

# NASA abandons plan to save Skylab

With the concurrence of President Jimmy Carter, the National Aeronautics and Space Administration has abandoned its attempt to keep the huge Skylab orbiting workshop aloft. As a result, NASA officials estimate, the heavy space station could make its fiery descent through the atmosphere as early as April 1979, with pieces weighing as much as two and a half tons possibly reaching the surface intact.

Skylab, whose final astronaut crew left it on Feb. 8, 1974, was predicted at the time to stay aloft until 1983, leaving plenty of time for space shuttle astronauts to attach a remotely controlled rocket engine that would carry the facility up to a higher, longer-lived orbit. However, subsequent recalculations of expected sunspot activity—which correlates with changes in the vertical extent of earth's upper atmosphere and thus with increased drag on Skylab—indicated that reentry was more likely in late 1979 or early 1980.

Earlier this year, NASA successfully reactivated the space station from the ground and commanded it into a streamlined orientation that would minimize the drag in hopes of keeping it aloft until the shuttle could reach it. But the shuttle schedule was delayed, key components on Skylab were in marginal condition, sunspot activity was exceeding even the revised estimates, and the costs of keeping the station under control and developing the remote-control booster had reached \$26 million. On Dec. 19, NASA announced that it was dropping the idea.

The agency estimates that without the full-time control effort Skylab will probably come down some time between July and September, but that further sunspot increases could hasten the time to May or even April. Reentry will take place within the 50°N-50°S latitude band covered by Skylab's orbit, a region that includes parts of North America (including most of the United States), Europe and Asia, most of

South America and all of Africa and Australia, although three-fourths of the area is ocean.

Predicting the actual impact region, however, is another matter. There are uncertainties about the upper atmosphere, and Skylab's drag characteristics are poorly understood. A NASA official estimates that the time of reentry may be predictable perhaps 12 hours in advance from early signs of tumbling, but that the location may be uncertain until there is only an hour or less remaining. The agency plans to continue monitoring the workshop as long as possible, since the knowledge of onboard guidance systems could yield more precise information than could earth-based radar "skin-tracking."

The impact "footprint"—the area on the earth's surface over which debris may fall—could extend more than 6,000 kilometers along the reentry track and about 80 km to either side, NASA estimates. Though most of Skylab will burn up in the atmosphere, some substantial chunks are likely to reach the surface. The largest, according to the agency, could turn out to be the girder-packed "airlock shroud," weighing about 2.5 tons and perhaps capable of getting down intact. A two-ton film vault is another candidate. Such pieces, officials calculate, could hit with speeds as high as 200 to 300 feet per second, although more lightweight, aerodynamic objects, such as sections of Skylab's metal skin, may just "float down like leaves."

NASA maintains that the likelihood of damage or injury from descending bits of Skylab is less than the chance of getting hit by a meteorite. In 1975, a 45-ton piece of space hardware, including five rocket engines, reentered the atmosphere bound for points below, yet one official says, "We never heard hide nor hair of that." The item? The upper stage of the mammoth launch vehicle that sent Skylab into orbit in the first place. □

spectrum. Precisely located exit slits select the desired wavelengths. The idea is to study which ultraviolet wavelengths are responsible for what particular happenings in the chemistry they affect. The vacuum tube is necessary to prevent absorption of the ultraviolet by the air before it gets to the samples to be studied. Key people involved in construction of the instrument are Donald G. McCoy, Frank Smith, John Wright, Keith Powell, Gerald Haddad, Trevor Hobbs and Brenton Lewis. □

## Cholesterol can counter cancer

A high-cholesterol diet is a well-documented heart attack risk factor, but cholesterol native to the body has now been found to protect the body against cancer. This surprising, and seemingly contradictory, finding is reported in the November PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Hans-Jorg Heiniger of the Jackson Laboratory in Bar Harbor, Maine, and K. T. Brunner and J.-C. Cerottini of the Swiss Institute for Experimental Cancer Research in Lausanne, Switzerland.

Dietary cholesterol precipitates heart attacks by clogging the arteries that supply the heart. In contrast, cholesterol native to the plasma membranes surrounding immune cells, called T cells, appears to be necessary for these cells to destroy tumor cells or other "enemies" they encounter.

Cholesterol is known to be an important constituent of the plasma membrane of the mammalian cells and is known to modulate the membrane's fluidity. This fluidity, in turn, seems to be vital to the mobilization of cell membrane receptors and some other membrane functions. Cell synthesis of cholesterol for cell plasma membrane use is also known to be inhibited by a chemical called 25-OH-cholesterol. What's more, T cells are known to bind to target tumor cells, kill them and then detach from them. Armed with this and other information, Heiniger and colleagues conducted various experiments to test whether cholesterol in the plasma membranes of T cells is crucial for their ability to contact tumor cells and kill them. The researchers incubated T cells for 24 hours with the chemical known to inhibit cell synthesis of cholesterol destined for plasma membrane use—25-OH-cholesterol. This resulted in a strong depression of the T cells' killing ability. In contrast, T cells incubated for 24 hours without 25-OH-cholesterol retained their ability to kill. These results strongly suggested that plasma membrane cholesterol is necessary for T cells to kill tumor cells. What's more, when cholesterol was added to T cells incubated with 25-OH-cholesterol, their killing ability was restored, further substantiating the importance of plasma

## Ultraviolet monochromator

Ultraviolet light from the sun provides the energy for a lot of the chemistry that takes place in the earth's atmosphere. It is especially important in the reactions that produce the compounds we call pollutants. ("Pollutant", after all, means an atmospheric additive we find uncomfortable. There was a time when oxygen could have been called a pollutant. Anaerobic bacteria certainly found it uncomfortable.) Ultraviolet also gets under people's skin—quite literally. It is involved with the skin pigment melanin in reactions that lead to sunburns and occasionally to cancer.

So a group of scientists and engineers at the University of Adelaide in Australia have built what they call the world's most



McCoy, Smith and uv diffraction tube.

precise ultraviolet monochromator to study such reactions. The device uses a diffraction grating housed in a 6-meter vacuum tube to spread white light into a

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membrane cholesterol to T cells' killing expertise. And to make certain that T cells' loss of killing ability in the presence of 25-OH-cholesterol had not been due to T cell proliferation instead of to the cholesterol inhibitor, the researchers inhibited the DNA synthesis of T cells. Such inhibition had no effect on the T cells' killing. Thus, they could safely conclude that membrane cholesterol is necessary for T cell destruction.

Still to be determined, of course, is precisely how cholesterol in the plasma membrane of T cells might allow these membranes to contact and kill tumor cells. Heiniger and his co-workers speculate that membrane cholesterol is probably necessary for the stability of membrane receptors that hook up to antigens in the plasma membranes of tumor cells. □

## First global weather experiment begins

The Global Weather Experiment has begun. GWE, which you may remember better as FGGE, is part of GARP, which brought you GATE and is sponsored by WMO and ICSU. WMO also runs WWW, which is providing data for GWE. GWE, incidentally, includes MONEX, POLEX and WAMEX.

Got it?

Seriously, behind all those acronyms is what is being billed as the largest international scientific experiment ever conducted — a year-long, 149-nation effort to build the most complete set of global weather data possible. GWE, which officially began December 1, was announced last week at a press conference by university scientists and representatives of the U.S. Air Force, Department of Energy, National Center for Atmospheric Research, National Science Foundation, National Aeronautics and Space Administration and National Oceanic and Atmospheric Administration.

The purpose of such massive data collection, said Richard Frank, administrator of NOAA, is to provide enough information to assess the currently used models for weather prediction and decide the "practical limits of weather forecasting." The U.S. coordinator of the experiment, Rex J. Fleming of NOAA, noted that errors exist in all stages of weather prediction — in observation, in analysis, in computer modeling and in understanding the physics of weather. "With this fantastic data base, we will try to assess the contribution of each source of error, how to minimize it and then design a system which works within those limits," he said.

The \$300-million experiment — one third of which is U.S.-funded — has been in the planning since 1973 by the Global Atmospheric Research Program (SN: 6/1/74, p. 354), a project sponsored jointly by the United Nations' World Meteorological Organization and the nongovern-

mental International Council of Scientific Unions. Though none has been of the scale or intensity of the GWE (earlier called the First GARP Global Experiment — FGGE), GARP has conducted previous international weather experiments such as GATE (GARP Atlantic Tropical Experiment) which assessed the importance of the tropics as the "boiler" for the atmospheric heat engine.

For an entire year, including two two-month "special observing periods" from January to March and May to June, data on both air and sea temperature, pressure and circulation will be collected around the world, with special emphasis on the little-studied southern hemisphere and the tropics. The 40,000 daily observations already made by balloon, aircraft, ship and ground stations through the WMO's World Weather Watch will be supplemented by five geosynchronous satellites (including three from the United States), four polar-orbiting satellites, 50 research vessels, 110 commercial and research aircraft, 300 constant-level balloons and 300 instrumented drifting buoys. In addition, three regional experiments — the Asian and West African Monsoon Experiments (MONEX and WAMEX) and the Polar Experiment (POLEX) — will explore the importance of those elements on global weather.

The plan is so vast that, as University of Wisconsin's Verner Suomi, chairman of the U.S. GARP committee, said, "It's like giving the earth's atmosphere its first complete physical." □

## A may-be moon for Melpomene

The possibility that some asteroids may have their own natural satellites has gained attention in recent months following the June 7 occultation of a star by the asteroid 532 Herculina. In addition to seeing the star's light wink out as the asteroid passed in front of it, two widely separated observers each reported "secondary occultations" that some astronomers believe may represent a smaller object orbiting Herculina (SN: 6/15/78, p. 36). Previous occultations by other asteroids had yielded some reports of secondary occultations, but Herculina was the first case in which more than one observer had reported secondaries whose timing indicated them to represent the same source region (which argues against other causes such as birds or clouds in front of the telescope). The Herculina case is considered less-than-substantial evidence by some, however, in part because one of the observers was using only his eye and a telescope, rather than the more trustworthy strip-chart recording of a photometer.

On December 11, the asteroid 18 Melpomene passed between the earth and the star SAO 114159, and several observers

across the country saw no signs of anything other than the "main event." In Atlanta, Ga., however, astronomer Richard Williamon of the Fernbank Science Center did record a secondary, using a photometer and a 36-inch telescope, although he turned out to be out of position to see the occultation by Melpomene itself. As in the pre-Herculina cases, there appeared to be only the one sighting of the Melpomene secondary, but at least it was documented on the chart record, and with one additional plus.

Observers of the main occultation, such as Michael A'Hearn of the University of Maryland and Richard Schmidt and Thomas Van Flandern of the U.S. Naval Observatory, found that as the asteroid moved into position, the light from the star diminished in two distinct steps, indicating a double lightsource — a previously unsuspected double star. Williamon's chart record of the secondary event, he says, shows that same characteristic "stair-step" in the light curve, suggesting that clouds and the like are not to blame, since they might alter the step's shape.

The secondary object, if it exists, has a diameter of at least 37 km, Williamon says. Preliminary timing correlations of the main event suggest a diameter of 130 to 135 km for Melpomene itself. Someday, astronomers hope, a secondary occultation will be properly recorded by two or more observers, adding weight to the possibility of a discovery perhaps as significant as the rings of Uranus, which were found in the same way. Melpomene, in fact, will occult the star AGK3 +18° 860 next June 9, says David Dunham of the International Occultation Timing Association, although the event may be visible only from Antarctica and perhaps New Zealand. Maybe this will be the one. □

## Hazardous waste disposal

The Environmental Protection Agency proposed three new regulations to ensure safe disposal of hazardous wastes. The first defines "hazardous." The agency has drawn up a list of 158 wastes and waste sources that they term hazardous. But any waste that is ignitable, corrosive, chemically reactive or toxic would be covered by the regulations even if it is not on the list. The second regulation would make waste producers responsible for: determining if their wastes are hazardous; recording quantities, constituents and the ultimate site of the wastes' disposal; and documenting waste movement from cradle to grave. The final regulation sets standards for treatment, storage and disposal practices and requires that disposal-site owners monitor and maintain sites for at least 20 years beyond their closure. It also makes site owners responsible for up to \$5 million in damages for each damage incident that occurs while the site is in active operation. □