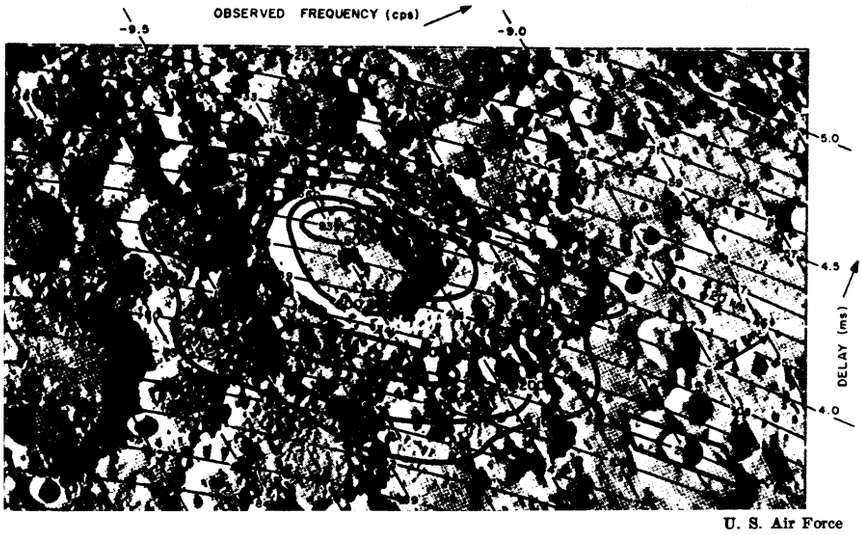

U. S. Air Force

MOON BY RADAR—A portion of one of the first radar maps of the moon, made at the Arecibo Ionospheric Observatory, is shown here. The numbers indicate return signal strengths. Craters Tycho and Heinsius A (lower right) exhibit higher power return of radar beams than do surrounding areas.

GEOPHYSICS

Mercury Rotation Found

By bouncing radar waves from Mercury, a new rotation rate was found, indicating that the same side of the planet does not always face the sun—By Ann Ewing

➤ THE PLANET MERCURY, smallest member of the sun's system, does not rotate so that the same side always faces the sun, as has been believed until now.

This discovery could mean that Mercury was once a companion of Venus and has been in its present orbit for not more than 400 million years, a short time astronomically speaking.

If Mercury's rotation is the same direction as the earth's—toward the east—then it turns on its axis once every 59 days, give or take five. If the rotation is toward the west, called retrograde, then its "day" is 46 days long, also give or take five days.

In either case, the planet does not rotate in the 88 days it takes to revolve once around the sun. The new rotation rate was found by bouncing radar waves from Mercury at Cornell University's Arecibo Ionospheric Observatory in Puerto Rico. The discovery clears up a long-standing puzzle.

The puzzle was that Mercury seemed to have a very even temperature, not one side perpetually cold, the other very hot. Such an even temperature distribution was at odds with a planet that always kept one face to the sun, unless Mercury had an atmosphere.

All available evidence indicates that Mercury does not have a noticeable atmosphere, and the radar studies have removed the necessity for suggesting one. Mercury's surface is likely to be very much like that of the airless moon, the radar studies show.

Drs. Rolf B. Dyce and Gordon H. Pettengill of the Arecibo observatory reported details on their radar observations of Mercury and other planets to the International Scientific Radio Union, which is meeting in Washington, D.C., under the joint auspices of the National Academy of Sciences-National Research Council and the Institute of Electrical and Electronics Engineers.

They said their studies of Mars have shown that one area on the planet having dark markings in visible light reflects radar waves to a much higher degree than the other areas scanned. The region, known as Trivium Charontis, could consist of material more dense than the rest of the planet scanned.

One explanation for the generally low radar returns from Mars could be dust layers, Dr. Thomas Gold, chairman of Cornell's astronomy department, told a news conference in Washington, D.C. The radar was beamed from and the reflected waves detected by the 1,000-foot Arecibo antenna during March, when Mars made a relatively close approach to earth.

Dr. Pettengill reported that the search for radar waves bounced from Jupiter was unsuccessful, although the returns should have been detected if previous Russian reports of picking up radar reflections from Jupiter were correct.

Venus Rotation 247 Days

A new determination of the rotation period of Venus, the most accurate yet made, pins its rotation down to 247 days, plus or minus five days.

Drs. Pettengill and Dyce observed the scattering of radio waves from Venus during a nine-month period centered around June 1964. Echoes of radio waves bounced off Venus were twice as strong as those from the moon.

This suggests, the scientists said, that Venus has either mountainous or irregular regions, because the moon, known to have mountainous regions, returns similar echoes.

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GEOPHYSICS

Young Craters Best For Landing on Moon

➤ IF MAN were to land on the moon within the next month, the best bet for a good spot to touch down would be young craters.

The young craters, which make up only about five percent of the lunar surface, are much more likely to consist of hard rock than the rest of the moon.

Most of the moon's surface is quite porous to a depth of at least ten feet, radar studies have shown.

Details on the first comprehensive map of the moon using radar were reported to the International Scientific Radio Union meeting in Washington, D.C., by Dr. Thomas W. Thompson of Cornell University's Arecibo Ionospheric Observatory in Puerto Rico.

The lunar radar map will be especially useful after the Surveyor instrument package has been landed on the moon.

With the information gathered by Surveyors, earthbound scientists can use the radar maps of the moon to pinpoint other areas similar in composition, possible spots for the manned landing planned for late this decade.

About half of the moon's visible surface has been mapped so far using the 1,000-foot radio telescope near Arecibo. Young craters with bright rays visible at full moon reflect radar waves to a much higher degree than the rest of the lunar surface.

This can be explained if the young craters are localized areas of bare, exposed and compacted rocks, Dr. Thompson said. Since the moon returns only seven percent of the radar energy hitting it, most of the surface strongly absorbs radar waves.

Dr. Thomas Gold, chairman of Cornell University's astronomy department, believes this high absorbency can best be explained by a lunar surface consisting of a very porous material, the top part of which has a "fairy castle" composition. The material below to a depth of at least ten feet would be compressed.

The radar studies have shown that this porous structure is widespread, absent only in small, young craters. The age of lunar craters is not known, but the newest are only a fraction of the one to four billion years of the moon itself.

The research was supported by the Advanced Research Projects Agency of the Department of Defense under a research contract with the Air Force Office of Scientific Research.

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