the greatest impact of energy production on climate on a global scale. They soon found that these effects were dwarfed by the potential heating effect due to carbon dioxide.

Somewhat less than half of the carbon dioxide released by man since the industrial revolution has remained in the atmosphere. Since that time about a 13 percent rise in atmospheric concentration of CO_2 has taken place, including a 5 percent rise in the last 15 years, as measured at Mauna Loa in Hawaii and at the South Pole.

If present energy trends continue upward and fossil fuels continue to supply the bulk of the energy, the panel finds



CO_2 at Mauna Loa, South Pole: Steady rise.

that by the middle of the next century CO_2 in the atmosphere will have doubled over preindustrial levels and by A.D. 2150 to A.D. 2200 it might be four to eight times the preindustrial level. Climatic modeling by Syukuro Manabe and Richard Wetherald—though admittedly imperfect—indicates a 3°C (5°F) rise in the average temperature of the lower atmosphere at middle latitudes for each doubling of the CO_2 level. Thus the panel concludes: "The mean increase in carbon dioxide anticipated for A.D. 2150 to A.D. 2200 might lead to an increase in global mean air temperature of more than 6°C (11°F)—comparable with the difference in temperature between the present and the warm Mesozoic climate of 70 million to 100 million years ago."

Such a warming would obviously have vast effects on ocean waters, polar caps, agriculture, plant photosynthesis, agri-climate zones and life in arid and semi-arid regions, where most people live. Some of the repercussions would clearly be deleterious, some possibly beneficial. But the world would have to change.

Examples: Warmer ocean water would form a "lid" on the ocean, reducing vertical mixing and lessening the upwelling of nutrients to the surface, thus cutting the productivity of marine plants. Marine ecosystems including fish populations would shift poleward. Sea levels would rise 1 meter due merely to thermal expansion of the water volume. The area of sea ice would be reduced, probably so much that both the Northwest and Northeast passages would be open to ships through most of the year. The Greenland and Antarctic ice caps would still remain below the freezing point, but the climate changes could nevertheless possibly lead to destruction of the West Antarctic ice cap (causing a rise in sea level of about 5 meters over 300 years).

Consequences for agriculture would be far reaching. The cornbelt might have to be shifted considerably northward, from Iowa and Indiana well into central Canada, where the soil is poor. Average annual precipitation would rise globally, but all this benefit might be lost through increased evapotranspiration from crops. The main effects would be shifts in the locations of crop-growing zones plus greater variability in weather, with all the problems that causes for agriculture.

Plant photosynthesis would increase. Revelle is optimistic that this could be a major benefit ("plants love carbon dioxide"). In fact he tends to be optimistic about turning these changes to advantages generally ("it's nice to be warm"). Other panelists, however, place emphasis on the uncertainties and the disruption to society of such widespread change. Clearly, much more needs to be known. The study recommends creation of a government Climate Council. Revelle guesses that a U.S. research program of $20 million to $100 million a year for the next 50 years will be necessary. As for the current administration emphasis on coal as the energy hope of the near future, Malone says: "The report should be treated as a flashing yellow light to the administration policy." □

At sea: 'Plesiosaur' merely a rotten whale?

What has four flippers, weighs two tons, is 44 feet long and was netted by Japanese fishermen near New Zealand? Japanese scientists say it's a descendent of an ancient reptile; American biologists guess it's only a small whale. Neither group will be able to substantiate their opinions; the only specimen was dropped back into the brine.

The dead animal, caught in fishing nets, was hoisted to the sea surface from a depth of about 1,000 feet. The stench was overpowering, the fishermen report, and they feared the oozing fatty liquids would spoil their cargo of fish. However, crewmen measured the animal and took several photographs before it was dumped. They also kept a sample of tissue.

Professor Yoshinori Imaizumi, director of animal research at the Japanese National Science Museum, examined the photographs and a drawing. "It's a reptile and the sketch looks like a plesiosaurus," he was quoted in the Washington Post. "It has to be a plesiosaurus," Tokio Shikama, a Yokohama National University "scholar of ancient animals" said in a United Press International report. Plesiosaurs are marine reptiles that flourished more than 100 million years ago.

American marine biologists scoff at the identification of a modern sea monster, calling it flotsam and jetsam, nonsense and mass hysteria. Carl Hubbs of the Scripps Institution of Oceanography in La Jolla told SCIENCE NEWS, "I

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