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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

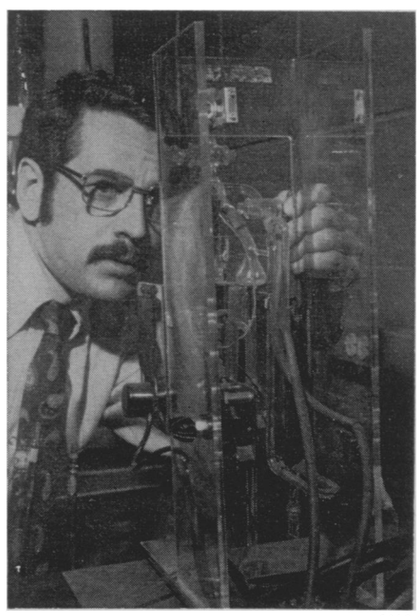
Adrenal release mechanisms

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.

will now be able to test alcohol, barbiturates, cocaine, marijuana and other drugs to see if or how they cause exocytosis in the adrenal gland. And Dr. Schneider's work also offers a promising means of developing and testing agents that may curb or inhibit this exocytosis and therefore the damaging effects of amphetamines and other drugs. □

THE AUTOMOBILE

Is the revolt starting?

There have been growing indications that much of the public is getting fed up with many aspects of a consumer civilization—including especially the automobile, its noise, congestion and air pollution. A revolt may be brewing —with the first skirmish right in the heart of automobile country.

Highland Park, Mich., on the northern edge of Detroit, is a minority group community of 30,000, entirely surrounded by the larger city. It has six north and south streets—which have become major traffic arteries for commuting suburbanites who live to the north and pass through Highland Park on their way to and from work.

As a consequence, says Eduardo Rabel, an engineer with the city's public works department, the quality of life in Highland Park has seriously eroded. So Highland Park decided to do something.

On Aug. 7, Second and Third Avenues, one-way streets that are the major arteries through the small city, were effectively closed off as thoroughfares; the city installed stop signs at every corner of the streets—about 20 initially, says Rabel. Only two of the six streets were left open for through traffic.

Highland Park has a Chrysler Corp. plant within its city limits. But, says Rabel, the citizens demanded an end to the traffic congestion. "They want to bring back neighborhood quality."

The commuter problem in Highland Park has existed since the 1940's, says Mayor Robert B. Blackwell. He says Detroit officials claimed it would be ameliorated with, first, the completion of a north-south freeway in the late 1950's, then, again, with the recent opening of the new Chrysler Freeway. Neither promise materialized, says Blackwell; the freeways, as has been the case elsewhere, simply generated more traffic.

How well the Highland Park experiment will work, no one knows. A city representative said Tuesday that traffic counts will not be taken for two weeks; by then, he hopes, commuters will have realized Highland Park is not the way to go, and they will have chosen other routes. □

IMMUNE RESPONSE

Gestation, aging and cancer

A vaccine is an extract of a foreign microorganism (bacteria or virus). It is injected into a person to produce a protective response (antibodies). Then, if the vaccinated person later comes into contact with the microorganism, the warrior antibodies are already formed, ready to fight the disease.

Such is the philosophy that has led to the development of sundry vaccines for infectious diseases. It is what youngsters learn about vaccines in basic health or biology classes. Yet while research to devise still more viable vaccines along these classic lines continues, scientists are also working on the basic questions: How does a cell recognize a foreign substance (antigen)? How does the cell make antibodies respond to the antigen? Why does the cell sometimes accept (tolerate) the foreign invader?

Some of the latest facts and speculations surrounding these questions, presented at the First International Congress of Immunology in Washington last week, may shed light on several important health problems—immune responses by mothers to their fetuses, aging and cancer.

Some scientists view the fetus as a naturally occurring tissue transplant and wonder how it gets around graft rejection. Dr. Ted Breyere and his team at Sibley Hospital in Washington looked for immune response by rodent mothers against their fetuses and found just the opposite—immune tolerance. Tolerance, Dr. Breyere reported, still eludes definition. Possibly the spleen in the mother produces antibodies (proteins) that coat the placenta, protecting her from fetal antigens (proteins or carbohydrates). To prove it would require isolation of maternal antibodies from the placenta, or of fetal antigens from the amniotic fluid. But that has not yet been achieved.

Dr. Breyere believes that a better understanding of maternal fetal immune tolerance might improve the chance of successful skin grafts and organ transplants. Dr. Breyere found that immediately after giving birth mother rodents accepted skin grafts from their progeny, and these grafts often held for a year.

Dr. Breyere also believes that maternal fetal immune tolerance might reduce eclampsia, a toxic reaction of pregnancy marked by convulsions and coma, which is believed to be a response, perhaps an immune response, of mother against fetus. Eclampsia occurs more often with first pregnancies. This evidence agrees with results of Dr. Breyere's animal studies that maternal tolerance of the fetus increases with the number of offspring produced.

In fact, if maternal fetal tolerance were understood, Dr. Breyere says, it might help control cancer. Both fetuses and cancers, he explains, share the properties of growth and invasion, and antigens found in the fetus and placenta are the same as those produced by some cancers. This statement is underscored by Dr. Phil Gold of McGill University in Montreal, who reported at the meeting that, on the basis of 4,000 biopsies, an antigen specific to colon and rectal cancers was also found in the pancreas, liver and gut of women in their second and third trimesters of pregnancy. Why an antigen specific to colon and rectal cancers is also found in tissue from pregnant women is a pressing question, since efforts are being made to use the antigen for early detection of colon and rectal cancers (SN: 7/31/71, p. 78).

Some scientists at the congress, such as Dr. Roy Walford of the University of California School of Medicine at Los Angeles, believe that chronological aging results when immune defenses break down, eventually leading to disease and death of an organism. Dr. Edmond Yunis of the University of Minnesota at Minneapolis, however, reported that chronological aging (or what he calls primary aging) could be due to either immunological decline, or to total collapse of the genetic apparatus, but that aging associated with disease results from a breakdown of immune response.

Dr. Yunis worked with eight strains of naturally long-lived and short-lived mice. Only the latter showed a decline in antibody production before they lived out their normal life span. This antibody production breakdown resulted from atrophy of the thymus gland. "My work," Dr. Yunis reported, "shows that mice, and probably men as well, are not born with comparable immune defenses. There are mice and men who are old when young and

Sibley Hospital

Breyere: Why mother fetus tolerance?