stars; and thus the moon describes a different path among the stars in every successive revolution, and her path, as well as her velocity, is constantly variable.

Hipparchus, however, reduced the motions of the moon to rule and to Tables, as he did those of the sun, and in the same manner. He determined, with much greater accuracy than any preceding astronomer, the *mean* or average equable motions of the moon in longitude and in latitude; and he then represented the anomaly of the motion in longitude by means of an eccentric, in the same manner as he had done for the sun.

But here there occurred still an additional change, besides those of which we have spoken. The Apogee of the Sun was always in the same place in the heavens; or at least so nearly so, that Ptolemy could detect no error in the place assigned to it by Hipparchus 250 years before. But the Apogee of the Moon was found to have a motion among the stars. It had been observed before the time of Hipparchus, that in 6585⅓ days, there are 241 revolutions of the moon with regard to the stars, but only 239 revolutions with regard to the anomaly. This difference could be suitably represented by supposing the eccentric, in which the moon moves, to have itself an angular motion, perpetually carrying its apogee in the same direction in which the moon travels; but this supposition being made, it was necessary to determine, not only the eccentricity of the orbit, and place of the apogee at a certain time, but also the rate of motion of the apogee itself, in order to form tables of the moon.

This task, as we have said, Hipparchus executed; and in this instance, as in the problem of the reduction of the sun's motion to tables, the data which he found it necessary to employ were very few. He deduced all his conclusions from six eclipses of the moon.[3] Three of these, the records of which were brought from Babylon, where a register of such occurrences was kept, happened in the 366th and 367th years from the era of Nabonassar, and enabled Hipparchus to determine the eccentricity and apogee of the moon's orbit at that time. The three others were observed at Alexandria, in the 547th year of Nabonassar, which gave him another position of the orbit at an interval of 180 years; and he thus became acquainted with the motion of the orbit itself, as well as its form.[4]

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[3] Ptol. *Syn.* iv. 10.

[4] Ptolemy uses the hypothesis of an epycicle for the moon's first inequality; but Hipparchus employs an eccentric.