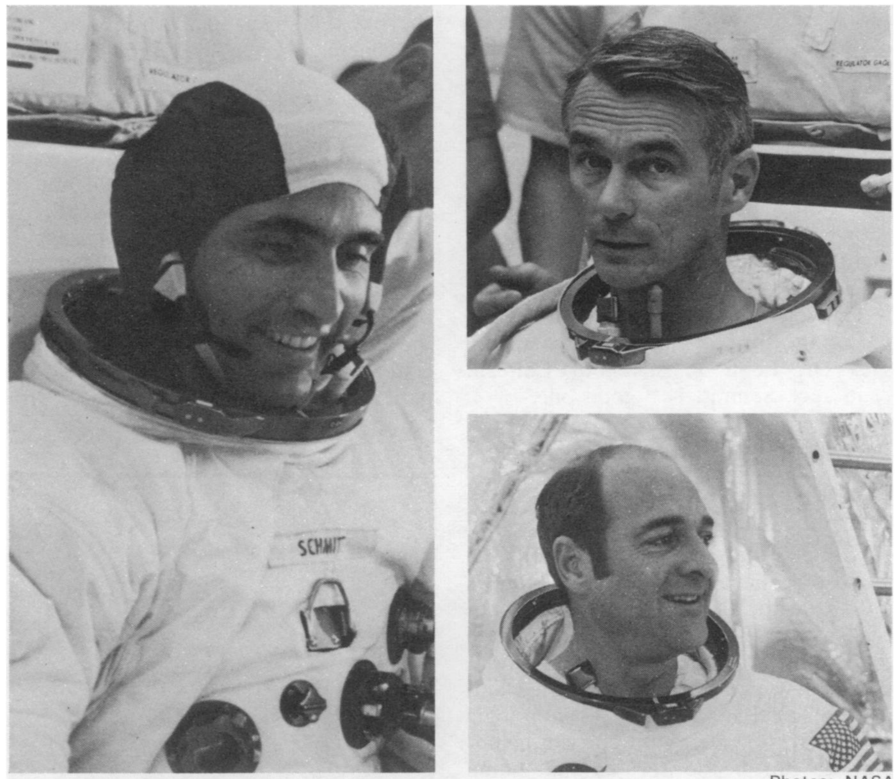
A scientist gets the nod for the final moon flight



Photos: NASA

Schmitt, a civilian geologist, joins Cernan and Evans on the Apollo 17 crew.

The decision to assign Dr. Harrison Schmitt to Apollo 17 delights scientists

The decision to send the only geologist-astronaut, Harrison (Jack) Schmitt, to the moon was a long time coming. When it did come this month, it was like icing on the cake to lunar scientists already elated with the results of the scientific observations made by Apollo 15's David R. Scott, James B. Irwin and Alfred M. Worden (SN: 8/21/71, p. 122).

"It was the best news I've heard since the first manned landing," geologist Eugene Shoemaker of the California Institute of Technology said this week. "I was deeply concerned about the whole future of manned space flight; it is extremely important to show how crucial man is—to develop the fullest use of human capabilities in space. One can only do this by having crews with mixed talents—pilots and scientists."

The decision came as a happy surprise not only to the scientists, but also to Schmitt himself. "Taking all things into consideration [the crew selection process and the cancellations of Apollos 18 and 19] . . . I think the chances of any scientist-astronaut going to the moon are probably fairly small," he had said only one week before he learned he would go.

To send Schmitt to the moon on the last flight, Apollo 17, in December 1972, meant breaking all established procedures for crew selections. Such an action had been taken by Donald K. (Deke) Slayton, director of flight crew operations, only once before, when Alan Shepard was assigned to Apollo 14. Had the normal procedure been followed, all members of the backup crew for Apollo 14 would have been named to Apollo 17: Eugene A. Cernan, Ronald E. Evans and Joe H. Engle. Instead, Schmitt, who was backup to Apollo 15 along with Richard Gordon and Vance Brand, will replace Engle. (The Apollo 15 backup crew would probably have flown on Apollo 18 had that flight not been canceled.)

Slayton, who recommends the crew selection to Robert Gilruth, director of the Manned Spacecraft Center, says he tentatively made the decision three months ago. But Schmitt was a backup crewman for Apollo 15 and might have had to replace one of the prime crew. Thus, says Slayton, it was not until Apollo 15 roared off the launch pad that the decision was sealed in his mind.

The decision was tough to make, and it hit hard—not only Engle, but Gordon and Brand as well. But, says Slayton, who himself had once been cheated out of a chance in space, "It was the best thing to do for the total program."

Slayton's decision, however, could have broader significance. "It shows," says one scientist, "a growing understanding at NASA about the nature of space exploration—that it's not just flying a machine, but doing science."

The evolution of the Apollo program toward this end has been gradual; it is probably partially the result of the unexpected technological success. "In 1965," says Schmitt, "you couldn't have convinced George Low [deputy administrator for NASA, then Apollo manager], me or anybody else that we were going to land on the moon the first time we tried it or that we could take the same basic spacecraft we landed on the moon with in 1969 and be staying there for three days with it [as on Apollo 15]. There were lots of conservatives in those days and I think we've done an extremely rapid job of making liberals out of a lot of people."

At that time the prime goal was getting the men to the moon and back safely. To do more science, as scientists were requesting, various aeronautical and engineering techniques had to be worked out successfully. They were. "We can look back on the enormous technological progress we have seen in just the two short years since Apollo 11," said Dr. Low after Apollo 15 returned to earth. "That pioneering step already looks primitive by today's standard."

Schmitt is regarded by many as a symbol of this change in emphasis from engineering to science. And "the guys in the backroom" to whom Scott addressed many of his questions and comments while on the moon couldn't be happier. They are the scientists—from NASA, from universities and from the U.S. Geological Survey—who organize the science and interpret the returns. In real time, they answer questions from the crew, ask questions, and revise field trips. After receiving his Ph.D. from Harvard in 1964, Schmitt worked with many of them at the USGS's Astrogeology Center in Flagstaff, Ariz.

Several major scientific decisions

remain for Apollo 17. As a result of many of the unexpected returns from Apollo 15, "everything is up in the air," says Schmitt. This includes time lines—what the men do on the surface, new scientific instruments to fly, and even the landing site itself.

"Apollo 17 belongs to a lot of people," says Cernan. "It is the last flight in the program, but . . . we look at it as the end of the beginning . . ."

The guys in the backroom agree. "Now the time is ripe for a scientist," says Dr. Leon T. Silver of Caltech, "and Jack Schmitt is a good one." □

IMPROVED KIDNEY DIALYSIS

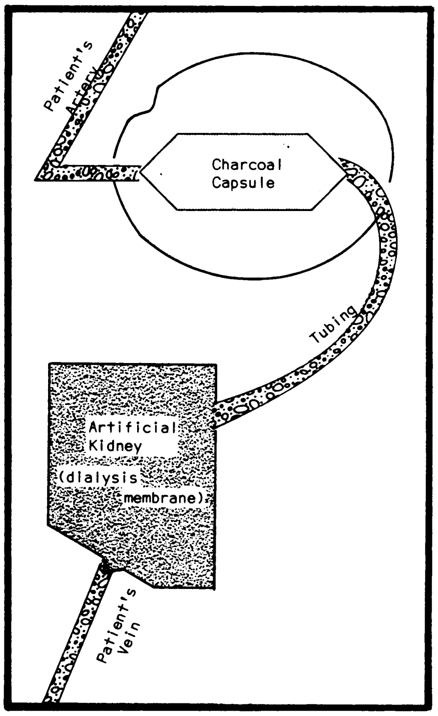
Coating the charcoal

Kidney dialysis—cleansing of the blood of patients with defective kidneys on an artificial kidney machine—can easily take eight to ten hours, three times a week. Aside from causing more than a few patients physical stress and psychological anguish (psychopathologic reactions associated with chronic hemodialysis can be so serious that some patients become self-destructive, Dr. Paul Lefebvre of the University of Montreal reports), dialysis membranes are often not selective enough to catch all the waste molecules that should be screened out of the patient's blood. Dialysis is even more of a problem with infants, who are generally more sensitive than adults to the rigors and difficulties of the procedure.

Now Dr. Joseph Andrade of the University of Utah has come up with a technique, based on extensive work at that university in chemically improving prosthetic devices (SN: 4/11/70, p. 376), which should make kidney dialysis both speedier and more effective.

Hundreds of prosthetic devices are being used by people today for medical and cosmetic purposes, but with varying success. Rejection of such devices by the human body, chemists believe, is not due to immune response, as it is with organ transplant rejection, but to interactions between hydrophobic (water-hating or resisting) molecules in the devices and hydrophilic (water-loving, or absorbing) molecules in living tissue. Hydrophobic materials are being widely used in prosthetic devices because they are inert and do not degrade in the body. But gels (chemicals in a state between hydrophobic and hydrophilic) are often chemically grafted onto the devices, to serve as buffers between them and living cells and tissue. Although Dr. Andrade, Dr. Donald Lyman, also at the University of Utah, and other chemists have designed gel-buffered prosthetic devices that work reasonably well, they are now coming up with chemical materials for prosthetic devices that could even surpass the prosthetic-gel buffer approach.

Nonetheless the buffered prosthetic device concept gave Dr. Andrade ideas on how to improve kidney dialysis. Several investigators had tried using activated charcoal to capture waste molecules that ordinarily would not be trapped by the dialysis membrane. Blood from an artery was passed through a capsule containing carbon and then returned, partially cleansed, to the patient's vein. The carbon indeed captured the intended waste molecules, but charcoal, being hydrophobic, damaged the patients' blood cells, which are hydrophilic, as they passed through the charcoal capsule. Dr. Andrade tried refining this technique by encapsulating the carbon molecules with a gel. Experiments with animals show that waste molecules diffuse easily through the gel and adsorb to the charcoal surface, yet the blood cells are not hurt by the charcoal because the gel acts as a buffer.



E. Cherry Doyle

Dialysis membrane—with a bonus.

The gel Dr. Andrade has had the most success with is albumin, a blood protein. "Because it is floating around in the blood, it should be compatible with blood," he says.

The next step now, says Dr. Lyman, is to do more animal studies to see how the improved dialysis technique changes blood chemistry and to determine whether it makes any long-term systemic changes in the animals. Once the technique has been proved both competent and safe on animals, says Dr. Lyman, opportunities for clinical testing should come. Perhaps it would be with an infant, in critical need of quick and safe dialysis. Dr. Lyman is confident that Dr. Andrade's improved dialysis technique will eventually find widespread acceptance in medical practice, and especially help infants in need of kidney dialysis. □

FIGHTING LEPROSY

The armadillo helps

Contrary to common opinion, leprosy is far from a defunct Biblical disease. Some 15 million people throughout the world, and 3,000 in the United States, have the disease in a mild or a progressive form. Although drug treatment to fight the leprosy bacilli can keep the disease reasonably well under control, no treatment has been successful in curing the disease. Patients must take heavy doses of drugs daily for the rest of their lives if they wish to keep the bacteria under control and prevent skin lesions, loss of muscular function and severe limb deformity. Clinicians also find it exceedingly difficult to estimate the right amount of drug dosage to prevent the bacteria from building up resistance to the drug.

Although a few animals have contracted diseases similar to leprosy, none had been successfully infected with human leprosy, necessary in using animals as models for conquering the disease. Now, however, Dr. W. P. Kirchheimer of the U.S. Public Health Service Hospital in Carville, La., has succeeded in infecting an armadillo with human leprosy.

The armadillo developed leprosy about a year after infection. It died four months later from the disease. Dr. Kirchheimer believes other armadillos can now be successfully infected with the disease, and they should prove to be ideal experimental animals for several reasons. They are mammals, with long life spans, which would allow observation of a slowly incubating and recalcitrant disease such as leprosy. They would prove ideal for the testing of various drugs, to find one that in moderate doses would not only control leprosy but also kill the bacteria swiftly. Armadillos also have the unique property of giving birth to four genetically identical babies in each litter (derived from one egg and sperm). An inbred, genetically pure line of infected animals could thus be built up quickly. The inbred line might also allow researchers to determine whether susceptibility to leprosy bacteria is due to a genetic defect in immune response.

The armadillo would also provide a ready source of bacteria for study. Although the leprosy bacillus was discovered in 1873, no one has succeeded in culturing it, and purification of the bacilli is required before a leprosy vaccine can be developed. □