Geometry

Geometry

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The greatest scientific contribution Muslims made to the world is the creation of mathematical science. Algebra, geometry, algorithm and arithmetic are at the heart of every scientific and social aspect of life. There is hardly a single device, business entity, industry, architecture built without the Arabic numerals, the decimal point, the sign and cosine, the ruler and the compass, all of which are Islamic inventions.

Many of the intellectual sciences Muslims developed were a direct result of the Qur'anic inspirations and of their need to fulfill the rituals and duties of worship. The Islamic duty of Zakah or alms giving, and the distribution of properties in a will are deleted a word examples of the duties that laid the foundation of geometry and arithmetic.

A Muslim is to give annually in charity and in taxation detailed amounts of currency and/or crops. Figuring out the exact distribution of Zakah and property distrbution of the well off do not come without complicated math. Each commodity requires precise scaling and percentage.

For example, for an acre of an irregular piece of land deleted a word to be split among a family of two boys and two girls, with the male share twice as that of the girl, a complicated formula and exact geometry of the land must take place before this duty is accomplished. Thus, mathematics and geometry came into existence.

The prominent historian, De Vaux , in his book, "The Philosophers of Islam" said:

…they (Muslim Philosophers) were indisputably the founders of plane and spherical geometry.

He further stated:

By using ciphers, (Arabic for zero) the Arabs became the founders of the arithmetic of everyday life; they made algebra an exact science. The Arabs kept alive higher intellectual life and the study of science in a period when the Christian West was fighting desperately with barbarism.

According to Gerard De Vaucouleurs, in his book, Discovery of the Universe, Page 35. Al Battani, (939-998) was a great astronomer and mathematician. He published an original Almagest and developed the science of trigonometry and discovered the inequality in the moon's motion known as the variation.

Gerard De Vaucouleurs, further said:

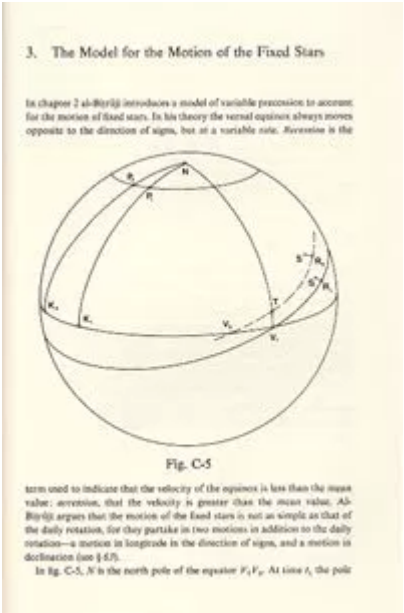
Abattani made new observations for the sun's position, improved the value of the tropical year, rectified Ptolemy's precession constant and measured the obliquity of the elliptic with care. He introduced the sine into trigonometry.

Albattani composed a work on astronomy, with tables, containing his own observations of the sun and moon and a more accurate description of their motions than that given in Ptolemy's "Almagest". In it moreover, he gives the motions of the five planets, with the improved observations he succeeded in making, as well as other necessary astronomical calculations.

Some of his observations mentioned in his book of tables were made in the year 880 and later on in the year 900. Nobody is known in Islam who reached similar perfection in observing the stars and scrutinizing their motions.

Ibn al-Haytham

Proving Elliptical Orbits 12th Century



3. The Model for the Motion of the Fixed Stars

In chapter 2 al-Bitrūjī introduces a model of variable precession to account for the motion of fixed stars. In his theory the vernal equinox always moves opposite to the direction of signs, but at a variable rate. *Recession* is the

Fig. C-5

term used to indicate that the velocity of the equinox is less than the mean value; *accession*, that the velocity is greater than the mean value. Al-Bitrūjī argues that the motion of the fixed stars is not as simple as that of the daily rotation, for they partake in two motions in addition to the daily rotation—a motion in longitude in the direction of signs, and a motion in declination (see § 6.7).

In fig. C-5, N is the north pole of the equator V_1V_2. At time t_1 the pole

Model for the Motion of the Fixed Stars – al Bitruji

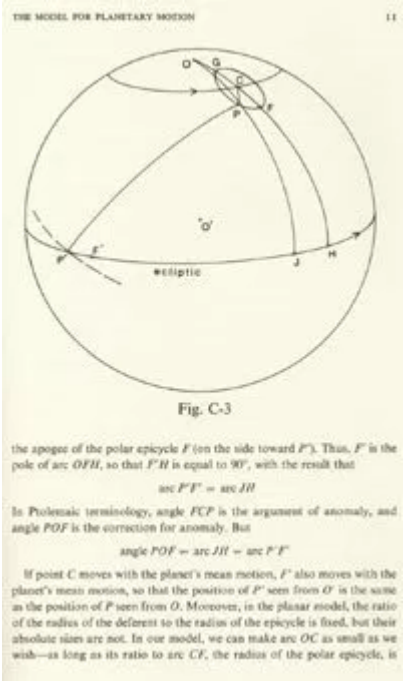


Fig. C-3

the apogee of the polar epicycle F (on the side toward P'). Thus, F' is the pole of arc OFH, so that $F'H$ is equal to 90°, with the result that

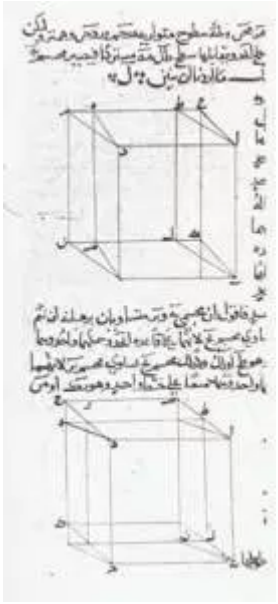
$$\text{arc } P'F' = \text{arc } JH$$

In Ptolemaic terminology, angle FCP is the argument of anomaly, and angle POF is the correction for anomaly. But

$$\text{angle } POF = \text{arc } JH = \text{arc } P'F'$$

If point C moves with the planet's mean motion, F' also moves with the planet's mean motion, so that the position of P' seen from O' is the same as the position of P seen from O. Moreover, in the planar model, the ratio of the radius of the deferent to the radius of the epicycle is fixed, but their absolute sizes are not. In our model, we can make arc OC as small as we wish—as long as its ratio to arc CF, the radius of the polar epicycle, is

al-Haytham



Arabic Study of Geometric Elements of Euclid

Al_kindi_1 (801-873)

Al Sufi (903-986)

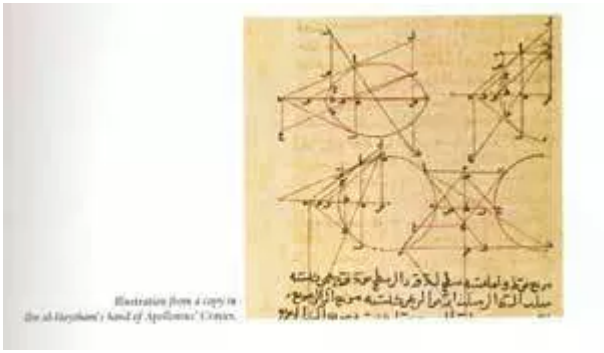
Al_kindi_1 (801-873)

Al-haitham – d1040

Al-batani (939-998)

Al-kahwarizmi-12th-Century

Abul-wafa-10th-Century



Model of Planetary Motion – al Bitruji