

## CO<sub>2</sub> warming: Proof may be in the ice cap

Polar ice caps, known to be efficient indicators of climatic change, may be showing the first signs of response to global warming caused by the buildup of carbon dioxide in the atmosphere. In a cautiously worded report in the Oct. 30 *SCIENCE*, researchers George Kukla and Joyce Gavin of Columbia University's Lamont-Doherty Geological Observatory at Palisades, N.Y., present satellite data showing that between 1973 and 1980 Antarctic pack ice in summer decreased by 2.5 million square kilometers, or about 35 percent of its average area. Navigation reports from whaling and research ships and from U.S. Navy and Russian atlases from the 1930s indicate that earlier in this century summer ice conditions were heavier.

Surface air temperatures, notably in the Northern Hemisphere, also may be reflecting the effects of CO<sub>2</sub>-induced global warming. The scientists report that in the Northern Hemisphere between 1974 and 1978 average surface air temperatures between latitudes 55° and 80°N along the seasonally shifting belt of melting snow were 0.9°C higher in the mid-1970s than in the mid-1930s. Temperatures in the entire Northern Hemisphere were warmer in the mid-1930s than at any one time during the century.

The findings are couched in tentative terms because scientists don't know how much of the change in snow and ice cover and in temperature can be explained by

natural variations in climate or by other processes unrelated to carbon dioxide. It is too soon, they say, to assume a causal relationship.

The suggestions are noteworthy, however, because they agree with expected effects of the rise in atmospheric carbon dioxide. Models used by V. Ramanathan of the National Center for Atmospheric Research in Boulder, Colo., and M. S. Lian and R. D. Cess of the State University of New York at Stony Brook predict that the effect of carbon dioxide will be greatest during late spring and summer along the edge of seasonally shrinking snow and ice fields.

In a telephone interview, Ramanathan expressed keen interest in Kukla's and Gavin's findings, especially that temperatures in the Northern Hemisphere are warmer now than in the 1930s. These findings agree with his own. However, he cited opposite results of a three-dimensional global model by Syukuro Manabe and Ronald Stouffer of the Geophysical Fluid Dynamics Laboratory at Princeton University. Over the Arctic Ocean, warming is greater in summer than in winter, they wrote in the October 20, 1980 *JOURNAL OF GEOPHYSICAL RESEARCH*.

Conclusions should not be drawn, Ramanathan said, until a longer data base is established, until observations and model calculations are thoroughly compared, and until the nature of seasonal variability is understood. □

## 'Sweetbreads' and the reproductive system

The thymus gland, an organ beneath the breastbone (and what chefs serve up as a "sweetbread"), is important to the body's immune system, processing white blood cells into disease fighters and manufacturing hormones that help patients with various illnesses (SN: 1/26/80, p. 6). Yet the thymus can also do something quite unexpected — influence the reproductive system — Robert W. Rebar and Akira Miyake of the University of California School of Medicine in San Diego and Teresa L.K. Low and Allan L. Goldstein of George Washington University School of Medicine and Health Sciences in Washington report in the Nov. 6 *SCIENCE*. "Our findings provide evidence linking neuroendocrine and immune functions," they write, "and suggest a new area of research with implications to the understanding and control of reproductive function."

Last year Rebar, along with other colleagues, reported that a strain of mice called athymic nude mice have reduced concentrations of luteinizing hormone and follicle-stimulating hormone (reproductive hormones of the pituitary gland) and that these hormones can be restored to normal levels in the mice by giving them

thymic transplants. So Rebar, along with Miyake, Low and Goldstein, attempted to see whether three different fractions of the thymus hormone thymosin—fraction five, fraction beta four and fraction alpha one—might influence the release of luteinizing hormone-releasing factor, a hypothalamic reproductive hormone. They put rat hypothalami into perfusion chambers, exposed them to the three thymosin fractions, then measured the amounts of luteinizing hormone-releasing factor released by the hypothalami after such exposures as compared to the amount usually released. They found that fraction five and fraction beta four (but not fraction alpha one) stimulated secretion of the hormone, showing that the thymus can influence hypothalamic reproductive hormones as well as pituitary ones.

These findings may also have practical implications, the researchers believe. For instance, thymosin fraction beta four might be injected into women who do not ovulate because of a luteinizing hormone-releasing factor deficiency, thereby bringing about luteinizing hormone-releasing factor production from the hypothalamus as well as ovulation. On a lighter note, the findings

likewise raise the provocative question of whether eating sweetbreads might stimulate people's reproductive systems. Goldstein replies to such a possibility with a chuckle: "I don't think there is any evidence at the moment that sweetbreads are anything more than a gourmet's delight. Most of these [thymic] hormones are polypeptides and in all probability are broken down by the acids and proteases in the gut before they would get through to the [reproductive] system. So I wouldn't think sweetbreads would be the way to go. But you can't rule it out. It's a remote possibility." □

## Freedom for quarks hinted at CERN

Free quarks are not supposed to exist, but evidence for them keeps popping up here and there. Quarks, of course, are the elemental subparticles out of which nearly all the particles encountered in physics are supposed to be built. One may or may not believe that quarks are real physical objects. All that theory requires is that their mathematical function be performed.

Even those who believe in quarks as physical objects are constrained by current theory not to expect to see them manifested as free-flying particles. Theory demands that quarks, whether real or mathematical, remain always bound inside the structures they compose.

The latest rumor of free quarks comes from the CERN laboratory in Geneva and concerns an experiment being done by Antonio Zichichi and a large number of colleagues. Even though a report appears in the Oct. 29 *NEW SCIENTIST*, the information should be classed as a hint or a rumor for the present, as it has not been officially confirmed or formally published.

Zichichi and co-workers have been studying interactions of neutrinos with matter, using a stream of neutrinos from the Super Proton Synchrotron and a target made of 23 tons of lead. Among the particles produced by interactions between the neutrinos and the lead atoms are some that seem to have fractional electric charge. Fractional charge is one characteristic that would identify a free quark. All the known particles of physics that have charge have the same amount. It may be positive or negative; it's always the same unit. To add up properly, quarks have to have either  $\frac{1}{3}$  or  $\frac{2}{3}$  of this unit of charge. In a chamber that identifies particles by how they ionize other matter, these differences would show up clearly. Ionization goes by the square of charge, so free quarks would give  $\frac{1}{9}$  or  $\frac{4}{9}$  the signal of some other particle. Zichichi and co-workers have seen some signals that seem to look like those, and are asking for more time on the accelerator to investigate further. □