

Science at the AAAS

From our reporters at the annual meeting of the American Association for the Advancement of Science in Denver

The sun since the Bronze Age

One year ago astronomer John A. Eddy reported convincing evidence that during a 70-year period in the late 17th and 18th centuries, sunspots and other signs of activity all but vanished from the sun (SN: 3/6/76, p. 154). Historical evidence for this period, called the "Maunder minimum," coincided with a very clear picture of the minimum shown as a radiocarbon anomaly in tree rings formed at the time. This enabled calibration of the radiocarbon dating method. And that, says Eddy, now at the Harvard-Smithsonian Center for Astrophysics, provides "the rosetta stone that now allows us to read earlier solar history in tree-ring radiocarbon records."

When we do this, he now reports, "we find a surprising record of solar irregularity in the past, with evidence of at least a dozen other periods of solar misbehavior (as severe as the Maunder minimum) since the late Bronze Age on earth." Each, he says, lasts from about 50 to 200 years.

In fact, in this new light of history, the present era, the period since the early 1700s, is what stands out as abnormal. "We have lived our lives, and built our explanations of the sun during solar conditions that have applied but 10 percent of the time, or less, in the longer run of history."

Furthermore, the latest analysis shows that not only the Maunder minimum but also each of the other known excursions in solar activity seem well correlated with times of climate change. Extended times of very low solar activity, like the Maunder minimum, correspond 1:1 with times of cold climate, such as the "Little Ice Age" in Europe. High solar activity coincides with warm or benign climate.

These apparent coincidences, Eddy says, are now extended through glacial records in Europe to at least 3000 B.C. In fact, he says, the most uncertain part of the association is the climate record: "That is now known with less certainty than the history of the sun."

Urban-related weather anomalies

During the summers of 1971 to 1975, an extensive multi-agency research program was carried out in the St. Louis region to determine the effects of a large urban-industrial complex on the weather around and downwind of it. The results of that study, called METROMEX for Metropolitan Meteorological Experiment, are reported by Stanley A. Changnon Jr. and Floyd A. Huff of the Illinois State Water Survey.

The key climatic effects of the city are increased cloudiness (up 10 percent), increased summer rainfall (up 30 percent) and increased frequency of severe thunderstorms (up 10 to 100 percent). All are related to urban effects on the summer atmosphere. The increases occur over and just east (downwind) of St. Louis in a fan-shaped area of 4,000 square kilometers.

The city as a whole leads to the rain changes discerned. This indicates, says Changnon, that there is no controllable way for urban planners to "design out" the problem. The summer rainfall increases, Changnon says, have led to increases in the corn and soybean yields in the same area east of St. Louis. The net agricultural benefit to the area affected by St. Louis-altered precipitation, after discounting for the extra hail and wind damage caused by additional storms, is a 2 to 5 percent increase in grain crop yields, worth about \$1.6 million. Agricultural land values have risen as a result. On the other hand, the more intense urban rains lead to more runoff (up 15 percent), more local flooding (up 50 to 100 percent) and more stream and ground-water pollution (up 1 to 400 percent).

The study indicates that the wisest use of the land in the area is for agriculture as opposed to suburban development.

Being and dying

In a rare synthesis of existential philosophy and clinical practice, physician E. Mansell Pattison of the University of California at Irvine offers a set of principles on how to comfort the dying. The current emphasis on the "right to die," he says, "obscures the fundamental fact that dying is a process," and a more important question is how to help the dying cope.

Rather than speaking of "treatment plans" for the dying, Pattison emphasizes the need to "relate to" the person involved. Thus, the first duty of a physician or relatives is to recognize the stages of the dying process and help the patient face them.

First comes the initial "crisis" phase when the imminence of death is first recognized. Here the dying person needs to be helped through a period of acute anxiety. Next may come a chronic phase, in which the preservation of close relationships with loved ones is most important. Finally, in the terminal phase, there should be support for acceptance and withdrawal.

"Helping is not so much doing as being," Pattison says. "To comfort is to share."

Losing the right to migrate?

The right to live where one wishes is "not so unlimited as Americans have casually assumed," reports Rand Corp. analyst Peter A. Morrison. Although migration is not yet legally barred, several new legal and economic mechanisms have arisen that can effectively encourage or prevent a person from settling in some given locality.

In what Morrison calls "one of the noteworthy reversals in migratory patterns in the country's history," 131 people are now leaving metropolitan areas for every 100 that move in. The result has been a net migration gain in two-thirds of all nonmetropolitan counties in the United States.

In response, many communities are experimenting with new laws to halt rapid growth from migration, ranging from outright limits on the population allowed in a town, to zoning laws barring multifamily dwellings. The problem, Morrison concludes, is that "there is no clear place for tinkering to stop."

Toward economic boom (or bust)

Where two or three economists are gathered together, controversy will be in the midst of them. A symposium on prospects for future U.S. economic growth was no exception, with predictions ranging boldly from gradual boom to imminent bust.

Presenting the optimistic view was John W. Kendrick, chief economist for the Department of Commerce. Productivity will be higher during the next decade than during the last, he predicts, because the forces behind the recent drop in productivity are temporary ones. Since roughly half of the rate of productivity is usually credited to advances in knowledge, one way to accelerate the boom is to increase the R&D budget.

Not necessarily, says Nathaniel J. Mass, director of the System Dynamics National Modeling Project at MIT: Longer-range forces may be "strongly depressing economic growth in the United States." According to his computer model, "long waves" of 50 to 60 years duration occur in the economic cycle, and we may now be in a downturn. According to this model, a boom period of a cycle is accompanied by overexpansion of production. When demand can no longer keep up, a sudden collapse of production follows, with steeply rising unemployment. The great depression of the 1930s, Mass says, may have been a "typical low point in the long wave." And conventional government intervention is too oriented toward short-term cycles to help prevent a long-wave downturn.