

HISTORICAL PERSPECTIVES*

IBN AL-SHATIR : ASTRONOMER

'Ala Al-din 'Ali ibn Ibrahim ibn Al-Shatir al-Muwaqqit, Arabian trigonometrist, lived from March 1306 until 1375 A.D.; he died in Damascus. His work progressed in Damascus where he was Muezzin at the great Mosque Jami' al-Umawi.

George Sarton, Science Historian at Harvard University, stated that Ibn Al-Shatir is considered one of the outstanding astronomers of his time. He made valuable astronomical observations and wrote a special treatise, *Rasd ibn Shatir* (Observatory of Ibn Shatir), concerning them. He devised astronomical instruments and wrote various treatises explaining their structure and use. With regular and precise observations, Ibn Al-Shatir investigated the motion of the celestial bodies and determined at Damascus the obliquity of the ecliptic to be 23 degrees 31 minutes in 1364 A.D. (The correct value extrapolated from the one at present time is 23 degrees 31 minutes and 19.8 seconds.)

In Ibn Al-Shatir's book entitled *A Text of Final Inquiry in Amending the Elements*, the Ptolemaic eccentric deferent was eliminated completely and a second epicycle was introduced. Both the solar and lunar models are non-Ptolemaic, and what is of greatest interest is that the lunar theory is identical with that of Copernicus (1473-1543 A.D) except for trivial differences in parameters.

Ptolemy assumed a circular path for the sun, but the orbit of Ibn Al-Shatir's sun deviated slightly from a circular motion. The major fault of the Ptolemaic lunar model is its exaggeration of the variation in lunar distance. The major Copernican contribution to the lunar theory consisted in the elimination of this Ptolemaic fault.

There is no trace of the heliocentric concept in the treatise of Ibn Al-Shatir. Al-Shatir and Copernicus were compatible in their idea of utilizing only those celestial motions constructible by combination of uniform circular motions.

There is much similarity between the models of Ibn Al-Shatir and those of Copernicus, both systems composed of constant-length vectors rotating at a constant angular velocity. These astronomers abandoned the Ptolemaic equality; the lengths of corresponding vectors in the two systems are, however, nearly equal and are in many cases identical.

During the period in history when the "dark ages" prevailed in the West, and when Muslim princes, religious groups, and rich patrons rivaled one another in commissioning the translation of ancient works and the writings of new scholars, Ibn Al-Shatir's work can be seen to be a significant contribution to trigonometry performed while he was Muezzin in the Mosque.

Brief historical perspectives of significant Arab scientists constitute a regular feature of the ARABIAN JOURNAL FOR SCIENCE AND ENGINEERING. The AJSE staff wishes to acknowledge gratefully the assistance of Dr. Ali A. Daffa', Chairman of the Mathematics Department at the University of Petroleum and Minerals, for providing this commentary on Ibn Al-Shatir.