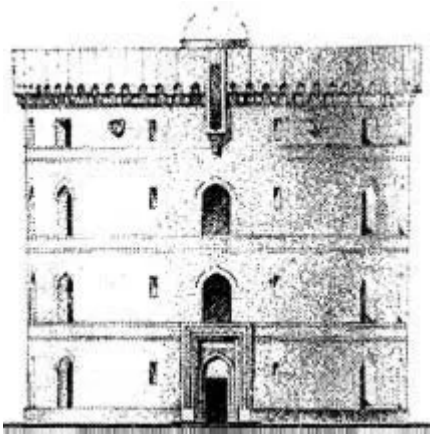
Astronomy

Astronomy

Published: 2002



Some intellectual sciences were developed as a direct result of Muslims needs to fulfill the rituals and duties of worship. Performing formal prayers, fasting as well as other Islamic duties requires that Muslim faces and visit Ka'ba, the house of Abraham in Mecca. This is known as "Qibla." To find Qibla from any part of the globe, Muslims invented the compass and developed the sciences of geography and geometry.

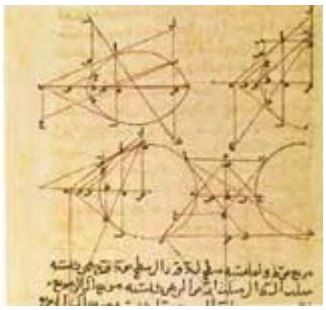
Furthermore, fulfillment of the former prayer and fasting also require knowing the times of each duty. Because the prayer and fasting times are marked by an astronomical phenomenon, the science of astronomy underwent a major development. For example, the Muslim's first prayer of the day starts at dawn. Because dawn for each part of the globe is different, a timetable system good for all parts of the globe was invented. Similarly, the second prayer begins at noon, the third prayer starts exactly afternoon, the fourth prayer begins just after sunset and the final prayer time is at dusk. Timetables marking prayer times for each region of the globe flooded the Muslim world in fulfillment of their faith.

Another major Muslim duty that was a key to developing astronomy further was the determination of the beginning and the ending of the lunar months for fasting, pilgrimage and the Islamic holidays. These events and much more are marked by certain days of the months of the lunar calendar. For example, Ramadan is the 9th month of the lunar calendar. Pilgrimage to Mecca

starts in the first of Thu al Hijjah (the 11th month) and lasts for ten days ending in the Great Feast of Sacrifice.

Maragha Observatory, 1257 CE. Directed by Nasir al-Din al-Tusi

The duty of the Pilgrimage to Mecca, that each Muslim must make at least once in his or her lifetime, is directly responsible for the development of the science of geography. Muslims from as far as Malaysia and Indonesia, from Europe and Africa, found their ways to Mecca. Arab pilots and the wealth of geographical maps and books developed in the period from the 6th century to the 15th century, were the engine from which the European discoveries of the 15th century were made. Ibn Battutah's 14th century masterpieces provided a detailed view of the geography of the ancient world.



As in the other sciences, astronomers in the Muslim lands built upon and greatly expanded earlier traditions. At the House of Knowledge founded in Baghdad by the Abbasid caliph Mamun, scientists translated many texts from Sanskrit, Pahlavi or Old Persian, Greek and Syriac into Arabic, notably the great Sanskrit astronomical tables and Ptolemy's astronomical treaties, the Almagest. Muslim astronomers accepted the geometrical structure of the universe that was expounded by Ptolemy. He stated that the earth rests motionless near the center of a series of eight spheres which encompass it but then faced the problem of reconciling the theoretical model with Aristotelian physics and physical realities derived from observation.

Some of the most impressive efforts to modify Ptolemaic theory were made at the observatory founded by Nasir al-Din Tusi in 1257 at Maragha in northwestern Iran. His work was continued by his successors at Tabriz and Damascus. Later, with the assistance of Chinese colleagues, Muslim astronomers worked out planetary models that depended solely on combinations of uniform circular motions.
The astronomical tables compiled at Maragha served as a model for later Muslim astronomical efforts. The most famous imitator was the observatory founded in 1420 by the Timurid Prince, Ulughbeg at Samarkand in Central Asia, where the astronomer Ghiyath al-Din Jamshid al-Kashi worked out his own set of astronomical tables. He used sections on diverse computations and eras, the knowledge of time, the course of the stars, and the position of the fixed stars to determine his tables. Essentially Ptolemaic, these tables have improved parameters and structure as well as additional material on the Chinese Uighur-calendar. They were widely admired and translated even as far away as England, where John Greaves, professor at Oxford, called attention to them in 1665.

An example of a Muslim astronomer was Abu Rayhan Muhammad ibn Ahmad al-Biruni (973 – 1048), who was a Persian Muslim polymath of the 11th century. His experiments and discoveries were as significant and diverse as those of Leonardo da Vinci or Galileo.

Abu Rayhan Muhammad ibn Ahmadal-Biruni (973 – 1048) five hundred years before the Renaissance. Al-Biruni was well-known in the Muslim world. He was a scientist, an

Astronomers Working with an Armillary Sphere, MS Illustration from Shāhnāmeh (Book of the King of Kings), Turkey, Sixteenth Century

The armillary sphere, an observational structure designed to represent the great celestial circles such as the equator, the horizon, the meridian, the tropical and polar circles, and the solar path, dates back to the Alexandrine Greeks of the second century AD. As they did with other ancient devices, the Muslims added refinements to the sphere. This illustration from a sixteenth-century Ottoman manuscript shows a giant device containing the fundamental circles; it is being used out-of-doors. The inner circle of the meridian ring could be rotated to provide measurements of solar altitudes and the angle of the sun's path.

anthropologist, an astronomer, an astrologer, an encyclopedist, mathematician, pharmacist, philosopher, and historian. George Sarton, the father of the history of science, described al-Biruni as:

“One of the very greatest scientists of Islam, and, all other considered, one of the greatest of all times.” – George Sarton, Introduction to the History of Science, Vol. 1, p. 707

A. I. Sabra desribed al-Biruni as:
“One of the great scientific minds in all of history.” – A. I. Sabra, Ibn al-Haytham, Harvard Magazine, September-October 2003.

Al-Biruni also commented on the eclipse of the moon. There is a crater on the moon named after him. Encyclopedia Britannica said this about al Biruni:
“…in full Abu ar-Rayhan Muhammad ibn Ahmad al-Biruni Persian scholar and scientist, one of the most learned men of his age and an outstanding intellectual figure….Possessing a profound and original mind of encyclopaedic scope, al-Biruni was conversant with Turkish, Persian, Sanskrit, Hebrew, and Syriac in addition to the Arabic.”