

says Dr. Gerry Neugebauer, "suggests that the surface is a very good heat insulator, in fact, better than any known solid material on earth."

Radio signals transmitted through the Martian atmosphere as the spacecraft passed behind the planet showed that the surface atmospheric pressure was about six and one-half millibars, in comparison with the 1,000-millibar pressure on earth. Thus the atmosphere on the Martian surface is about as thin as earth's at elevations of 100,000 to 150,000 feet. The occultation experiment, says Dr. A. J. Kliore, also observed an ionosphere at an altitude of about 82 miles plus a smaller ledge of ionization at an altitude of 63 miles.

This week Mariner 7 was returning the first close photos of the cratered south polar cap; it appeared to consist of frozen carbon dioxide.

While this new information on Mars from the probes was being analyzed, the Space Science Board of the National Academy of Sciences issued a report of a 23-man study panel calling for a vigorous national program of unmanned exploration of the outer solar system. Two recommended grand tour missions beyond Jupiter will probably prompt the most discussion, but they actually were rated only third and fourth in order of scientific significance among five missions recommended.

More important for now would be a 1974 Jupiter flyby mission to drop a probe into that planet's atmosphere, and a mission in 1976 to place a spacecraft into orbit about Jupiter. The atmospheres of Jupiter and Saturn hold extreme interest for scientists because they are thought to have remained nearly the same since the formation of the solar system. Lighter planets like the earth lost their original atmospheres before producing their present ones.

The grand tour concept is based on an unusual orientation of the planets in the late 1970's. A spacecraft can use the gravitational attraction of each of the outer planets to swing on toward the next one at a remarkable saving in energy. The identical situation won't exist again for 179 years.

The scientists suggest at least one spacecraft be launched in 1977 to Jupiter, Saturn and Pluto and two in 1979 to Jupiter, Uranus and Neptune. A fifth recommended mission would be to send a probe into Uranus' atmosphere in the 1980's.

Because of the massive technological difficulties to be surmounted, say the scientists, detailed planning must begin now. They suggest the National Aeronautics and Space Administration present to Congress a balanced long-term program for outer-planet exploration in its 1971 budget proposal. ◇

ATOMS FOR PURITY

Redirecting a national lab

As nuclear power becomes less of a research problem and more of a commercial reality, the need for vast Government laboratories in the atomic field will decline. And although nuclear engineering still has a lot of pioneering to go through (see p. 113) those concerned with the labs are looking to a possible future when they will have nothing to do.

Argonne National Laboratory is a prime example. Without new top priority challenges to justify the capital investment of over \$400 million and an annual cost of more than \$120 million, the laboratory could find itself in the untenable position of having outgrown its usefulness. However, salvation may be close at hand.

Last week, at a Chicago convention of the Argonne Universities Association, the independent controlling body of the Argonne Lab, more than 300 scientists, university presidents, students, industry leaders, Congressmen and public officials supported a proposal to set a new course for the Argonne organization. The new mission would pioneer a unique interdisciplinary approach to problems caused by the impact of the technological revolution upon the environment.

National concern for environmental problems has resulted in a runaway proliferation of fragmented efforts to cope with the lengthening list of troubles, but the total effect is that of a medusa-headed, flailing activity which is failing to stem the continuing deterioration of the earth's life-support systems.

Things have not gotten any better since Congress conducted a survey three years ago which vividly demonstrated the disjointed, scattered activities concerned with environmental pollution control and abatement conducted in 196 laboratories operated by nine different Federal agencies or departments (SN: 3/12/66, p. 471). The policy-makers for Argonne believe they have both the organization and technical-scientific capability to provide the continuity and competence necessary to help close the widening gaps in the nation's attack on environmental problems.

And it is research that is needed. Dr. Rene J. Dubos, microbiologist at the Rockefeller University, points out that while cost is often cited as the major obstacle to pollution control, "in fact, we could not formulate really effective control programs even if we had limitless resources because we know so little concerning the origin, nature and effects of most . . . pollutants."

Dr. Philip N. Powers, AUA president,

says there is no way to tell how large this effort may become, nor just what relationship it will have with the Argonne National Laboratory. "But of course," he says, "we hope it will grow." On the question of funding, Dr. Powers says that no source would be overlooked, including Federal, state, industry and foundations.

From Congress, where some money must come, there was positive reaction to the new direction planned. Rep. Chet Holifield (D-Calif.), chairman of the Joint Committee on Atomic Energy, says the AUA plan could produce a "valuable model" for coordinating the resources of universities, Federal laboratories and Government to improve the environment. And Rep. Melvin Price (D-Ill.), also a JCAE member, says one of its best points is that it would lead scientists into the kind of involvement and excitement with environmental problems that "is sure to yield results."

SCIENCE AND ENGINEERING

Disenchantment with Apollo



Hess: Science takes the second seat.

"We . . . have the scientific program for the next several lunar missions well organized," wrote Dr. Wilmot N. Hess, director of science at the Manned Spacecraft Center in Houston.

Well organized, perhaps, but apparently not very well fed. Despite the vast knowledge that stands to be gained from the lunar rocks brought back by Apollo 11 and its successors, the National Aeronautics and Space Administration's manned flight effort is by any standard an engineer-dominated undertaking. Space scientists agree that it is an engineering marvel which has made their opportunity possible, but a number of them have nonetheless been dissatisfied that science's role is such a meager one.

Dr. Hess's seemingly optimistic state-

ment, made scarcely a week after the Apollo 11 crew had returned safely to earth, was paradoxically part of his resignation from what ought to be one of the most scientifically desirable posts in the world. Just as man is taking his first halting steps into his mysterious universe, Dr. Hess will step down to direct a dozen research laboratories for the Environmental Science Services Administration in Boulder, Colo., after only two years in Houston.

"We have passed a milestone in the manned space flight program by the recent lunar landing," explained Dr. Hess in his resignation announcement. "We have put the Lunar Receiving Laboratory into operation, and it is performing its mission well."

Just how well is questionable, as witness many technical difficulties, including a vacuum chamber glove leak in which a technician narrowly escaped serious injury. Moreover, other top NASA scientists, who ought just to be reaching the most exciting points in their careers, also are departing the fold.

One such is Dr. Elbert King, curator of the LRL and at present one of the most vital men in the space agency, as he shepherds his elaborate but troubled facility through the first look at pieces of another world. Before Apollo 11 ever took off from earth, he had announced that autumn would find him chairing the geology department at the University of Houston. Mere weeks remain until Dr. King himself joins the brain drain from NASA, yet he warns that "we really need to get more top management who have a better understanding of the need for scientific inputs."

One NASA branch that should finally be sinking its teeth into real meat is the Office of Lunar Exploration. After years of struggling along with earth-based telephotos and television transmissions from unmanned Surveyor and Lunar Orbiter spacecraft, it is finally seeing men on the moon to carry out exploration first hand. However, Dr. Donald Wise, who is the office's chief scientist as well as its deputy director, leaves at the end of this month for a position at the University of Massachusetts.

Future Apollo landings are tentatively scheduled for more scientifically interesting sites than the flat lunar maria (SN: 8/2, p. 92), but the rougher sites could be a while in coming. The landing of Eagle (the lunar module of Apollo 11) in Mare Tranquillitatis was a tense, demanding job that took the full abilities of both Neil Armstrong and Buzz Aldrin and used up two-thirds of the planned fuel safety margin. Thus NASA planners are thinking harder about the risks of such scientist-pleasing sites as the crater-

strewn area around the crater Censorius and the dark, craggy area known as Littrow, scheduled at present for Apollo 14 and 15 respectively.

Besides worrying earthbound scientists, the landing difficulties also suggest a possibly bleaker future for NASA's scientist-astronauts, most of whom have had to learn flying from scratch and none of whom can hold a candle to the test pilots and military aviators comprising their non-scientist colleagues. Prior to Apollo 11, the scientist-astronaut group had already dropped from 17 to 14, largely because of dissatisfaction with the demands of flight training and the small amount of time left for scientific pursuits. This week, Dr. Frank Curtis Michel became the fourth to resign, both to devote more time to his

FAMILY SUPPORT

Action on welfare

Born out of the depression, the U.S. welfare system has seen few significant changes in its 33 years. Those major changes that have occurred involve aid to the disabled and health assistance programs (Medicare and Medicaid). Otherwise, public welfare has gone along getting bigger and more costly. At present, the Federal Government pays out \$4.7 billion to more than 10 million people, with state and local agencies contributing another \$4.2 billion.

But this week President Nixon was to present a proposal to the nation for the first sweeping changes in the public welfare system since its inception. Heart of the Nixon program, which must be approved by Congress, is the Family Security Plan (SN: 6/7, p. 549). It was expected to provide a standardized minimum payment—the first such Federal welfare standard—to a family of four on welfare of \$1,500 a year and \$300 for each additional child, regardless of the state in which the family lives. This is coupled with a provision allowing a working welfare client to retain more of his earnings than he would at present.

Under the present system, welfare recipients are allowed to keep the first \$30 they earn plus one-third of the remainder, the rest of their earnings being deducted from welfare checks.

The Nixon plan is designed to reduce the welfare rolls in the long run by providing an incentive for people to work. In the short run it could add many more people to the relief rolls. Also, it is estimated that the plan will cost the Government another \$2 billion.

On a monthly basis, the standardized Federal payments come down to a little more than \$31 per person for a family of four, a blessing for states that spend little on welfare but worthless or nearly

physics research and because a berth on a spacecraft seemed to be only a distant possibility.

There is considerable disagreement over whether science is the primary justification for sending man into space. National prestige, "man's inherent urge to explore" and other reasons all have their supporters.

But until it becomes profitable to mine minerals on the moon, or to carry commercial passengers to stops on other planets, scientific research is virtually the only thing there is to do out there. So now, with the engineering a demonstrated fact, the scientists just want the science done right.

The mass exit of scientists from the Apollo Program seems to indicate that it isn't.

so for high-paying states. Mississippi, for example, spends \$9.50 per person per month, \$1.50 of which comes from the state, while New York pays \$70, with at least \$35 of that amount coming from state and local sources. Since the states set their own individual welfare payments and since the Nixon plan does not compel them to match the Federal funds, states such as New York, already receiving more than the \$31 from the Government, will get no relief from welfare. Although there is no compulsory provision in the plan, the Government can threaten states who do not match Federal funds with cuts in other federally supported programs if they do not come across.

In a further move to eliminate disparities that exist in welfare payments between states, the Nixon plan was seen to incorporate a \$50-a-month-minimum payment to all adult welfare recipients, including the aged, the blind and disabled.

NUCLEAR POWER

Overselling a dream

This has been a long, hot summer for electric power. Three weeks ago a heat wave caused a power shortage along the East Coast, and this week in New York City equipment failure produced a second dim-out. Voluntary restrictions and rationing and outside purchases of electricity by power companies averted blackouts—this time.

But power planners are not certain about the future when the demand for electricity will stagger the present capacity of U.S. utility companies. It is estimated that the country will need half again as much energy annually by 1980