

1958: The Coming ICE AGE

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The Coming Ice Age

When Will the Glaciers
Reach America?

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Better Public Servants**
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SCIENCE

The Cooling World

There are ominous signs that the earth's weather patterns have begun to change dramatically and that these changes may portend a drastic decline in food production—with serious political implications for just about every nation on earth. The drop in food output could begin quite soon, perhaps only ten years from now. The regions destined to feel its impact are the great wheat-producing lands of Canada and the U.S.S.R. in the north, along with a number of marginally self-sufficient tropical areas—parts of India, Pakistan, Bangladesh, Indochina and Indonesia—where the growing season is dependent upon the rains brought by the monsoon.

The evidence in support of these predictions has now begun to accumulate so massively that meteorologists are hard-

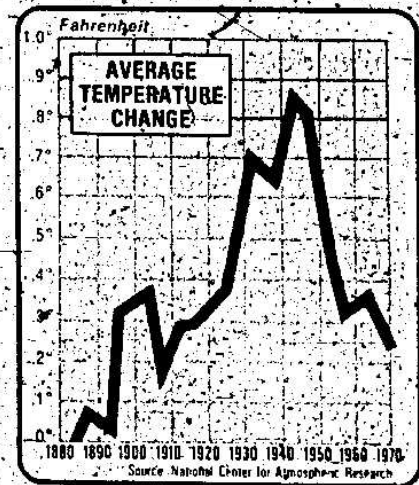
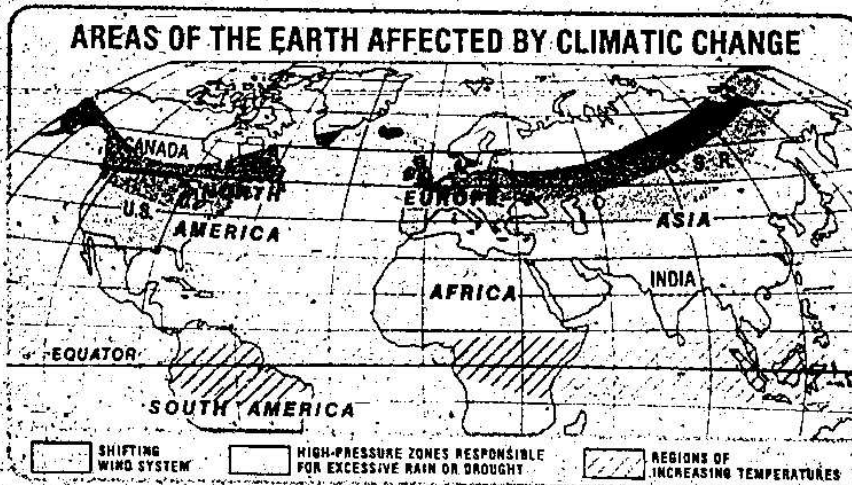
ly to reduce agricultural productivity for the rest of the century. If the climatic change is as profound as some of the pessimists fear, the resulting famines could be catastrophic. "A major climatic change would force economic and social adjustments on a worldwide scale," warns a recent report by the National Academy of Sciences, "because the global patterns of food production and population that have evolved are implicitly dependent on the climate of the present century."

A survey completed last year by Dr. Murray Mitchell of the National Oceanic and Atmospheric Administration reveals a drop of half a degree in average ground temperatures in the Northern Hemisphere between 1945 and 1968. According to George Kukla of Columbia University, satellite photos indicated a sudden, large increase in Northern Hemisphere snow cover in the winter of 1971-72. And

the change is at least as fragmentary as our data," concedes the National Academy of Sciences' report. "Not only are the basic scientific questions largely unanswered, but in many cases we do not yet know enough to pose the key questions."

Extremes: Meteorologists think that they can forecast the short-term results of the return to the norm of the last century. They begin by noting the slight drop in over-all temperature that produces large numbers of pressure centers in the upper atmosphere. These break up the smooth flow of westerly winds over temperate areas. The stagnant air produced in this way causes an increase in extremes of local weather such as droughts, floods, extended dry spells, long freezes, delayed monsoons and even local temperature increases—all of which have a direct impact on food supplies.

"The world's food-producing system," warns Dr. James D. M. Quigg of NOAA's Center for Climatic and Environmental Assessment, "is much more sensitive to



pressed to keep up with it. In England, farmers have seen their growing season decline by about two weeks since 1950, with a resultant over-all loss in grain production estimated at up to 100,000 tons annually. During the same time, the average temperature around the equator has risen by a fraction of a degree—a fraction that in some areas can mean drought and desolation. Last April, in the most devastating outbreak of tornadoes ever recorded, 148 twisters killed more than 300 people and caused half a billion dollars' worth of damage in thirteen U.S. states.

Trend: To scientists, these seemingly disparate incidents represent the advance signs of fundamental changes in the world's weather. The central fact is that after three quarters of a century of extraordinarily mild conditions, the earth's climate seems to be cooling down. Meteorologists disagree about the cause and extent of the cooling trend, as well as the very specific impact on local weather conditions. But they are almost unanimous in their view that the trend will

study released last month by two NOAA scientists notes that the amount of sunshine reaching the ground in the continental U.S. diminished by 1.3 per cent between 1964 and 1972.

To the layman, the relatively small changes in temperature and sunshine can be highly misleading. Reid Bryson of the University of Wisconsin points out that the earth's average temperature during the great Ice Ages was only about 7 degrees lower than during its warmest eras—and that the present decline has taken the planet about a sixth of the way toward the Ice Age average. Others regard the cooling as a reversion to the "little ice age" conditions that brought bitter winters to much of Europe and northern America between 1600 and 1900—years when the Thames used to freeze so solidly that Londoners roasted oxen on the ice and when iceboats sailed the Hudson River almost as far south as New York City.

Just what causes the onset of major and minor ice ages remains a mystery. "Our knowledge of the mechanisms of climat-

the weather variable than it was even five years ago." Furthermore, the growth of world population and creation of new national boundaries make it impossible for starving peoples to migrate from their devastated fields, as they did during past famines.

Climatologists are pessimistic that political leaders will take any positive action to compensate for the climatic change, or even to allay its effects. They concede that some of the more spectacular solutions proposed, such as melting the arctic ice cap by covering it with black soot or diverting arctic rivers, might create problems far greater than those they solve. But the scientists see few signs that government leaders anywhere are even prepared to take the simple measures of stockpiling food or of introducing the variables of climatic uncertainty into economic projections of future food supplies. The longer the planners delay, the more difficult will they find it to cope with climatic change once the results become grim reality.

PETER COVAGE and DONALD ROBERTS

One Environmentalist:

“. . . offer up scary scenarios. . . Make little mention of any doubts. . .”



sented no grave, immediate danger to the ozone layer. However, our wish for certainty—for solid factual ground beneath our feet—places the scientists in a quandary. We are asking them to do something that in their profession is normally considered mildly disreputable: we are asking them to make predictions based on little information. Worse, we are asking them to make predictions about that notoriously unpredictable matter, the weather—and to do so regarding the weather not just of, say, Michigan over the next three days but of Earth over the next century.

Stephen Schneider of the National Center for Atmospheric Research described the scientists' dilemma this way: "On the one hand, as scientists, we are ethically bound to the scientific method, in effect promising to tell the truth, the whole truth, and nothing but—which means that we must include all the doubts, the caveats, the ifs, ands, and buts. On the other hand, we are not just scientists but human beings as well. And like most people we'd like to see

the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climatic change. To do that we need to get some broad-based support, to capture the public's imagination. That, of course, entails getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of any doubts we might have. This 'double ethical bind' we frequently find ourselves in cannot be solved by any formula. Each of us has to decide what the right balance is between being effective and being honest. I hope that means being both."

The caveats, ifs, ands, and buts are extensive. To begin with, the magnitude of the various perturbations (to use the scientists' delicate word) of the environment are difficult to predict. And estimates of even the immediate effects of those perturbations are unreliable. Still harder to predict are the ground-level consequences of these effects—for example, the number of feet by which sea level will rise given a particular rise in the temperature of the globe, or the effects on phytoplankton of a particular increase in ultraviolet radiation caused by a particular reduction in the ozone

layer. Harder yet to predict—lying, really, entirely in the realm of speculation—are the synergistic consequences of all or some of these effects. And lying completely beyond prediction are any effects that have not yet been anticipated.

For all these reasons, the margin for error is immense. And that, of course, is the real lesson to be learned from the world's earlier attempts at predicting global perils. What the mistakes show is that in these questions even the most disinterested and professional predictions are filled with uncertainty. Uncertainty in such forecasts is not a detail, soon to be cleared up; it is part and parcel of the new situation—as inextricably bound up with it as mounting levels of carbon dioxide or declining levels of ozone. For the scientists' difficulties do not stem merely from some imperfections in their instruments or a few distortions in their computer models; they stem from the fundamental fact that at this particular moment in history mankind has gained the power to intervene in drastic and fateful ways in a mechanism—the ecosystem—whose overall structure and workings we have barely begun to grasp.

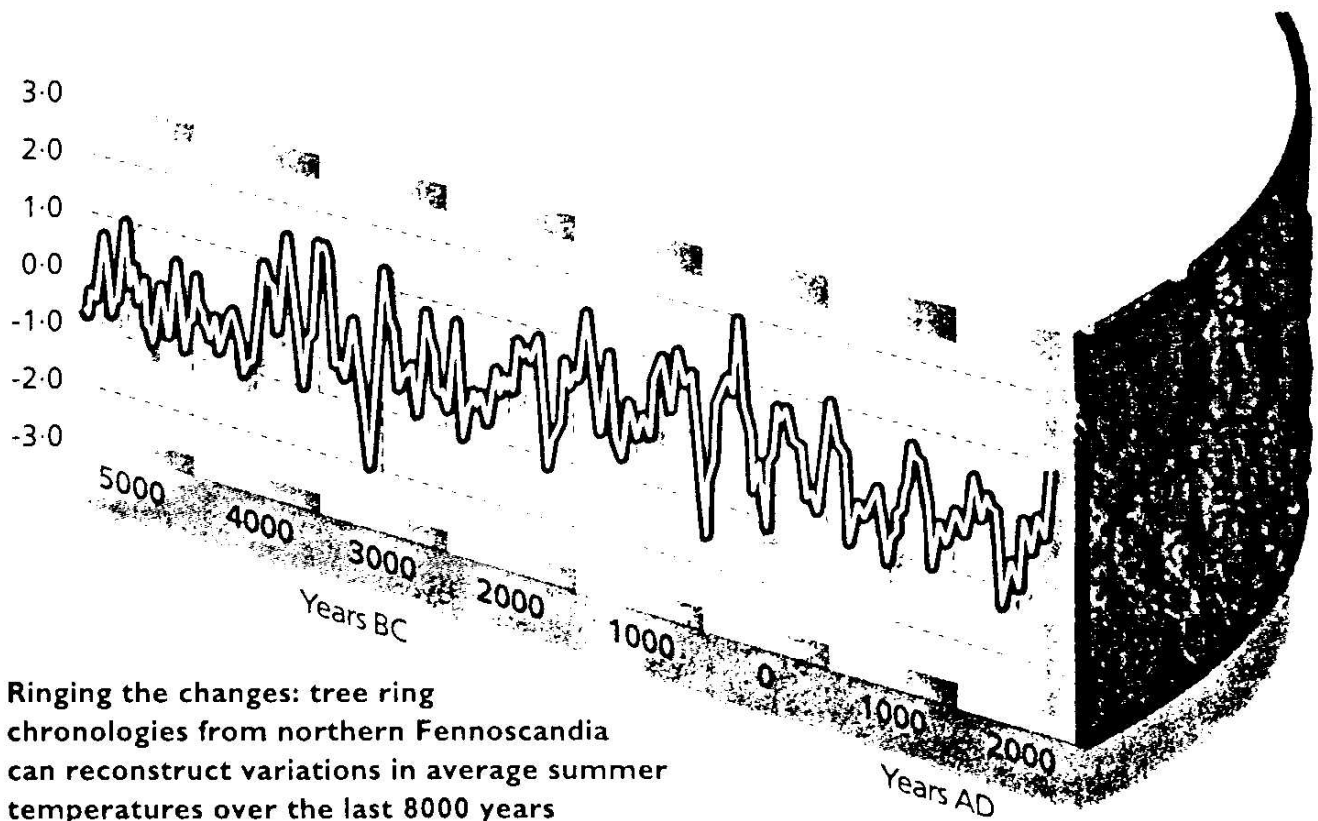
Here human power has outrun human knowledge. The stream of history, once contained within the natural world, has now overflowed its banks and threatens to inundate both nature and itself. If the stories of melting glaciers and drowned cities seem out of place in our newspapers, that is because we are now called on to decide in a few years questions that until now were decided over eons by the rise and fall of mountain ranges, by rain, by wind, by the patient winnowing of natural selection, by continental drift. In several decades we threaten casually to alter the conditions of life on Earth in dramatic and possibly irreparable ways. We have placed ourselves in the driver's seat of evolution and are now the guarantors of the survival of all species, including our own.

Last April a candidate for president in Brazil advocated a reduction in international debt payments as the price for saving his country's rain forests, whose rapid destruction is contributing heavily to the buildup of carbon dioxide in the atmosphere. Such demands are sure to be the stock-in-trade of international

New Scientist, December 14, 1996

Notice:

1. The extreme variability of temperature
 2. Today is cooler than earlier times (in that region)
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Ringing the changes: tree ring chronologies from northern Fennoscandia can reconstruct variations in average summer temperatures over the last 8000 years

14 December 1996