SPACE

Moon Surface Safe?

Analysis of Ranger photographs indicates that the lunar surface can support one ton per square foot, sufficient for Surveyor whose weight will be distributed on its three "feet".

➤ BOTH THE UNMANNED Surveyor spacecraft and the two-man Lunar Excursion Module (LEM) will be able to land safely on the moon without breaking through the crust or sinking down out of sight in a layer of dust, some scientists now believe.

The Surveyor "robot laboratories" will each weigh about 2,450 pounds when they are fully instrumented. Their three round 12-inch "feet" will distribute the weight over about two and a third square feet. Analysis of the lunar photographs taken by the Ranger spacecraft indicates that the moon will support about 2,000 pounds per square foot, so the Surveyors will have plenty of safety margin.

A Surveyor's feet could be as small as 8.65 inches across and still provide adequate support, except that the Surveyors will not make very soft landings. The retrorockets will cut off about 13 feet above the lunar surface, leaving the spacecraft to drop the rest of the way. This will not be nearly as hard on the instruments as it would on earth, however. The moon's one-sixth-normal gravity will make the drop more like a two-foot fall.

The LEM is a much heavier vehicle, weighing about 14 tons. The smallest that each of its four feet could be, even without the shock of landing to contend with, is slightly more than 25 inches.

The design for the footpads has not been permanently set, but the anticipated design is four huge 37-inch bowls, reinforced inside with aluminum honeycombs. Together, these feet could hold up two LEMs combined.

Computed by Dr. Kuiper

The moon's ton-per-square-foot bearing strength was computed by Dr. Gerard P. Kuiper, director of the University of Arizona's Lunar and Planetary Laboratory, Tucson, Ariz. His result was reported to a conference on the Nature of the Surface of the Earth at Greenbelt, Md., by Dr. Ewen Whitaker, also of the Planetary Laboratory.

"Pimples" made when a meteor slammed into the lunar surface gave Dr. Kuiper the clue to how much load the moon could bear.

He calculated this weight as one ton per square foot by measuring the distance of the pimples from the primary crater from which the material causing the pimples was ejected. The smallest of the pimples is only one or two yards across.

Dr. Kuiper based his conclusions on the following:

1. The distribution of the rock (how far it splattered out) from the center of a crater can be measured and its velocity of impact is approximately known.

2. The diameter of the rock can be measured as well as its height above the (surrounding) surface, the solar elevations being known (10 degrees).

3. It may be assumed that the bulk density of the rock is about two on the grounds that material was sufficiently strong and coherent to survive the blast that tossed the rock out of the crater.

4. It seems reasonable to assume that one-half of the buried depth resulted from penetration into the lunar surface and one-half from squashing the rock itself.

Different Picture of Moon

Another and very different picture of the moon was presented to the symposium by Dr. Thomas Gold, Cornell University, Ithaca, N.Y.

He said the moon has a layer of ice some 300 feet deep, bottled up beneath a surface layer of sediment topped by dust. His conclusion is based not only on the Ranger lunar probes but also on observations from earth by radar and light telescopes.

Electrical layers just above the surface caused dust on the high areas of the moon to be gradually eroded away during a long period of time, Dr. Gold reported to the conference.

The conference, attended by 150 lunar experts, was sponsored jointly by the International Astronomical Union and the National Aeronautics and Space Administration's Goddard Space Flight Center.

A Russian scientist, Dr. Boris J. Levin of the USSR Academy of Sciences, Moscow, told the conference that the temperature at the core of the moon is 2200 degrees Fahrenheit.

His calculations of the temperature deep inside the moon are based on the assumption that the moon has the same composition as the meteorites called chondrites, which are visitors from space found on the earth's surface.

If this is true, the interior of the moon is even now partially melted. Volcanic action occasionally brings a slushy lava of crystals and liquids to the surface, forming ash.

Whether this ash is basaltic or acidic was a source of disagreement at the conference. Dr. Levin believes it is basaltic lava.

However, Dr. John O'Keefe of the Goddard Space Flight Center, where the conference is being held in cooperation with the International Astronomical Union, believes it is acidic lava that turns into ash after reaching the surface.

Dr. O'Keefe and Dr. Levin are among the many scientists who think that some kind of vulcanism is inevitable on the moon.

Other scientists believe that the maria, or lunar seas, are formed of dusty sediment sifted down from the high mountain areas.

Most lunar experts at the conference were in agreement that at least 95% of the craters on the moon have been formed by impacting meteorites.

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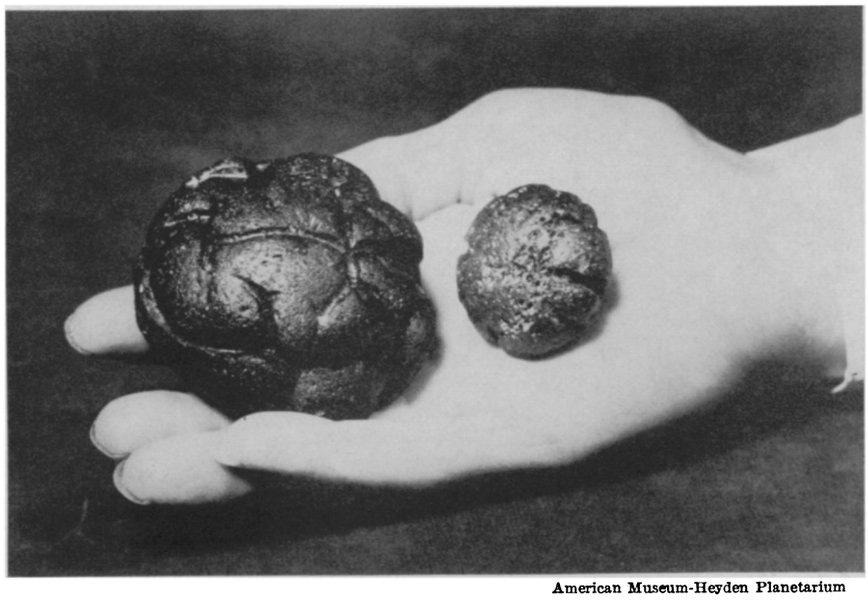

American Museum-Heyden Planetarium

MOON CHIPS?—Tektites, glassy black rocks from space, may provide valuable help in solving spacecraft reentry problems, space scientists believe. On display at the American Museum-Heyden Planetarium, New York, is one of the largest tektites known, found in the Philippines, weighing nearly half a pound. Some scientists say tektites are pieces of the moon, while others believe they were once fragments of the earth's crust.