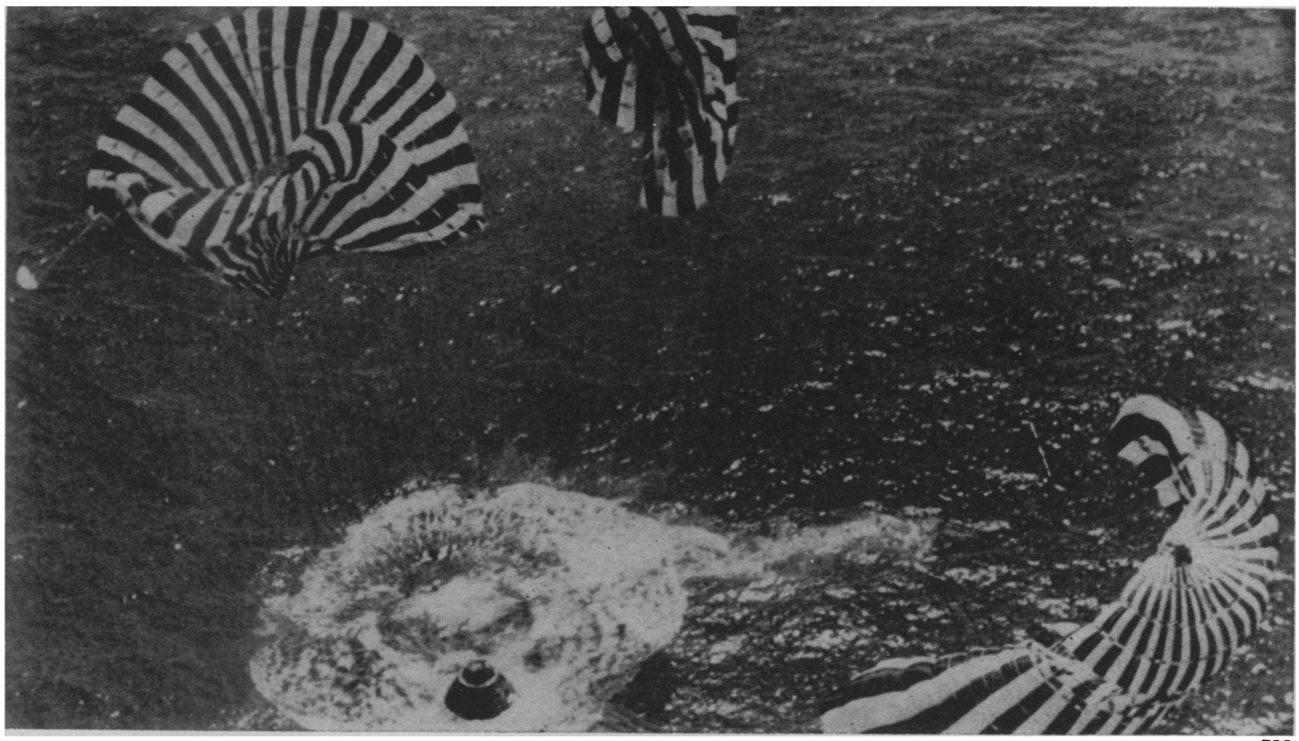


ESS

A mountain of data from the Apennines

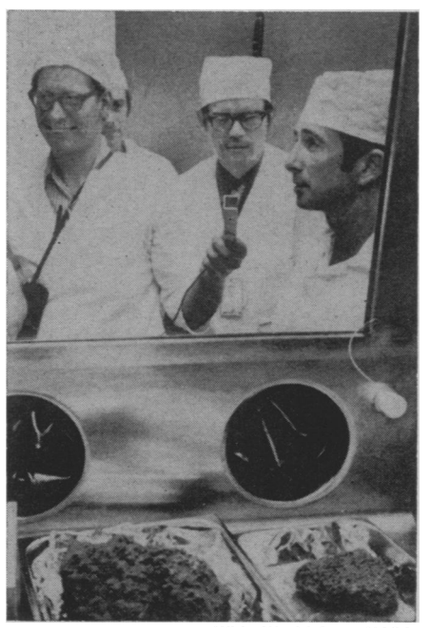
The moon revealed by the Apollo 15 flight is different from that of any previous Apollo mission. It is described, not as cold, stark and foreboding, but as beautiful and spectacular; out of this world, but a little like Sun Valley. "Now we feel a little homesick for it," said Commander David R. Scott.

The astronauts Scott, Alfred M. Worden and James B. Irwin, were safely back in Houston but the work of Apollo 15 was really just beginning.

This week at the Manned Spacecraft Center, the detailed work of unraveling 300 hours in space began. What is in the minds of the astronauts is considered as valuable as what is in the rocks. The men, therefore, will spend their first two weeks back on earth verbally retracing their million-mile journey with engineers, geologists and physicists.

The returned samples began a similar process. At least 28 bags of documented rocks, 14 bags of soil, more than 10 large rocks, sundry selected samples and 11 core samples totaling more than 171 pounds were placed in cabinets with nitrogen atmospheres. After a long day of medical examination and debriefings—a procedure to be repeated every evening for the next two weeks—the crew was on hand for a first look at the rocks.

MSC geologist W. C. Phinney and Lunar Receiving Lab curator Michael B. Duke described the scene as the men got their first look at what they had returned, "We have never before had the kind of description from the lunar surface as we did this time," Phinney said. In the lab the crew was able to recall how far away from the LM the samples were collected, which sides were up, and how many rocks like the samples were seen in that particular area—all important factors in analyzing the significance of the rocks.



Wide World from NASA

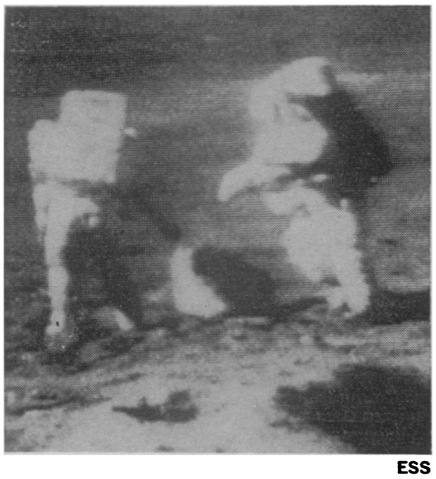
Apollo 15 samples await analysis.

At least 63 bags were returned with one or more rocks in each. The rocks had been photographed from six different positions as they lay on the lunar surface.

Several are of particular interest to the scientists. From descriptions from the lunar surface, the scientists believe that at least two of the rocks could be anorthosites—rocks which on earth are crystallized at great depth. If any of the rocks indeed are anorthosites, they could be part of the moon's original crust. Scott and Irwin also returned the largest lunar rock yet, one that weighs 21 pounds—more than two pounds heavier than the Big Bertha of Apollo 14. The Apollo 15 material not only weighs more than previous Apollo samples but also appears to be more varied and complex.

This week, while the samples were being sorted and processed, at least 1,200 frames of film taken at the site were being developed. Scientists getting their first glimpse were thrilled, "The layering of Hadley Delta Mountain and of the rille shows up much better than we ever expected," says Phinney. Also being processed were more than 5,000 frames taken from lunar orbit.

But the returned samples and pictures were only one part of the mission. "The Apollo program has now achieved the network of stations that we have



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Examining a large rock on the moon.

sought so long," says Dr. Gary Latham of the Lamont-Doherty Geological Observatory. Apollo 15 left behind a third station that forms a triangle with the ALSEP sites still operating from Apollos 12 and 14. One important bit of data has already been received, which leads Dr. Latham to speculate that there may be a layer beginning about 25 kilometers beneath the surface that transmits seismic waves with greater velocity than does the material above it. If this observation is borne out from further seismic observation from the three sites, "this would mean that we have something on the moon equivalent to the crust on the earth," says Dr. Latham.

Other instruments in the Apollo 15 ALSEP site are working but the information will take longer to interpret. The heat flow experiment placed for the first time on the moon showed temperatures of 170 degrees F. at the surface and minus 9.4 degrees F. at a point 50 centimeters below the surface. "This indicates that there is a tremendous attenuation of the surface temperature with depth even over the short distance," says Dr. Marcus E. Langseth, also of Lamont-Doherty. The ALSEP station should continue to provide data for at least two years.

The equipment on the lunar orbiter lasted only for the mission, but the data will take months to interpret. Some preliminary results, however, have already verified what the surface descriptions had revealed: that the moon is more complex and has a stormier past than scientists had expected.

The gamma-ray experiment, for example, has tentatively put to rest one speculation resulting from Apollo 14: that the highlands would be richer than the maria in uranium, thorium and potassium. After orbiting the moon the instrument showed "that the radioactivity [produced by decay of these elements] of the surface layers of the moon is not typically as high as the radioactivity of the Apollo 14 site," says Dr. James R. Arnold of the University of California at San Diego. The X-ray spectrometer, however, did show a marked difference between the highlands and the maria in amounts of aluminum, magnesium and silicon. The highlands are much richer in aluminum than the maria. There is a distinct drop in silicon and aluminum in the maria but the amounts promptly rise again as one climbs out of the maria into the highlands, says Dr. Isidore Adler of the National Aeronautics and Space Administration's Goddard Space Flight Center. The mass spectrometer detected an unusual event on the back side of the moon: A release of carbon dioxide at sunrise at the surface.

Frederick J. Doyle and Dr. Harold Masursky, both of the U.S. Geological Survey, reported some preliminary results from the two cameras that mapped the lunar surface. Although the mean radius of the moon is supposed to be 1,738 kilometers, it appears that only about two places of the moon are really that elevation. Everything else is either higher or lower. On the average the radius on the front side of the moon is two kilometers less than the mean. At one point it is five kilometers less. On the back side, the radius rises to as much as 9.5 kilometers above the mean.

Mascons, or mass concentrations, have been a mystery to geologists since their discovery about three years ago. Preliminary data, says Dr. William L. Sjogren of the California Institute of Technology's Jet Propulsion Laboratory, indicates that the mascon in Mare Serenitatis is 7 to 10 kilometers thick. If this is true "it would imply some kind of crust to support it," he says.

Worden's observations from orbit included evidence of previous volcanic activity and cinder cones (SN: 8/7/71, p. 89). In addition to the volcanic craters he identified in the Maria Serenitatis, Crisium and Smythii, he also saw a great number of lava flows in Mare Imbrium, including the "hot spot" Aristarchus Plateau.

Scientists involved with the Apollo program appear overwhelmed with the amount of scientific data beginning to come from Apollo 15. "I don't know why they are so amazed," says Donald K. Slayton director of flight crew operations. "This is what we had been predicting all along for the J series spacecraft [Apollos 15, 16 and 17]." One scientist put it succinctly: "We knew the crew was exceptional and we had hoped for engineering perfection—that the Rover would work, the orbital instruments would work, and the surface instruments would work. We didn't really expect everything to work. We are just amazed that we are getting what we were promised." □

HORMONES

Adrenal release mechanisms

Speed or amphetamines increase blood pressure, stimulate heart muscles and accelerate heart rate, all of which can produce damaging effects on the body. The drugs cause these reactions by stimulating the release of epinephrine into the blood stream.

Epinephrine, a stress hormone, is secreted by the adrenal medulla and is released into the body during stress (exercise or fear). Using a cow's adrenal gland, Dr. Frederick H. Schneider of the University of Colorado Medical School in Denver has traced what he believes to be the exact mechanism by which this hormone is released. This mechanism is called exocytosis, literally "out of the cell."

The hormone is stored and produced in the chromaffin granules—tiny sacs or vesicles—in the medulla or inner portion of the adrenal gland. During stress the adrenal medulla is stimulated by nearby nerves that release a substance called acetylcholine. It causes charged calcium ions to accumulate in the vicinity, and this aggregation prompts the vesicles to move and cling to the inner surface of the membranes of the cells within the adrenal medulla. When this happens the epinephrine is spilled from the vesicles into the blood stream and the heart is affected.

The American Heart Association reports that Dr. Schneider is now developing a simpler model of exocytosis that uses pure vesicles and pieces of cell membrane—the basics. This will help him to trace the chemical routes through which drugs may affect behavior. For instance, Dr. Schneider

AHA

Schneider: Hormones in a test tube.