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XCII. *On the Periodic Times of Saturn's Rings.*

By HENRY WILDE, D.Sc., D.C.L., F.R.S.*

IN my paper on the "Origin of Cometary Bodies and Saturn's Rings," read before the Society in October last † a new determination was made of the periodic times of the rings, based on the commonly accepted distance of Mimas, 3.36 Saturnian units. This element of the orbit was derived from observations made by Herschel and subsequently adopted by all astronomical writers.

Recent observations of American astronomers with more powerful telescopes and under more favourable conditions, have reduced the distance of Mimas from the planet to 3.16 units, with the consequent increase in the times of rotation of the rings.

The difference between the older and later determinations is sufficiently large to induce me to place on record for comparison the results computed from both observations and Kepler's third law, as shown and demonstrated in the following tables :—

Distances of Mimas = 3.36 and outer edge of ring A = 2.3.

(1) $3.36^3 : 2.3^3 :: 22\text{h. } 37^2\text{m.} : x = 12\text{h. } 48^2\text{m.}$ for A.

Distances of Mimas = 3.36 and inner edge of ring C = 1.27.

(2) $3.36^3 : 1.27^3 :: 22\text{h. } 37^2\text{m.} : x = 5\text{h. } 15^2\text{m.}$ for C.

Distances of Mimas = 3.16 and outer edge of ring A = 2.3.

(3) $3.16^3 : 2.3^3 :: 22\text{h. } 37^2\text{m.} : x = 14\text{h. } 4^2\text{m.}$ for A.

Distances of Mimas = 3.16 and inner edge of ring C = 1.27.

(4) $3.16^3 : 1.27^3 :: 22\text{h. } 37^2\text{m.} : x = 5\text{h. } 45^2\text{m.}$ for C.

The unit distance, 3.16, for Mimas necessarily involves the correlative reduction of the distances of the other Saturnian satellites, as now set forth in the tables of these elements published by American astronomers.

That Saturn's rings are ejectamenta from the interior of the planet is further evident from the fact that no causal connexion subsists between their times of rotation and that of the planet itself, as the inner edge of the ring C has a

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periodic time of only 5 hours 45 minutes, while the axial rotation of Saturn is 10 hours 13 minutes.

The same conclusion may also be drawn with reference to the origin of the two satellites of Mars, as Phobos has a period of only 7 hours 39 minutes, while the axial rotation of the planet is 24 hours 37 minutes.

The comparative minuteness of these bodies, which are estimated to be less than 10 miles in diameter, indicates them as ejectamenta rather than the successive condensations of a nebular substance surrounding the planet.

Saturn's dusky ring and the inner satellite of Mars are the only bodies in the solar system that revolve in a shorter time than their primaries.

ELEMENTS OF SATURN'S RINGS.

Mimas=3·16.

Rings.	Distance from centre of Saturn.		Time of Revolution.	
	Sat. Units.	Miles.	h.	m.
Exterior A	2 30	84,937	14	4
Breadth	0·26	9,602	"	"
Mid-breadth	2·17	80,138	12	51
Interior A	2·04	75,337	11	44
Interval	0 07	2,585	"	"
Exterior B	1·97	72,752	11	8
Breadth	0 47	17,357	"	"
Mid-breadth	1·735	64,073	9	12
Interior B	1·50	55,335	7	23
Exterior C	1·50	55,395	7	23
Breadth	0·23	8,493	"	"
Mid-breadth	1·385	51,148	6	33
Interior C	1·27	46,901	5	45
Ball Space	0 27	9,971	"	"
Sat. Ball	1·00	36,930	10	13
Mimas	3·16	116,698	22	37