ciple into a doctrine, and elaborated each their system, differing only from one another in minor details, and all agreeing to place the Earth in the centre of the world which their imagination created.

Of all these systems, the most famous, and the one which enjoyed the longest term of favour, is that of PTOLEMÆUS, a philosopher of the Alexandrian School, who accomplished his life-work about the years 139–161 of the Christian Era, and who profited largely by the observations of HIPPARCHUS, a great Greek astronomer flourishing 300 years before him.*

Ptolemæus represents the celestial vault as a solid and material whole. What he entitles the *primum mobile* consists of a sphere of crystal animated by a continuous and uniform movement. In this movement, the sphere of crystal involves not only the stars, sparkling points set in its concavity, but, moreover, a certain number of inferior spheres which, in their course, include and conduct the planets, the Sun and the Moon. The star-gemmed sphere revolves around the Earth in 24 hours. The Sun and Moon travel in movable orbits, which they traverse, the one in 365, the other in 28 days. More complex, indeed, are the planetary movements : these stars do not simply describe circles in their sphere ; each also circles round an imaginary centre which, in its turn, is constrained to accomplish a circular orbit—a movement whose track is a curve—forming a series of *knots* or *epicycles*, which correspond in some degree to the apparent motions of the planets. Jupiter has 12, Saturn 19 epicycles ; and so on.†

* [The truth is, we owe almost all our knowledge of Hipparchus, justly styled " the first and greatest of Greek astronomers," to the statements concerning him in the writings of Ptolemæus. He appears to have been a Bithynian, who flourished about B.C. 160–145, and devoted himself with intense enthusiasm to astronomical pursuits. It was he who drew up the first catalogue of stars, assigning to those he numbered their places and magnitude. For an account of his labours in the cause of science, see Delambre, " Histoire de l'Astronomie Ancienne ;" and Sir G. Cornewall Lewis, " On the Astronomy of the Ancients."]

† [On this theory of Epicycles a vast amount of unnecessary ridicule has been lavished. " The common notion," says Professor de Morgan, " is, that it was a cumbrous and useless apparatus, thrown away by the moderns, and originating in the Ptolemaic, or rather Plutonic, notion, that all celestial motions must either be circular and uniform motions, or compounded of them. But, on the contrary, it was an elegant and most efficient mathematical instrument, which enabled Hipparchus and Ptolemy to represent and predict much better than their predecessors had done ; and it was probably at least as good a theory as their instruments and capabilities of observation required or deserved. And many readers will be surprised to hear that to this day the modern astronomer resolves the same notions into epicyclic ones. When the latter expresses a result by series of sines and cosines (especially when the angle is a mean motion or a multiple of it), he uses epicycles ; and for one which Ptolemy scribbled on the heavens, to use Milton's phrase, he scribbles on twenty. The difference is, that the ancient believed in the necessity of these instruments, the modern only in their convenience ; the former, used those which do not sufficiently represent actual phenomena, the latter knows how to choose better ; the former taking the instruments to be the actual contrivances of nature, was obliged to make one set explain everything ; the latter will adapt one set to latitude, another to longitude, another to distance. Difference enough, no doubt ; but not that sort of difference which the common notion supposes."— PROFESSOR DE MORGAN, article " Ptolemæus," in Dr. Smith's " Dictionary of Greek and Roman Biography and Mythology," vol. iii. p. 576.]