No. 42 THE PERIOD OF REVOLUTION OF URANUS' SATELLITE MIRANDA

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ABSTRACT

Using all suitable plates obtained at the 82-inch McDonald reflector, the period of revolution of Miranda is re-evaluated.

From differential measures between Miranda and Oberon on plates taken in 1948 at the Cassegrain focus of the 82-inch McDonald reflector, D. L. Harris (1949) deduced a mean daily motion of 254°.68921 ± 0°.00129 for this faint satellite. This corresponds to a period of 1.413487 ± 0.000007 days. The material used covered an interval of only 9 months. Since then many additional plates have been obtained, mostly by Dr. G. P. Kuiper, for the purpose of a revision of the satellite orbits. Additional series are planned in 1965–66 when the satellite orbits appear nearly on edge. Reference is made to a recent listing of the plates by Kuiper (1961).

In the meantime, an improvement on the period of Miranda can already be made. Many images of this faint satellite are so close to the overexposed image of the planet that their measure is difficult. In all cases, however, approximate estimates of the position-angle relative to the planet can be secured, and since the satellite has described more than 3600 revolutions in the interval 1948–1962, a reliable period can now be obtained.

From the estimated position-angles were deduced the nearest times of maximum southern elongation, or position-angle 180°. In 1948–49 the apparent orbits of the satellites were nearly circular so that the deviation from uniform rotation was small. At the end of the series in 1962, the orbits appeared quite elongated. The four brighter satellites are known to move in a common plane in almost circular orbits. It was assumed that Miranda's orbit was of the same character and that, therefore, intervals of time as a function of position-angle could be deduced from the ephemerides of the other satellites. In column 1 of Table 1 are listed the dates of the observations to 0.01 days, corrected for the light-time, which varies only by a small amount. The estimated position-angles are given in column 2; the 45-degree diffraction rays due to the Cassegrain mirror support assisted in these estimates. The corresponding epochs of elongation in column 3 are expressed in Julian days. Column 4 lists the number of revolutions and column 5 the dates of the southern elongations, computed from 2432611.72 + 1.413555n. The last column shows the residuals in decimal parts of the day. This run is systematic and indicates a period of P = 1.41347 days, confirming the value derived by Harris. As was to be expected, the scatter is somewhat larger in the second part of the table when the orbit was seen more on edge. Possible perturbations from the other satellites

TABLE 1
REPRESENTATION OF THE OBSERVATIONS

U.T.	P.A.	J.D.	n	COMP.	O.-C.
1948 Mar. 1.00	110°	2611.69	0	2611.72	−0.03
Mar. 24.99	120	2635.75	17	2635.75	.00
Oct. 25.32	255	2850.61	169	2850.61	.00
Oct. 27.29	128	2852.09	170	2852.02	+ .07
Oct. 31.35	160	2856.27	173	2856.27	.00
Nov. 6.33	70	2861.90	177	2861.92	− .02
Nov. 7.25	210	2863.37	178	2863.33	+ .04
1949 Feb. 24.05	215	2972.18	255	2972.18	.00
Feb. 26.99	181	2974.99	257	2975.00	− .01
1954 Jan. 29.19	10	4771.72	1528	4771.63	+ .09
1955 Jan. 28.20	185	5136.22	1786	5136.32	− .10
1960 Apr. 15.09	218	7040.33	3133	7040.39	− .06
Apr. 16.00	5	7041.68	3134	7041.80	− .12
1961 Apr. 5.09	184	7395.10	3384	7395.19	− .09
Apr. 7.13	15	7396.73	3385	7396.61	+ .12
1962 Mar. 27.20	195	7751.34	3636	7751.41	− .07
Mar. 29.20	20	7752.83	3637	7752.82	+ .01
Apr. 21.05	355	7775.54	3653	7775.44	+ .10
Apr. 25.05	5	7779.63	3656	7779.68	− .05

were not taken into account, but from the run of the residuals it appears that there is no reason to doubt that the orbit is nearly circular.

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REFERENCES

Harris, Daniel L. 1949, *The Satellite System of Uranus* (Chicago: Doctor's Dissertation).

Kuiper, G. P. 1961, *The Solar System,* Vol. III, (Chicago: University of Chicago Press), p. 587.