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SCIENTISTS DISCUSS SOME PRELIMINARY RESULTS OF APOLLO-15

The Apollo-15 moon mission has reaped such a rich harvest of scientific data that scientists say it will take years to reduce and understand it. Nonetheless, the scientific community already has begun to discuss some of the preliminary results of the mission.

For example, although its deep interior is convulsed by monthly quakes, the moon remains outwardly calm. On a planet like earth such quakes might fracture the surface. But there is no visible effect on the moon.

So thick and rigid is the lunar shell that the extent and depth of lunar seismic activity (induced by tidal pull when the moon and earth are at closest approach each month) has been completely disguised until now.

Further, the moon is troubled all the time by swarms of tiny quakes unrelated to tidal strain but of unknown origin. These revelations, called "astounding" by scientists, were reported earlier this month.

They were the most spectacular and unexpected findings among a wealth of new information disclosed by a panel of principal investigators, the scientists who devised experiments for the Apollo 15 mission and the Atomic-Powered Observatory (ALSEP station) left on the moon.

Another significant discovery was that the interior lunar temperature rises with depth, about one degree Fahrenheit per foot. The discovery is based on the first direct measurements of the rate of escape of heat (heat flow) from the moon's interior by a temperature probe inserted to a depth of nine feet (2.7 meters) by Astronaut Scott.

Scientists said lunar heat flow, about one-fifth that of Earth, suggests an abundance of radioactive minerals inside the moon, comparable for its size to the abundance inside Earth.

It further suggests that if the heat-generating radioactive elements (uranium, thorium, etc.) are uniformly distributed throughout the lunar body, the moon is hot at its core. However, if the minerals are not evenly distributed, the lunar core may be relatively cool.

The distribution of radioactive and other metals is a major unanswered question with scientists about equally divided on the issue.

Dr. Gary Latham, seismologist of the Lamont-Doherty Geological Laboratory in New York, said the two distinct kinds of quake activity inside the moon and "the much greater seismic energy release is really a revelation to us."

He said the quake "swarms" -- series of mini-quakes following in rapid succession -- completely escaped detection previously. Their origin and how shallow or deep they are is "still a complete mystery to us."

He speculated they may be triggered by mascons (massive concentrations of denser material beneath the lunar plains) out of balance with the rest of the moon or by "some activity at a great depth" in the moon.

He said a network of seismometers at the Apollo 12, 14 and 15 stations registered this week the largest quake ever recorded on the moon. Its epicenter was 700-800 kilometers below a point 600 kilometers West of the Crater Tycho.

"This great depth," he said, "means the moon's crust is rigid and can support rupture."

On Earth, by contrast, the deepest quakes emenate from 720 kilometers and occur only rarely because rocky material at that depth tends to become viscus and sloshy from heating.

The great depth of lunar quakes (they can be anticipated monthly) is the more startling because the moon is only about one-fourth the size of Earth.

Dr. Latham said the use of sophisticated mathematical formulae, applied to lunar seismic data with computer assistance, brought to light the mini-quakes last April.

Triangulation with the three Apollo stations on the moon permitted pinpointing the depth of the big moon quake, he said, on the moon's Eastern limb.

Dr. Isadore Adler of NASA's Goddard Space Flight Center at Greenbelt, Maryland, said X-ray mapping of the moon by Astronaut Worden discloses that the "highlands are markedly higher in aluminum than the maria (seas or plains)...two or three times greater."

Dr. Marcus Langseth of the Lamont-Doherty Observatory and chief scientist of the Heat Flow Experiment, said measurement of the "quite substantial" rise in temperature with depth inside the moon is important as a "first," but he warned against concluding from the shallow measurements that the lunar core is hot or cold.

Dr. Paul Gast, chief of Planetary and Earth Sciences Studies at NASA's Manned Spacecraft Center at Houston, described the over-all impressions gained from preliminary study of the 171 pounds (76.95 kilograms) of rocks brought back by the Apollo 15 crew:

-- There are essentially two kinds of rocks on the moon. One type is found on the Maria -- dark in color, iron-rich, aluminum-poor, relatively young at about 3.7 thousand million years old. The other type is found in the highlands (mountains) -- light in color, aluminum-rich, iron-poor, much more complex in structure, and older at 4.3 to 4.4 thousand million years.

-- None of the rocks returned by Apollo Astronauts, including Apollo 15 samples, are original moon material. All have been subjected to processes that changed them from their original state.

"Every rock is in some way related to crystallization," he said. "They are not primitive dust." The so-called "genesis" rock is very old but a breccia, that is, a combination of fragments that were something else before forming in its present state. However, he said, it is a most important find because it is almost

pure anorthosite, representing the oldest types of rock yet recovered from the moon.

-- The precise chemical nature, structure, age and other characteristics of Apollo 15 samples must await thorough study by 200 scientific teams around the world.

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