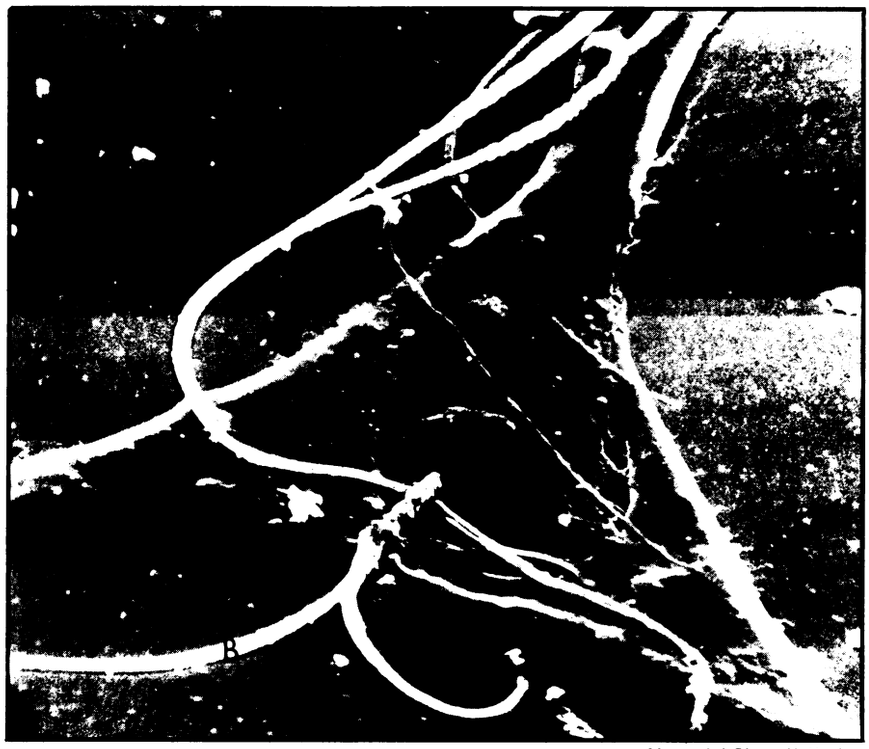


Memorial Sloan-Kettering

Tails of mouse sperm stick out of hamster cells after their heads have entered.

SPERM FERTILIZE NONEGG CELLS

Sperm normally fertilize egg cells, but biochemists at the Memorial Sloan-Kettering Cancer Center in New York City have managed to unite sperm with mature body cells rather than with egg cells and apparently transfer the sperm's genetic information to the cells. The technique, reported in the March 1 SCIENCE, should open new approaches in cancer research and in repairing genetic disease at the cellular level.

In recent years investigators have managed to fuse pretreated rabbit sperm with body cells. But Sloan-Kettering's Aaron Bendich, Ellen Borenfreund and Stephen S. Sternberg managed to get live sperm to propel themselves into somatic cells. The sperm were from the mouse, the cells from the hamster. Using the scanning electron microscope, they could see that the sperm had deeply penetrated the cells, most of their tails, still attached, remained outside the cells. To trace the passage of sperm genes (DNA) into the nuclei of the cells, the New York biochemists had prelabeled the sperm with radioactive tags. Three days after the sperm had been cultured with the cells, radioactivity showed up in two to 10 percent of the cells' nuclei. Although this radioactivity was not widespread, the researchers interpreted it as encouraging since their previous experiments had shown that DNA rarely survives uptake by body cells.

As the cells multiplied, the researchers carefully scrutinized them to see whether there had been a functional transfer of genetic information by the sperm. By using immunofluorescence tests, they found that some of the cells expressed what appeared to be gene products of mouse sperm—antigens (proteins) normally found in the mouse fetus. Proof that mouse sperm actually produced gene products in the hamster body cells, however, will depend on the isolation and identification of the presumed gene products.

Meanwhile the scientists are using the technique to probe the role of fetal antigens in the cancer process. Such antigens pop up in cancer cells, but not in healthy, mature body cells. So the scientists are now studying the hamster cells that appear to express mouse fetal antigens and see whether the cells become cancerous.

Uniting sperm with mature body cells also holds potential for treating genetic diseases, the Sloan-Kettering biochemists believe. "There must be more than 600 well-established genetic diseases, many of them characterized by the absence of normal genes," says Bendich. "I think it should be possible to correct some of these deficiencies—at some future time—by administering sperm to cells taken from diseased individuals, getting the sperm to deliver some of the missing DNA, allowing the cell to build up into a healthy population and reimplanting them in the patient." □

A SHINY GLOBE ROCKS THE WEATHER

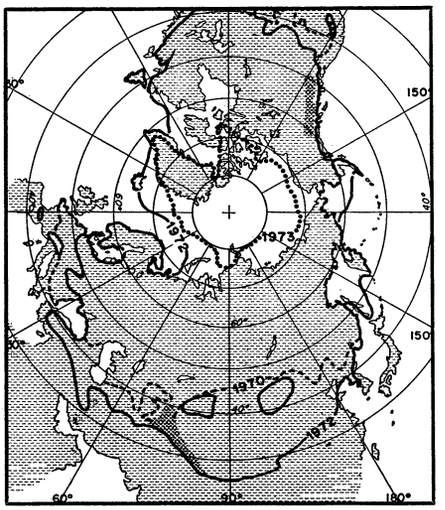
It's like a science fiction movie of the world gone wild: record numbers of tornadoes in the United States, unprecedented drought in Africa, scores of new temperature extremes in diverse parts of the globe. The weird weather of 1972 and 1973 cost tens of thousands of lives, hundreds of millions of dollars. This week a husband-and-wife research team suggested a possible explanation: the early and enlarged build-up of snow and pack ice in the northern hemisphere, to the point where it may have significantly changed the average reflectivity of the earth's surface.

The link between reflectivity and weather is the heat balance of the planet. It is an equilibrium between the amount of the sun's incoming energy that is reflected back into space and the amount that is absorbed by the earth. The absorbed energy provides the source of most of the heating of the atmosphere. This, according to George and Helena Kukla of the albedo (reflectivity) task group of the Climate Long-Range Investigation, Mapping and Prediction (CLIMAP) program of the International Decade of Ocean Exploration, is what seems to have changed.

Normally vegetated ground, the investigators report in the Feb. 22 SCIENCE, reflects only about 15 to 20 percent of the solar energy that reaches it, and calm ocean reflects even less, about 5 to 10 percent. Snow-covered grasslands and pack ice, however, reflect about 80 percent. "This reflected light," they say, ". . . represents a deficit in the earth's energy balance."

In 1967, the National Oceanic and Atmospheric Administration began routine mapping of the snow and ice fields in the northern hemisphere. Up until 1971, the area covered by snow and ice hovered between about 33 million and 34 million square kilometers. That year it began to climb, increasing some four million square kilometers by year's end and staying there through most of 1973. It would take only seven such spurts, the Kuklas point out, for the snow and ice cover (with the resulting increased reflectivity and decreased solar-energy absorption) to approach the size of the northern hemisphere cover during the last glacial age. (Such sudden growths are rare, they point out reassuringly, and normal patterns tend to come back in between them, "but the potential for fast changes of climate evidently does exist on the earth and should be kept in mind.")

Also beginning in 1971, the seasonal variations of the cover began to build up earlier and decline later, with a corresponding increase in the year-to-year coverage of snow and ice in a given month. In October of 1972, for ex-



Science

Record snow and ice cover of 2/10/72 (solid line) vs 1970 maximum (dashes).

ample, snow and ice covered twice as much ground as in October of 1968.

Changes in the snow and ice cover do not occur at the same time as large-scale changes in temperature. There is a time lag, since the heat energy is first involved in the freezing or melting process. "When melting into water," the Kuklas report, "ice and snow consume almost 80 calories per gram. It is partly for this reason that the summer peak air temperatures in the northern mid-latitudes are delayed six weeks after the insolation (incoming solar energy) peak." Similarly, although the cover had become quite large by mid-1971, it was late in the year before the Icelandic semi-permanent low-pressure system in the atmosphere began to intensify strongly.

As in all things meteorological, however, there are other factors which complicate the problem, such as the effect of the cloud cover on the energy arriving from the sun. "It is still premature," according to the authors, "to say that the global weather pattern of 1972 was a response to the anomalous snow cover of 1971, and therefore could have been expected. But, in view of the close links connecting the distribution of snow and ice with heat reserves in the oceans and with atmospheric circulation, such a relation is possible."

This in turn suggests the intriguing possibility of prediction. The Kuklas' data came largely from visible-light photographs taken by weather satellites, and they admit that it can sometimes be difficult to distinguish snow and ice cover from clouds. Other sensors, however, such as infrared and multi-spectral scanners, can produce images in which frozen water can be more readily distinguished. In any event, say the researchers, snow and ice deserve more attention from forecasters. □

SOCIAL INDICATORS: CHARTING OUR PROGRESS

The task facing scientists concerned with social policy is enormous. They must bring together and correlate diverse concepts and advances, use them to evaluate existing social programs and recommend goals and priorities for future programs. If social scientists were working with atoms or chemicals, their task would be relatively simple. Atoms always act and react in a predictable manner. People and societies do not. Therefore, the only way social scientists can get a handle on their subject is in retrospect. They must let the action take place and then look back and try to evaluate what happened. Since the mid-1960's it has been fashionable to believe that the job of looking back could be accomplished with the aid of a comprehensive system of social indicators—measures taken at regular intervals that can be used to chart a society's progress or lack of it.

In 1969 the Federal Government got into the business of social indicators. For the past five years the Office of Management and Budget has been coordinating a data collection and evaluation project that is supposed to yield information with which to plan government programs. The results of this work were released last week in a large book, *Social Indicators 1973*. The document has in it a selection of statistics on social conditions and trends in the United States in the areas of health, public safety, education, employment, income, housing, leisure and population. Says Frederick V. Malek, deputy director of OMB: "It is an effort to open up government communication and provide the American people with a better understanding of progress in our society and the bases on which government decisions are made. Certainly, not all of the indicators are good news. But in order to make progress, we must have a basis from which to measure that progress."

Among other things, the indicators show that:

The average length of life for persons born in the United States has increased from 49.3 years in 1900 to 71.1 years in 1971. Females can expect to live for 74.9 years on the average, compared to 67.4 for males.

The rate of crime reported to the police is not the same as rates perceived by victims. The rate of victimization of violent crimes (murder, robbery, rape and aggravated assault was 358 per 100,000 population, compared to the reported rate of 198.

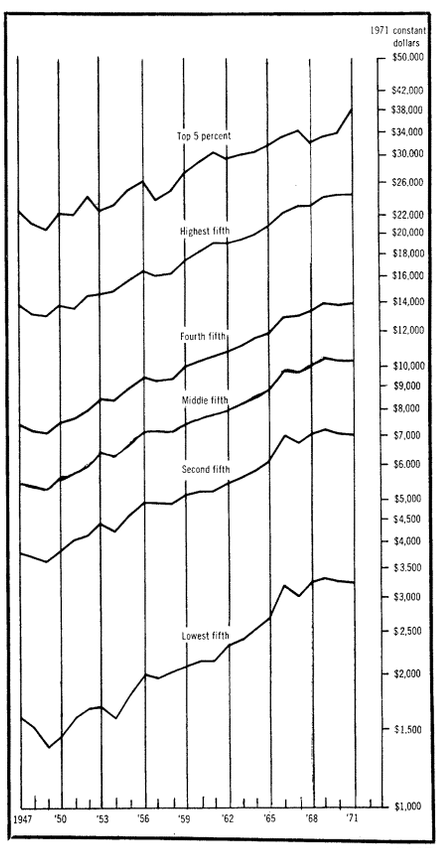
The high-school graduation rate for the 17- and 18-year-old population has increased from 56.4 percent in 1950 to 76.2 percent in 1967. This rate has not increased since 1967.

The college educated 25-29-year-old population in the United States has increased from 5.8 percent in 1940 to 19 percent in 1972.

Access to medical care was examined on the basis of the people's attitudes. Some 84 percent of the population say they have a great deal or fair amount of confidence that they can get good medical care for themselves and their families when they need it. But these figures differ widely by income—75 percent for those with incomes under $5,000 in 1971, compared to 95 percent with incomes of $15,000 or more.

The OMB document gives a national picture but cities, states and metropolitan area governments are producing similar materials to meet their separate needs. In addition, the governments of Great Britain, Japan, France and West Germany have produced similar documents that will eventually be combined to produced a system of social indicators on a worldwide level.

The next installment of *Social Indicators* is scheduled for 1976. At that time the decision makers will have another chance to evaluate the effects of the social policies. □



OMB

Social indicators: One fifth of the population has 76 percent of all the wealth. The bottom fifth of the population has only one percent.