

Conflicting reports on climate change

Climatologists have for some time been saying that the Northern Hemisphere is cooling down and that this might cause a new ice age (SN: 3/1/75, p. 138). Three new studies offer conflicting views on the controversy.

National Oceanic and Atmospheric Administration scientists Donald R. Wiesnet and Michael Matson report that after studying satellite records of the Northern Hemisphere snow cover, they find a "lack of systematic increase" that would presumably accompany a cooling trend. Photographs and radiometer readings from NOAA satellites begun in 1966 show no significant change in the North American snow cover and only a small fluctuation in the Eurasian snow cover, which peaked in the winters of 1971-72.

Wiesnet and Matson say their findings tend to "contradict the evidence presented by some proponents of climatic change that the current climate is changing adversely with attendant cool hemisphere temperatures and harsh winters." The lack of a deteriorating trend "should perhaps be encouraging to energy conservationists," they conclude.

The exact opposite conclusion—that a cooling trend is indeed present—is supported by a research group at the Lawrence Livermore Laboratory that has developed a computer model of the climate that not only predicts the cooling effect, but offers an explanation. In the Dec. 23 NATURE, the group reports that their model predicts a 0.2 degree C. drop in temperature largely due to removal of tropical rain forests.

These forests cover 34 percent of the land area lying within five degrees of the equator, and extensive deforestation has taken place recently because of the need for firewood (SN: 9/27/75, p. 198). The mechanism involved is apparently a reduction of the latent heat normally released when rain is formed from vapor—the process that helps drive global air circulation, transferring heat and moisture from the tropics to the temperate zones. The reduction stems from an increased reflectivity of the tropical ground. (Barren land absorbs less sunlight than forest.) As the air currents become cooler and dryer, rainfall should decrease at the equator, and global temperatures fall. The authors say their study confirms a climate modeling experiment done by NASA.

Finally, from Rice University comes an interim report on research being conducted by geologist John A.S. Adams, who says the widespread burning of wood may be releasing much more carbon dioxide into the atmosphere than previously estimated and that the ability of remaining trees to reabsorb the gas is concurrently decreasing. Carbon dioxide content of the atmosphere has increased 15 percent over the last century, he says.



Computer-enhanced satellite picture of North America shows winter snow cover.

This may affect the climate in unknown ways, and how much of this increase comes from wood burning, as opposed to other fossil fuels, is hard to say. Adams is now beginning quantitative studies to find out. □

Ozone drop supports depletion theory

The largest solar proton event in recorded history has provided the first natural confirmation that photochemical events can cause an abrupt and significant decrease in stratospheric ozone. This confirmation adds considerable weight to the evidence mounting in the controversy over ozone depletion by fluorocarbons. The researcher who presented this data calls it "the experiment that nature did for us."

Paul J. Crutzen of the National Oceanic and Atmospheric Administration at Boulder, Colo., described this "natural experiment" to the 12th International Symposium on Free Radicals meeting in Laguna Beach, Calif., last week. He was assisted in the analysis of the solar proton event by Donald Heath and Arlin Krueger of the NASA Goddard Space Flight Center.

In August 1972, an enormous solar flare caused the production of a large quantity of energetic protons—the largest quantity yet recorded. These entered the earth's atmosphere through the polar regions, since the planet's magnetic field would deflect them at lower latitudes. These energetic protons produce fluxes of secondary electrons, Crutzen says, that dissociate nitrogen gas (N_2) and cause nitric oxide (NO) to form. This NO, in turn, attacks and depletes ozone in the upper stratosphere.

Crutzen predicted last summer that an ozone decrease should have occurred immediately after the August 1972 solar proton event. But the confirmation itself

was provided by data from a Nimbus 4 weather satellite which was measuring and recording ozone concentrations at the time. Heath and Krueger retrieved and analyzed the satellite data from a NASA computer. Crutzen had predicted that the increased production of NO would cause an ozone depletion of 15 to 20 percent over the North Pole. The Nimbus satellite measured 16 percent.

"The important thing about this particular event," Crutzen says, "besides it being a natural confirmation of the NO photochemical models, is that we predicted a large depletion in ozone and saw it." Symposium co-chairman F. Sherwood Rowland, a physical chemist at the University of California at Irvine and the first to propose the fluorocarbon-ozone depletion theory (SN: 9/21/74, p. 180), was equally enthusiastic.

"People keep telling us 'If there are really effects on the ozone layer by chemicals from aerosol cans or SST's, show us where a chemical injection into the stratosphere has caused a problem.' Crutzen predicted a measurable effect from NO and it was there." Besides this, Rowland says, the effect was discontinuous.

This means, Crutzen says, that after the ozone level dropped, it remained at this new lower level for a while. "This is exactly what one would expect." The drop in ozone would stay constant until the source of depletion, the NO, was removed from the polar region by air currents. This discontinuous effect shows, among other things, that there is no immediate "atmospheric sink" for the reactive chemicals. This point has been disputed during the SST debates, which focus on reactive nitrogen species, and during the fluorocarbon debates, which focus on reactive chlorine species (SN: 5/17/75, p. 322). Following NO dispersal, the overall effect of the NO on the earth's ozone layer should be about a one percent decrease, Crutzen says, and those data are now being analyzed. □

Graduate science enrollments up

For the second year in a row, graduate science enrollments are up, according to a study from the National Science Foundation. A national sample of graduate science departments indicates that full-time graduate enrollments in Ph.D.-granting institutions increased about 4 percent between fall 1974 and fall 1975, after increasing nearly 5 percent the previous year. The turnaround in enrollment that began in 1973 came after a five-year decline.

The life sciences alone have shown continued growth in full-time graduate enrollment since 1971, with the greatest increases occurring in 1974 (10 percent) and 1975 (8 percent). The decline in social

sciences and engineering enrollment turned around in 1974, and enrollment in these areas continued to grow in 1975. The mathematical and physical sciences have been holding steady.

Psychology was the only area of science to show a drop in full-time enrollment in 1975, a reversal of a growth spurt in 1974. The study says the dropoff may be due to word that many new Ph.D.'s in psychology have had difficulty finding jobs.

Due to the increases in 1974 and 1975, there are more full-time graduate students in science and engineering now than there were in 1971 in all areas except the mathematical and physical sciences. □

The earth-Venus asteroid shuttle

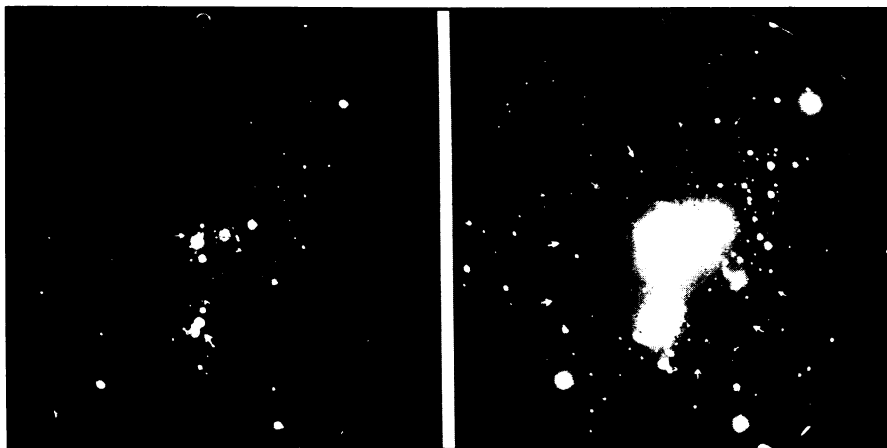
Sometimes asteroids wander outside the asteroid belt. The most displaced yet of such wanderers has now been found by Charles Kowal of the California Institute of Technology. The object is officially designated 1975 YA (Fast-Moving Object Kowal), and its claim to fame and significance is that it spends all of its time between the orbits of the earth and Venus. Its aphelion distance is only 1.04 times the mean radius of the earth's orbit.

Asteroids that sometimes come within the orbits of the inner planets have been known, but all previous ones had aphelion points in the asteroid belt and spent part of their time there. This is the first to appear wholly detached from the asteroid belt. Kowal believes it is probably an asteroid of the Apollo group that strayed within the earth-Venus neighborhood and was trapped here by the planets' gravity. He suspects there may be more such asteroids.

Brian G. Marsden of the Smithsonian Astrophysical Observatory, who calculated an orbit for Object Kowal, points out in International Astronomical Union Circular 2897 that the object has the smallest mean distance from the earth of any body yet recorded. Although this flying rock, which is estimated to be about a kilometer in diameter, approaches within three million kilometers of the earth, a collision with either the earth or Venus is considered extremely unlikely because of the high inclination of its orbit (32 degrees from the plane of the ecliptic).

Observations by Kowal and by observers at the Lowell and Harvard Observatories and possibly elsewhere are being continued through February to determine the orbit more closely. After that, Object Kowal will disappear from view for three years. (Its orbital period is nine months, so four of its orbits and three of the earth's will bring them close again.) Each close pass to earth or Venus will alter the object's orbit severely, and Kowal expects that in a short time, astronomically speaking, the object will be ejected from the earth-Venus neighborhood. □

Orion's 'star nursery' in far ultraviolet



The constellation Orion as viewed in the far ultraviolet (1,250 to 2,000 angstroms). The Orion neighborhood is a "nursery" for newborn stars, which start life radiating in the ultraviolet. Several of the bright objects shown in these rocket-borne pictures from the U. S. Naval Research Laboratory are faint if they appear at all in visible light. Conversely, the red giant Betelgeuse (position marked by circle) does not show up in the ultraviolet. The left photo, a 30-second exposure, shows the Orion nebula and a nebula near the star Zeta Orionis (arrows). The 100-second exposure (right) shows an extended nebulosity known as Barnard's Loop. □

Science adviser: Politics and surrogates

When the Ford Administration, in the person of Vice President Nelson Rockefeller, approached Congress last year on reinstating a White House science adviser position, all sides expressed hope for quick approval. But a welter of conflicting approaches soon scotched that possibility (SN: 6/21/75, p. 397). The Administration's proposal for a loosely described Office of Science and Technology Policy (OSTP) finally gained House approval in early November, but the Senate is now pushing for a substantially stronger, more clearly defined White House unit. As the legislative process dragged on, two informal advisory groups were formed to "facilitate planning" for OSTP, and these have now begun to work on selected problems for the President.

Failure to secure Senate approval of the House-passed OSTP legislation appears to be another example of the inept communication that has plagued the Administration in its dealings with Congress. Though White House staffers worked carefully with House leaders to hammer out a compromise bill, Senators complain that they were not consulted. Now, led by Sen. Edward M. Kennedy (D-Mass.), the Senate has been trying to add provisions to have members of OSTP individually confirmed, give the science adviser some independent authority on setting R&D budget priorities, and have the adviser be formally a member of the Security Council—all opposed by the Administration.

Meanwhile, two informal advisory groups were formed of such science establishmentarians as ex-science adviser Edward E. David Jr., leading academic

researchers, some Nobel laureates and corporate executives. The group on "Contribution of Technology to Economic Strength" is chaired by Simon Ramo (the "R" in TRW, Inc.). The group on "Anticipated Advances in Science and Technology" is chaired by William O. Baker, president of Bell Labs and a veteran unofficial adviser to Presidents (SN: 7/28/73, p. 52).

Ramo told a small group of science correspondents in Washington this week that the informal advisory set-up should be able to generate "momentum" to help OSTP once it is established. He emphasized the need for a new formula of cooperation between Government and industry in technical matters and said the scientists hope to identify areas where "things need to be done and won't be done without help from the White House." A task force on food and nutrition has been set up.

SCIENCE NEWS has learned that new compromises between the Senate and Administration positions on OSTP are under consideration. These include having the adviser make his budget recommendations to the Office of Management and Budget (OMB), rather than act autonomously; dropping the confirmation requirement for OSTP members other than the chairman; and discussing further with the Administration the nature of the science adviser's relationship to the Security Council.

The legislation is expected to hit the Senate floor by the first week in February and perhaps go to conference committee a week later. Says one knowledgeable Senate aid: "We don't see a huge confrontation." □