Maimonidean Calendrical Astronomy

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In medieval times, the Ptolemeic model was used to predict the positions of the sun, moon and planets. Al-Battani, and other Islamic experts, improved these astronomical calculations, and also developed criteria for visibility of the first crescent.

In classical times, the Hebrew lunisolar calendar was based on observation, as is still the practice among Karaite Jews today. This was replaced by an arithmetic calendar among Rabbinites. Nevertheless, Maimonides devoted several chapters of his magnum opus to the calculation of visibility.

We compare the accuracy of Maimonidean theory--believed to have been based on that of al-Battani, with that of the *Sûrya Siddhanta* (c. 1000) in India and with modern astronomical calculations. We will see, for example, that the periodic error in Maimonides' calculation of solar longitude is about half that of the Hindu, with a maximum of approximately 8 arcminutes. (There is also a significant mean error.) Near the time of the phasis, which is all that Maimonides was interested in, the periodic error in lunar longitude can reach 6 arcminutes.

By separating out various elements of the theory, one can determine the impact of different sources of error, and of suggested corrections. It turns out, for instance, that stepped trigonometric tables have negligible impact, while inaccuracy of the equation of time is the main source of error in the Hindu determination of sunrise.