

Muslim Contributions That Changed the World

Astrolabe

Astrolabes, originally thought to be invented in the Hellenistic world in 150 BC, were further developed by Muslim astronomers, by introducing angular scales and adding circles indicating azimuths on the horizon. It was widely used throughout the Muslim world, chiefly as an aid to navigation and as a way of finding the Qiblah (Muslim direction of prayer facing Makkah). The first person credited with building the astrolabe in the Muslim world is reportedly the 8th century mathematician Muhammad Al-Fazari. Astrolabes were used to find the times of sunrise and the rising of fixed stars, to help schedule morning prayers. In the 10th century, Abd Al-Rahman Al-Sufi first described over 1,000 different uses for an astrolabe, in areas as diverse as astronomy, astrology, horoscopes, navigation, surveying, timekeeping, Muslim prayer, Qibla, etc. Astrolabes were introduced to Europe in the early 1100s and had become the most popular astronomical instrument by 1650.

Trigonometry

Trigonometry remained largely a theoretical science amongst the Greeks. It was developed to a level of modern perfection by Muslim scholars, although the weight of the credit must be given to Al-Battani. The words describing the basic functions of this science: sine, cosine and tangent – are all derived from Arabic terms. Thus, original contributions by the Greeks in trigonometry were minimal.

Algebra

Muslim mathematicians, the inventors of algebra, introduced the concept of using letters for unknown variables in equations as early as the 9th century A.D. Through this system, they solved a variety of complex equations, including quadratic and cubic equations, and equations with letters such as the now familiar x and y's. They used symbols to develop and perfect the binomial theorem. The word "algorithm" comes from mathematician Al-Khwarizmi, known as the father of Algebra. 'Algebra' is from the Arabic word for equation (Al-Jabr).

Astronomy

Muslim astronomers made numerous improvements upon Ptolemy's findings as early as the 9th century. They were the first astronomers to dispute his archaic ideas. In their critic of the Greeks, they synthesised proof that the sun is the centre of the solar system and that the orbits of the Earth and other planets might be elliptical. They produced hundreds of highly accurate astronomical tables and star charts. Many of their calculations are so precise that they are regarded as contemporary. The Alphonsine Tables are little more than copies of works on astronomy transmitted to Europe via Islamic Spain; specifically, the Toledo Tables.

Optometry

Ibn Firnas of Islamic Spain invented eyeglasses during the 9th century, and were manufactured and sold throughout Spain for over two centuries. Any mention of eyeglasses by Roger Bacon was simply a regurgitation of the work of Al-Haytham (d. 1039), whose research Bacon frequently referred to.

Matter

The concept of the finite nature of matter was first introduced by Muslim scholar Al-Biruni. He discovered that, although matter may change its form or shape, its mass always remains the same. Thus, for instance, if water is heated to steam; if salt is dissolved in water etc., the total mass remains unchanged. The principles of this discovery were elaborated centuries before by Islamic Persia's great scholar, Al-Biruni (d. 1050). Lavoisier was a disciple of the Muslim chemists and physicists and referred to their books frequently. Antoine Lavoisier later introduced these principles to Europe during the 18th century.

Gunpowder

The Chinese developed saltpetre ("Chinese snow") for use in fireworks and knew of no tactical military use for gunpowder, nor did they invent its formula. Research by Reinuad and Fave has clearly shown that gunpowder was formulated initially by Muslim chemists. Furthermore, these historians claim that the Muslims developed the first fire-arms. Notably, Muslim armies used grenades and other weapons in their defence of Algericus against the Franks during the 14th century. Jean Mathes indicates that the Muslim rulers had stock-piles of grenades, rifles, crude cannons, incendiary devices, sulfur bombs and pistols decades before such devices were used in Europe. The first mention of a cannon was in an Arabic text around 1300 A.D.; Roger Bacon learned of the formula for gunpowder from Latin translations of Arabic books.

Geography

Muslim geographers produced untold volumes of books on the geography of Africa, Asia, India, China and the Indies during the 8th through to the 15th century. These writings included the world's first geographical encyclopaedias, almanacs and road maps. Ibn Battutah's 14th century masterpieces provide a detailed view of the geography of the ancient world. The Muslim geographers far exceeded the output by Europeans regarding the geography of these regions well into the 18th century.

Pendulum

The pendulum was discovered by Ibn Yunus Al-Masri during the 10th century, who was the first to study and document its oscillatory motion. Its value for use in clocks was introduced by Muslim physicists during the 15th century.

Navigation

Muslim geographers and navigators learned of the magnetic needle, possibly from the Chinese, and were the first to use magnetic needles in navigation. They invented the compass and passed the knowledge of its use in navigation to the West. European navigators relied on Muslim pilots and their instruments when exploring unknown territories. Gustav Le Bon claims that the magnetic needle and compass were entirely invented by the Muslims and that the Chinese had little to do with it. Neckham also states that the Chinese probably learned of it from Muslim traders. It is noteworthy that the Chinese improved their navigational expertise after they began interacting with the Muslims during the 8th century.

Glass Mirrors

Glass mirrors were in use in Islamic Spain as early as the 11th century. The Venetians learned of the art of fine glass production from Syrian artisans during the 9th and 10th centuries.

Clocks

A variety of mechanical clocks were produced by Spanish Muslim engineers, both large and small, and this knowledge was transmitted to Europe through Latin translations of Islamic books on mechanics. These clocks were weight-driven; designs and illustrations of epicycle and segmental gears were provided. One such clock included a mercury escapement. The latter type was directly copied by Europeans during the 15th century. In addition, during the 9th century, Ibn Firnas of Islamic Spain, according to Will Durant, invented a watch-like device which kept accurate time. The Muslims also constructed a variety of highly accurate astronomical clocks for use in their observatories.

Cheques

The modern cheque comes from the Arabic 'saqq', a written vow to pay for goods when they were delivered, to avoid money having to be transported across dangerous terrain. In the 9th century, a Muslim businessman could cash a cheque in China drawn on his bank in Baghdad.

