

# Viking Lander Sees Frost on Mars

*Twenty years ago, the world was changed forever: On October 4, 1957, Sputnik I—the first man-made object to orbit the earth—was launched from the Soviet Union. Since that electrifying inauguration, the Space Age has grown to where, as of this week, there were 4,470 satellites, space stations, spent rockets and other pieces of hardware circling the planet. A dozen human beings have walked on the moon; unmanned probes have visited every planet from Mercury to Jupiter, with spacecraft now on the way to Saturn and perhaps to Uranus and Neptune. Various orbiting objects relay phone calls, watch the weather, guide ships and aircraft, spy on the enemy, monitor crop conditions and look at the stars. As this is written, researchers are pondering frost on Mars, a new station in space and a satellite in pieces on the bottom of the ocean. Just another week in the Space Age . . .*

Back in earth's January, when the northern hemisphere of Mars was still in the autumn of its 688-day year, scientists with the Viking project were forecasting frosty times to come for Viking lander 2, less than 43° of latitude away from the ruddy planet's north pole. There were expectations that winter might see the ground around the lander covered in a blanket of white, and that perhaps the polar cap itself would extend its borders until they impinged on the spacecraft's very feet. As one researcher put it, lander 2 could find itself in "an honest-to-god polar environment" (SN: 2/5/77, p. 84).

The northern Martian winter began with the solstice on May 31, and will end in less than a month with the Nov. 5 vernal equinox. But the frost has remained elusive, leaving Viking's meteorologists and others struggling to understand the movements of carbon dioxide and water in and out of the Martian polar caps, atmosphere and rocky ground. When the northern cap was still shrinking, for example, giving up its substance to the atmosphere, the Viking orbiters failed to find signs of the expected neatly matching growth at the south pole. Mars provides an elegantly simplified laboratory for meteorologists seeking to understand the far more intricate weather mechanisms at work on the earth, but it still has its mysteries—and its surprises.

Last week, Kenneth Jones of Jet Propulsion Laboratory, a member of Viking's lander imaging team, was showing a friend through part of the elaborate, computerized image-processing system. They were in a section known as FOVLIP (First Order Viking Lander Image Processing), a tiny room in which a computer console is used to "punch up" new Viking photos onto a video monitor for their first look prior to the detailed enhancement procedures that follow. As a demonstration, Jones ordered up a recent lander 2 photo for the monitor, glanced at it—and then looked again.

There, spread among the rocks of the lander's bumpy terrain, were a number of bright white patches that very much resembled frost. Hazes, fogs and even possible surface frosts had been seen in photos taken from orbit, but no such patches had ever before been identified in the hundreds of lander images. At first, says Jones, he thought it might be a mistake in the processing. Other researchers, viewing the image the next day, suggested that the patches might be very light-colored sand, deposited or freshly turned by the wind. Further study, however, has virtually confirmed that they are frost: the first visual signs of winter to be seen at the lander 2 site, more than two-thirds of the way through the season.

But what kind of frost are the patches composed of? The photo was taken in the early afternoon of Sept. 13, when the temperature was about 174° K—approximately 23° to 26° too warm for CO<sub>2</sub> (the most common constituent of the atmosphere) to freeze. On the other hand, the local atmosphere this late in winter is seemingly too dry to have provided much in the way of water. The only remaining possibility seems to be a "clathrate"—a sort of ice/dry ice amalgam in which the CO<sub>2</sub> has become trapped in the molecular structure of the frozen water.

The frost spots continued to show up in photos taken as recently as the end of the month, and project officials were making plans this week to take more. Because of the "high" temperatures, says Viking meteorologist Robert Henry, it seems likely that the patches are actually remnants of larger frosty areas that have been sublimating away since they formed in colder times as much as 50 to 150 days ago. Limited photo coverage, variable lighting conditions and a dusty atmosphere kept them from being seen clearly until now, but a look back at earlier images, says Jones, shows almost certain signs in a photo from mid-August, with "50-50 possibilities" in pictures several weeks before that.

The lander team is now planning to take a series of pictures of the frosty spots at intervals over a single day, to see whether the patches shrink visibly under the planet's chill sunshine. Another possibility being considered is to reactivate the lander's soil-sampling arm, which carries a temperature sensor, and to guide the sensor to rest on top of one of the patches.

The frost has created quite a stir among the Viking researchers, whose mission is funded only through May 1978. There is hope of finding money to extend operations an additional eight months, so that the orbiters and landers will have been able to observe a full Martian year, and the frost discovery could help turn the trick. "It's one of the most exciting things to happen," says Jones, "since the landing." □

## Second satellite blow-up in 16 days

An Intelsat IV-A communications satellite was destroyed when its Atlas-Centaur rocket exploded barely one minute after taking off from Cape Canaveral on Sept. 29. It was the second such disaster in 16 days, following the destruction of the European Space Agency's Orbital Test Satellite on Sept. 13 when its NASA-provided Delta rocket also blew up in midair (SN: 9/17/77, p. 181).

The malfunctions are not believed to

be connected, but both are being studied by investigating boards. The Delta and Atlas-Centaur are to be used for almost all of NASA's launchings until the space shuttle begins its operational missions in 1979 or 1980. Of 21 launches currently scheduled for 1978, for example, 12 are assigned to Deltas, 6 more to Atlas-Centaur and only 3 to the smaller Atlas F.

Of more immediate concern is the launch of the double-payload International Sun-Earth Explorer mission (one satellite each from NASA and ESA), which has been scheduled to take off on Oct. 19 aboard a Delta. The next Atlas-Centaur launch, another Intelsat IV-A, has been targeted for Nov. 10. With its two key rockets under investigation, however, NASA may find its schedule slipping, even if the time only goes to be sure that nothing is chronically wrong.

A similar case of successive malfunctions took place in 1968-69, when three payloads were lost in less than 12 months—all using the supposedly "old reliable" Delta. Yet investigations showed apparently unrelated causes rather than any common thread, "a case," said one engineer, "of statistics catching up with us." □

## Sixth Salyut space station launched

Salyut 6, latest in the Soviet Union's series of space stations, was fired into an earth-circling orbit on Sept. 29, with indications that a crew of cosmonauts would soon go aloft to occupy it. The previous station, Salyut 5, was destroyed during atmospheric reentry on Aug. 8, ending a nearly 14-month lifetime during which it was manned by two different crews and unsuccessfully approached by a third.

"We are preparing astronauts now to work on board the orbiting stations," said veteran cosmonaut Vladimir A. Shatalov on Oct. 3, "and a launching will follow soon . . ." In addition, besides the Oct. 4 20th anniversary of Sputnik 1, there is the coming 60th anniversary of the Russian Revolution, with both events being likely candidates for Soviet commemoration in space.

Shatalov's use of "stations," in the plural, could be a reference to Salyut 6 and others to come, or it could be merely a broad usage describing the Salyut and the spacecraft that would carry the crew to meet it. Salyut 5 was said by Soviet officials to carry at least two docking ports, so that an additional spacecraft could be sent up to resupply the station, but this capability was not used. Multiple dockings, however, are one way to assemble large, modular structures in space, and both the U.S. and Soviet space programs include studies of such possibilities. It has thus been speculated that there might be an attempt to join two Salyuts together in orbit, thus creating a large station, presumably with a crew of at least four people. □

## Gene-splicing bills suffer setback

It was three steps back last week for recombinant DNA legislation. Both in the House and in the Senate the DNA bills ran into unexpected delays and opposition. However, deadlines for possible enactment this year have long since passed. The continuing work on these bills now aims for settlement in the next Congressional session.

Sen. Edward M. Kennedy (D-Mass.) withdrew support for his own bill, which has already passed the Senate Human Resources Committee. "I am concerned about the fluctuating scientific data and the emotional atmosphere of the debate," Kennedy told a meeting of medical writers. Kennedy proposes instead compromise legislation to extend the current National Institutes of Health guidelines for one year to all parties conducting recombinant DNA research and to establish a national recombinant DNA study commission to recommend, after nine months, whether permanent legislation is necessary.

Kennedy cited new work by Stanley Cohen of Stanford University as challenging the belief that recombinant DNA research can produce novel organisms. "Dr. Cohen believes that by using this technique [recombinant DNA], scientists can only duplicate what nature can already do," Kennedy says.

Recent experiments by Cohen and Shing Chang demonstrate that within bacteria small, independent rings of DNA (plasmids) can be snipped and resealed by the same enzymes that scientists use to engineer plasmids outside the cells. Fragments of DNA either from bacteria or mouse mitochondria were clipped from or inserted into plasmids within bacteria. "It seems reasonable to speculate from our findings that restriction endonucleases [the enzymes that cut DNA at specific sites] may play a major role in the natural evolution of plasmid, and perhaps chromosomal, genomes," the researchers conclude in a paper to be published in an upcoming issue of the *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*.

Cohen's results may provide Kennedy with a graceful retreat from his strong position on recombinant DNA control, although they are not decisive on the question of hazard, some scientists suggest. Cohen's experiments do not conclusively establish that such genetic recombination occurs in nature. For example, the bacterial cells in the experiments are treated with calcium chloride so that the plasmids may enter. The work does not address incorporation into plant and animal cells, nor does it answer the objection that products of genetic recombination may be hazardous, even if recombination occurs in nature.

In a separate action, the Senate Committee on Commerce, Science and Transportation announced that it will hold hearings next month to examine

the effect of the proposed legislation on the conduct of basic research and the freedom of scientific inquiry. Committee Chairman Sen. Warren G. Magnuson (D-Wash.) says the bills "appear to go considerably beyond previous legislative attempts to control the use of potentially hazardous materials."

In the House last week, commerce committee Chairman Rep. Harley O. Staggers (D-W.Va.) blocked a vote on the bill proposed by Rep. Paul G. Rogers (D-Fla.) and approved by the Health and the Environment Subcommittee. The commerce committee will consider the recombinant DNA bill again this week. □

## The right brain: Surviving retardation

As the mysteries of the left and right hemispheres of the brain begin to unravel, it is apparent that although the halves function autonomously in many ways, they may also support, complement and even inhibit each other. Both the autonomous and inhibitive aspects of hemispheres were strikingly portrayed in two studies presented recently at the annual meeting of the American Psychological Association.

In one study, University of Houston researchers report that some youngsters classified as retarded in the left brain functions of speech, writing, logic and mathematics, are normal and above average in the right brain-controlled processes of creativity. In the other study, University of Connecticut psychologists find that persons with left brain damage frequently are more expressive and non-verbally communicative than either persons with right brain damage or non-damaged individuals. The researchers suggest that in many "normal" people the left hemisphere may actually inhibit the right side's facility for "spontaneous nonverbal expression."

The Houston research, conducted by Patricia L. Musick, set out to examine the possibility—which had been implied in several previous studies—that persons who are considered retarded by the usual language- and mathematically-oriented criteria may not be retarded in their right brain functions. "It has been assumed that children with retarded mental development would follow the same stages of growth [in creative development] as the typical child, but at a much slower pace," says Musick.

The psychologist chose a sample of eight 3- to 9-year-olds, ranging from moderately to profoundly retarded. The drawing and painting ability of each was evaluated during one semester by specialists in "creativity for the handicapped." During the next semester, each of the specialists worked with one of the eight children in a program designed to