Most of these spectrograms show a small amount of power reflected diffusely by the disk. Some of them, however, show relatively strong, narrowband reflections, which originate from an area less than 2° in extent about the sub-Earth point.

Figures 1 through 4 are samples of these spectrograms from successive 10° strips of Mars. The narrowband echo is seen to increase, reaching a maximum at 200° to 210° (the region of Trivium Charontis), and then it drops off rather abruptly. One may conclude that there is a very smooth region on Mars, extending 20° to 30° in longitude, and of unknown latitudinal extent.

A similar, but wider band, sequence of echoes was reflected from the 240° to 250° region. Figure 5 is a sample spectrogram.

When data reduction is complete, both returned power and bandwidth will be presented as functions of longitude, and compared to the optical features on Mars. It may also be possible to show some of the regions of stronger reflectivity as functions of time as well.

(Paper 69D12–611)

Recent Arecibo Observations of Mercury

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As the new determination of Mercury's rotation is at variance with four generations of optical work and is not confirmed by JPL workers, it is appropriate to further discuss the Arecibo procedures.

Mercury moved into the Arecibo beam on 11 March 1965 with strongest echoes predicted for 7 April 1965. Although this conjunction should have given echo strengths slightly inferior to the conjunction of May 1964, improvements in receiver noise figure and data handling technique have more than made up for the less favorable geometry.

[1] Operated by Cornell University with the support of the Advanced Research Projects Agency under a research contract with the Air Force Office of Scientifi Research, OAR.

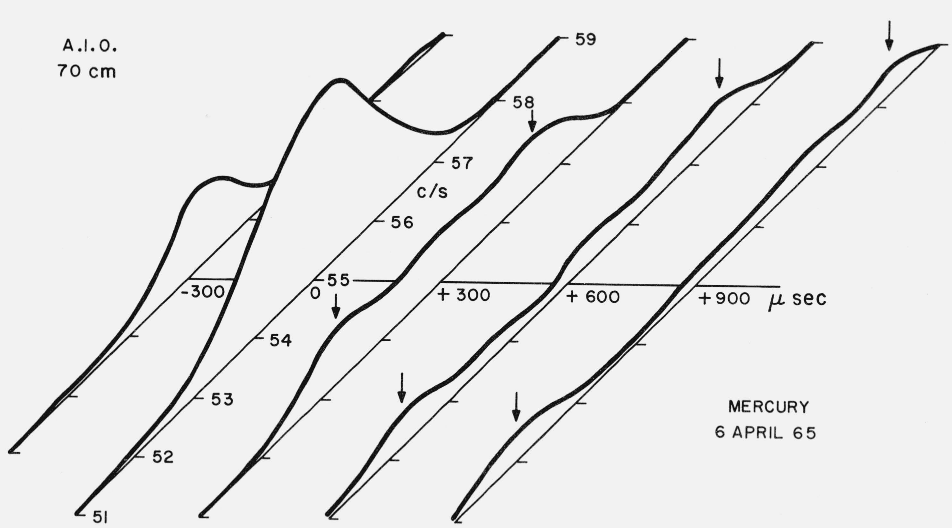

FIGURE 1. *Plot of echo power as a function of relative delay (toward the right) and Doppler frequency shift (diagonally).*

The arrows indicate the "wings", whose separation, when combined with the distance from the echo maximum, gives the instantaneous apparent rotation rate.

Using short pulses (0.5 msec), enough echo strength was available from the planetary surface several pulse widths behind the nearest point to measure the Doppler frequency spectrum at known relative delays.

The procedure is illustrated in figure 1, showing the two humps in the frequency spectrum which arise because of the larger surface area lying at these values of range and frequency. The limb-to-limb Doppler difference and the instantaneous apparent rotation can be computed from the separation in frequency at given time or distance after the maximum echo. An estimate of error in the reading of the data can be obtained from the consistency of several limb-to-limb determinations on a given date.

It is clearly indicated that the accepted synchronous rotation does not fit the radar observations (see review paper in this same issue). The best estimate appears to be a sidereal rotation period of 59 ± 5 days in a direct sense. Fortunately, the measurements can be repeated in August 1965 at a different place along the Mercury orbit.

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Recent Arecibo Observations of Mars and Jupiter

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Mars has been under observation at Arecibo since 19 November 1964 but the strongest returns were obtained during the month of March 1965. The relatively wide frequency spectrum (1300 c/s limb-to-limb) does not permit simultaneous determination of Doppler spectrum and range.

During the most favorable observing period of 1965 the subradar point on Mars traversed a line of Martian latitude of +21°. The radar reflectivity from the surface varies widely (0.03 to 0.13 πr^2) as a function of longitude (see fig. 1). There is a tendency for the strongest echo strength to be associated with dark regions passing near the subradar point, with the remarkable exception of a notch exactly where the tip of Syrtius Major passes the subradar point (277°). The JPL reflectivity variation of 1963 appropriate to a subradar latitude of +13° shows some similarity. Results from JPL 1964 confirm the AIO curve, especially the reflectivity peak near Trivium Charontis.

[1] Operated by Cornell University with the support of the Advanced Research Projects Agency under a research contract with the Air Force Office of Scientific Research, OAR.

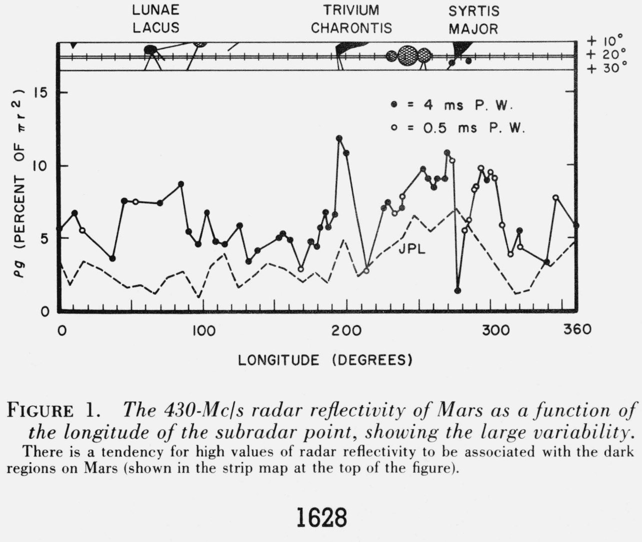

FIGURE 1. *The 430-Mc/s radar reflectivity of Mars as a function of the longitude of the subradar point, showing the large variability.*
There is a tendency for high values of radar reflectivity to be associated with the dark regions on Mars (shown in the strip map at the top of the figure).