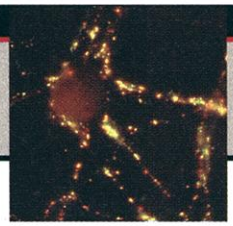

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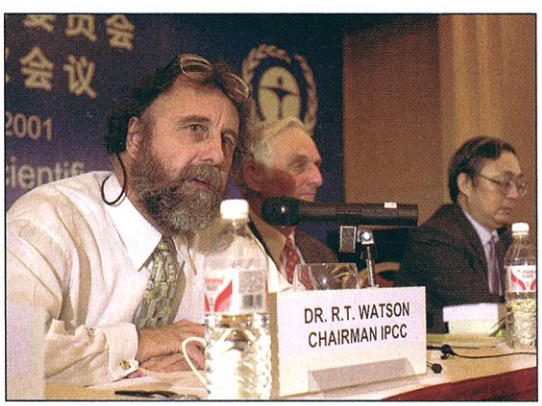
CLIMATE CHANGE

It's Official: Humans Are Behind Most of Global Warming

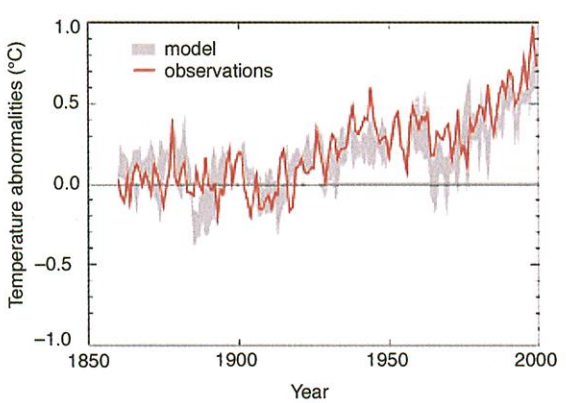
Expert opinion just got much more certain that humans are driving the planetary fever of recent decades. Eschewing its vagueness of 5 years earlier about glimpsing "a discernible human influence on global climate," the United Nations–sponsored Intergovernmental Panel on Climate Change (IPCC) officially declared early this week that "most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations." Not the sun, not natural climate fluctuations, not some bug in a computer model, but carbon dioxide and other heat-trapping gases that humans are pumping into the atmosphere. The panel—whose report represents the consensus of hundreds of participating scientists and was just approved by 100 participating governments in Shanghai—was vaguer than ever, though, about how bad things could get by the end of the century. At a minimum, the world will warm more than twice as much in the coming century as it did in the past one, the panel concluded, but it could warm 10 times as much.



Mixed progress. IPCC chair Robert Watson reports a human cause but uncertain outcome for global warming.

The warming outlook is founded on the improved scientific understanding since the last IPCC report in 1995. "There have been substantial increases in insight over the past decade," says atmospheric scientist and U.S. IPCC delegate Daniel Albritton of the National Oceanic and Atmospheric Administration in Boulder, Colorado. "I found it pretty impressive." Computer models now do a better job at calculating how much of past warming might be due to natural climate fluctuation and how much warming there might be in the future. Albritton and others are particularly impressed with the millennium-long temperature records extracted from tree rings and other climate proxies. With this long perspective, the Northern Hemisphere warming of the 20th century "is likely to have been the largest of any century during the past 1000 years," the report finds, and "is unlikely to be entirely natural in origin."

While uncertainties have narrowed about what's causing the warming, projecting it into the future seems more uncertain than ever. In the 1995 report, researchers combined projections of how much greenhouse gas humanity might produce with model estimates of climate sensitivity—that is, how much various increases in greenhouse gases should warm the climate. The range of possible warming by 2100 ran from 1.0°C to a hefty 3.5°C in 1995.



The greenhouse did it. A model with rising greenhouse gases and minor solar and volcanic effects simulates global warming.

In the new report, the projected range of warming starts from a still modest 1.4°C but rises to a staggering 5.8°C. While estimates of climate sensitivity haven't changed much, projections of possible global pollution levels in 2100 have. In this go-round, IPCC members considered scenarios in which countries drastically cut emissions of sulfurous pollution, which forms a cooling haze over large parts of the world. Without a protective umbrella, the greenhouse would sizzle.

Although only the upper end of a range of possibilities, the 5.8°C number is prompting headlines proclaiming seemingly inevitable climate disaster. Albritton views the broadened range of possibilities as a recognition of the obvious. "You can't forecast what technology or the human race is going to do 100 years from now," he notes. This socioeconomic uncertainty is currently as large as the uncertainty still inherent in climate models, the report notes.

Negotiators at last November's climate talks at The Hague (*Science*, 1 December 2000, p. 1663) were aware of the gist of the IPCC report—drafts of which were widely leaked last year—but negotiations on reining in greenhouse gases broke down anyway. Many problems remain to be taken up again when talks reconvene in May in Berlin, but a looming obstacle is the stance, which has yet to be spelled out, of President Bush and his Administration. Atmospheric physicist Michael Oppenheimer of Environmental Defense in New York City thinks the report could make a difference. It shows that "there's been a climate change, and there are going to be bigger changes in the future," he says. "It's hard to see how the new Administration could fail to take it seriously."

–RICHARD A. KERR

QUANTUM OPTICS

Atomic Squeeze Play Stops Light Cold

Last year, physicists made headlines by slowing light down to the speed of a leisurely bicycle ride. Now, pushing the experiment to its logical conclusion, they have slammed on the brakes. In papers in *Physical Review Letters* and *Nature*, scientists report that they have used atomic gases to grab light pulses, squeeze them into a smaller space, imprint them on atoms, and read them out again after a delay. The researchers speculate that such sleight-of-light tricks might

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