|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Elements of the Satellites of Saturn.* | | | | | | | |
|  | Mean  Longitude. | Epoch Greenwich Mean Noon. | Mean Daily Motion. | Mean  Distance. | Eccentricity. | Long. of Pericentre. | Mass  Saturn. |
| Mimas . | 127° 19∙0' | 1889, April | 381∙9945° | 26∙814" | Small | Doubtful | 16,340,000 |
| Enceladus | 199 19∙8 | "" | 272∙73199 | 34·401 | **"** | **II** | 4,000,000 |
| Tethys . | 284 31·0 | " | 190∙69795 | 42∙586 | » | " | 921,500 |
| Dione . | 253 51∙4 | "" | 131∙534975 | 54·543 | »» | **"** | 536,000 |
| Rhea | 358 23∙8 |  | 79∙69oo87 | 76∙170 | " | **"** | 250,000 |
| Titan | 260 25∙1 | 1890, Jan. | 22∙5770093 | 176∙578 | ·02886 | 276° 15' + 31∙7" | 4,700 |
| Hyperion | 304 31 ∙8 |  | 16∙919983 | 213∙92 | ·1043 | 255 47 - 18∙663° | unknown |
| Japetus . | 75 26∙4 | 1885, Sept. 1 | 4∙537997 | 5I4∙59 | ·02836 | 354 30 + 7∙9° | 100,000 |
| Phoebe . | 343 9·0 | 1900, Jan. | -0∙65398 | 1871∙6 | ·1659 | 291 2 — 0∙27°t | unknown |

*Satellites of Saturn.*

Saturn is surrounded by a system of nine or (perhaps) ten satellites. The brightest of these was discovered by Huygens in 1665 while pursuing his studies of the ring. The following table shows the names, distances, times of revolution, discoverer and date of discovery of the nine whose orbits are well established :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name. | Dis-  tance. | Periodic  Time. | Discoverer. | Date of Discovery. |
| **I** Mimas | 3∙1 | **d. h.**  0 23 | W. Herschel | 1789, Sept. 17 |
| 2 Enceladus | 4·0 | 1 9 | " | 1789, Aug. 28 |
| 3 Tethys | 5∙0 | I 21 | G. D. Cassini | 1684, March |
| 4 Dione . | 6∙3 | 2 18 | »» | 1684, March |
| 5 Rhea . | 8∙9 | 4 12 | " | 1672, Dec. 23 |
| 6 Titan .. | 20·5 | 15 23 | Huygens | 1655, Mar. 25 |
| 7 Hyperion . | 25∙1 | 21 7 | W. C. Bond | 1848, Sept. 16 |
| 8 Japetus . | 59·6 | 79 8 | J. D. Cassini | 1671, October |
| 9 Phoebe | . 2o9∙3 | 546 12 | W. H. Pickering | 1898, August |

The five inner satellites seem to form **a** class by themselves, of which the distinguishing feature is that the orbits are so nearly circular that no eccentricity has been certainly detected in them, and that the planes of their orbits coincide with that of the ring and, it may be inferred, with the plane of the planet’s equator. Thus, so far as the position of the planes of rotation and revolu­tion are concerned, the system keeps together as if it were rigid. This results from the mutual attraction of the various bodies. A remarkable feature of this inner system is the near approach to commensurability in the periods of revolution. The period of Tethys is nearly double that of Mimas, and the period of Enceladus nearly double that of Dione. The result of this near approach to commensurability is a wide libration in the longi­tudes of the satellites, having periods very long compared with the times of revolution.

Each of the four outer satellites has some special feature of interest. Titan is much the brightest of all and has therefore been most accurately observed. Hyperion is so small as to be visible only in a powerful telescope, and has a quite eccentric orbit. Its time of revolution is almost commensurable with that of Titan, the ratio of the period being 3 to 4. The result is that the major axis of the orbit of Hyperion has a retrograde motion of 18° 40' annually, of such a character that the conjunction of the two satellites always occurs near the apocentre of the orbit, when the distance of the orbit from that of Titan is the greatest. This is among the most interesting phenomena of celestial mechanics. Japetus has the peculiarity of always appearing brighter when seen to the west of the planet than when seen to the east. This is explained by the supposition that, like our moon, this satellite always presents the same face to the central body, and is darker in colour on one side than on the other.

In studying a series of photographs of the sky in the neighbour­hood of Saturn, taken at the branch Harvard observatory at Are- quipa, Peru, W. H. Pickering found on each of three plates a very faint star which was missing on the other two. He concluded that these were the images of a satellite moving around the planet. The latter was then entering the Milky Way, where minute stars were so numerous that it was not easy to confirm the discovery. When the planet began to emerge from the Milky Way no difficulty was found in relocating the object, and proving that it was a ninth satellite. Its motion was found to be retrograde, a conclusion confirmed by Frank E. Ross. This phenomenon may be regarded as unique in the solar system, for, although the motion of the satellite of Neptune is retrograde, it is the only known satellite of that planet.

Another extremely faint satellite has probably been established by Pickering, but its orbit is still in some doubt.

The conclusions from the spectrum of Saturn, and numerical particulars relating to the planet, are found in the article Planet.

The planes of the orbits of the inner six satellites are coincident with the plane of the ring system, of which the elements are as follow :

|  |  |
| --- | --- |
| Longitude of ascending node on ecliptic . | 167° 43' 29" |
| Inclination | 28° 10' 22" |
| Exterior diameter of outer ring, in miles | 166,920 |
| Interior „ „ „ . . | 147,670 |
| Exterior „ inner ring „ | 144,310 |
| Interior „ „ „ . . | 109,100 |
| Interior „ dark ring „ | 91,780 |
| Breadth of outer bright ring „ . . | 9,625 |
| Breadth of division between the rings, in miles | 1,680 |
| Breadth of inner bright ring „ . | 17,605 |
| Breadth of dark ring „ . | 8,660 |
| Breadth of system of bright rings „ . | 28,910 |
| Breadth of entire system of rings „ . | 37,570 |
| Space between planet and dark rings „ . | 9,760 (S. N.) |

SATURNIA (mod. *Saturnia}i* an ancient town of Etruria Italy, about 23 m. N.E. of Orbetello and the coast. Dionysius of Halicarnassus enumerates it among the towns first occupied by the Pelasgi and then by the Tuscans. A Roman colony was conducted there in 183 b.c., and it was a *praefectura,* but other­wise little is known about it. Remains of the city walls, in the polygonal style, still exist, to which Roman gates were added. Roman remains have also been discovered within the town, and remains of tombs outside, originally covered by tumuli, which have now disappeared, so that Dennis wrongly took them for megalithic remains. Pitigliano, some 12 m. to the S.W., is another Etruscan site.

See G. Dennis, *Cities and Cemeteries of Etruria* (London, 1883), i. 496; ii. 275; A. Pasqui in *Notizie degli scavi* (1882), 52.

(T. As.)

SATURNIAN METRE (Lat. *Saturnius, i.e.* which relates to Saturn), the name given by the Romans to the crude and irregular measures of the oldest Latin folk-songs. The scansion is generally of the following type:

υ-υ^∙u∙^υ

with which Macaulay compares the nursery rhyme, “ The Queen was in her parlour, eating bread and honey.” There was, however, considerable licence in the scansion, and we can gather only that the verse was generally of this type, and had a light and vivacious movement. It occurs in a few inscriptions (the verses on the tombs of the Scipios: cf. Bücheler, *Anfhologia Latina,* 1895) in fragments, Livius Andronicus and the *Bellum Punicum* of Naevius. Subsequently it was ousted by Greek metres. The question as to whether it depended upon accent or upon quantity has been much discussed.

See Keller, *Der saturnische Vers* (Prague, 1883 and 1886) ; Thumeysen, *Der Saturnier* (Halle, 1885); Havet, *De saturnio Latinorum υersu* (Paris, 1880) ; Müller, *Der saturnische Vers und seine Denkmäler* (1885) ; Leo, *Der saturnische Vers* (1905); Du Bois, *Stress Accent in Roman Poetry* (New York, 1906); also Mommsen, *Hist. of Rome,* i. chap. xv.

SATURNINUS, LUCIUS APPULEIUS, Roman demagogue. As quaestor (104 B.c.) he superintended the importation of com at Ostia, but had been removed by the Senate (an unusual proceeding), and replaced by M. Aemilius Scaurus *(q.v.),* one of the chief members of the government party. He does not appear to have been charged with incapacity or mismanagement,