

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-