

Important Muslim Scientists who contributed in Mathematics and Medicine in Islamic Society

MATHEMATICS

Important scholars who contributed in the field of Mathematics in Medieval Islamic Society as follows:

1. Muhammad bin Musa al-Khwarizmi

The first great Muslim mathematician, Muhammad bin Musa al-Khwarizmi, designed the subject of algebra, which was supplementary advanced by others, most notably by Umar Khayyam. AlKhwarizmi's work, in Latin translation, carried the Arabic numerals along with the mathematics to Europe, through Spain. The word "algorithm" is derived from his name.

Al-Khwarizmi, born in 780 A.D., was the forefather of modern Algebra. He developed sine, cosine and trigonometrically tables, which were later translated to the West. His book on algebra "Hisab al-Jabr waal-Muqabalah" (The Calculation of Integration and Equation) was used until the 16th century as the principal textbook of European universities. In it he composes that given an equation, collecting the unknowns in one side of the equation is called al-Jabr and collecting the known in the other side of the equation is called al- Mukabalah. He also described six basic types of equations: $nx = m$, $x^2 = nx$, $x^2 = m$, $m + x^2 = nx$, $m + nx + x^2$ and $x^2 = m + nx$. He also explained the particular equation $x^2 + 21 = 10x$ using geometrical arguments.

Al-Khwarizmi also aided to announce Arabic numerals, the decimal position system, and the concept of zero. Algebra and Algorithm are in fact corruptions of his work and name. Interestingly, this book on algebra comprised many examples from the Islamic inheritance laws and how they could be answered using algebra. Under al-Mamun the caliph of the time, he with some others was the first to map the globe.

2. Ghiyath al-Din al- Kashani

Another exceptional mathematician was Ghiyath al-Din al-Kashani of the late fourteenth century. He functioned on the theory of numbers and techniques of computations. In 1424, he figured a value of 2π to sixteen decimal digits of accuracy using an approximation of the circle by 805306368 side polygon. One of his most important works was “Miftah-ul-Hissab” or “The Calculators’ Key”; in it he defined an algorithm for finding the fifth root of any number. The book was taught in Persian schools until the seventeenth century. Later in his life he relocated to Samarkand on the invitation of the ruler to support directly to a new scientific school and observatory and conduct research with other scholars of the time. Kashani also wrote on how to approximate \sin by solving a cubic equation accurately.

3. Abu Wafa Muhammad al-Buzanji

Abu Wafa Muhammad al-Buzanji was born in Buzjan, Nishapur in 940 A. D. He became a great mathematician and astronomer at Baghdad and died in 997 A.D. Al-Buzanji’s main contribution lies in several divisions of mathematics, in geometry and trigonometry especially. In geometry he added to a solution of geometrical problems with opening of the compass, construction of a square equivalent to other squares, regular polyhedral, construction of regular hexagon taking for its side of the equilateral triangle inscribed in the same circle, constructions of parabola by points and geometrical solution of the equations $x^4 = a$ and $x^4 + ax^3 = b$.

Al-Buzanji’s involvement to the progress of trigonometry was also widespread. He was the first person to show the generality of the sine theorem relative to spherical triangles. He established a new scheme of assembling sine tables, the value of $\sin 30$ being correct to the eight decimal places. In addition he deliberated tangent and planned tables for them. He announced the secant and cosecant for the first time. He composed a large number of books on mathematics and other subjects, most of which have been lost or exist in modified forms. He also penned rich commentaries on Euclid and al-Khwarizmi. A substantial part of today’s trigonometry can be copied back to him.

4. Abu Abdullah al- Battani

Abu Abdullah al-Battani (862-929 A.D.) was a son of a scientist and also a famous astronomer, mathematician and astrologer. He is often considered one of the greatest astronomers of Islam.

In mathematics, al-Battani was the first to substitute the practice of Greek chords and the first to cultivate the concept of cotangent and provided their table in degrees. He composed a number of books on astronomy and trigonometry.

5. Mohammad Bin Ahmed

Mohammad Bin Ahmed in the tenth century invented the concept of zero or sifr. Thus swapping the cumbersome, Roman numerals and creating a revolution in mathematics. This directed to improvements in the calculation of the program of the worlds and progresses in the fields of astronomy and geography. Muslim mathematics had innated both the Babylonian hexadecimal system and the Indian (Hindu) decimal system, and this provided the basis for numerical techniques in mathematic. Muslims constructed mathematical models using the decimal system, conveying all numbers by means of ten symbols, and each symbol permitted the value of position as well as absolute value. Many inventive methods of doing multiplications were established by Muslims; methods of checking by casting out nines, and decimal fractions. Thus Muslim scholars added and positioned the foundations of modern mathematics and the use of mathematics in the fields of science and engineering.

6. Al-Hassan ibn al-Haytham

In seventeenth century Europe cracked the problems framed by Al- Hassan Ibn al-Haytham (965-1041) known as “Alhazen’s problem”. Again his work that was interpreted into Latin made Europeans aware of al- Haytham’s amazing successes in the field of Optics “Kitab al-Manazir”. A theory of vision and a theory of light, and was called by his successors of the twelfth century “Ptolemy the Second”. Furthermore by encouraging the use of experiments in scientific research, al-Haytham played an important role in setting the scene in modern science.

Al-Haytham’s assistances to geometry and number theory went well beyond the Archimedean tradition. Al-Haytham also operated on analytical geometry and the early stages of the link between algebra and geometry. Subsequently, this work headed in pure mathematics to the harmonious fusion of algebra and geometry that was exemplified by Descartes in geometric analysis and by Newton in the calculus. Al-Haytham was a scientist who made major 8 contributions to the fields of mathematics, physics and astronomy during the latter half of the tenth century. John Peckham in the late-thirteenth century used al-Haytham’s Kitab al-Manazir and Witelo’s Optics too has echoes of Kitab al-Manazir.

Muslim scholars added not only to the use of logic in the development of mathematical ideas and relationships, but also to an effective system of numeration that involved zero and headed to the solution of equations. Muslims had thus begun the work that directed on to mathematical modeling and its application for the purpose of testing their theories. This knowledge and approach was slowly transferred to Europe through Spain and Sicily.

MEDICINE

Important scholars who contributed in the field of Medicine in Medieval Islamic Society as follows:

1. Abu Ali Ibn Sina

Abu Ali Ibn Sina (980-1037), better recognized to the West as Avicenna, was conceivably the utmost physician until the contemporary epoch. His renowned book, *Al-Qanun fi al-Tibb*, stayed a typical textbook even in Europe, for over 700 years. Ibn Sina's effort is still considered and assembled upon in the East.

Other substantial offerings were made in pharmacology, such as Ibn Sina's *Kitab al-Shifa'* (Book of Healing), and in public health. The Ottomans were particularly noted for their building of hospitals and for the high level of hygiene practiced in them. Every single city in the Islamic world had a number of outstanding hospitals and many of them were specialized for particular diseases, including mental and emotional.

Abu Ali Ibn Sina, alone wrote 246 books, together with *Kitab-al Shifa* (The Book of Healing) containing 20 volumes and *Al-Qanun fit Tibb* (The Canons of Medicine). The Qanun was the principal guide for medical science in the West from the twelfth to the seventeenth century. Dr. William Osler, who wrote *The Evolution of Modern Science*, remarks "The Qanun has remained a medical Bible for a longer period than any other work". Comprising over a million words, it graphed the entire medical facts available from ancient and Muslim sources together with his innovative assistances. Ibn Sina's creative influences involved such developments such as acknowledgment of the communicable nature of phthisis and tuberculosis; spreading of diseases by water and soil and the collaboration between psychology and health. Also, the book defined over 760 medicines and became the most authentic of its era. Ibn Sina was also the

first to describe meningitis and prepared ironic contributions to anatomy, gynecology and child health.

This interest in medicine went back to the time of the Prophet Mohammad (p.b.u.h), who once said that “there is always a cure existed for every disease”. With this essence there were hospitals and clinics built all over the Muslim world, the earliest built in 707 by Caliph Walid ibn Abd a-Malik in Damascus. Muslims equipped many developments such as the awareness of flow of blood and separation and the establishment of the first apothecary shops and the earliest school of pharmacy.

2. Abu Bakr Muhammad ibn Zakariya al-Razi

Abu Bakr Muhammad ibn Zakariya al-Razi (865-925 AD), identified as Rhazes, was one of the greatest inexhaustible Muslim doctors and perhaps second only to Ibn Sina in his endeavors. He was born at Ray, Iran and became a student of Hunayn ibn Ishaq and later a student of Ali ibn Rabban. He penned over 200 books, including Kitab al-Mansuri, ten volumes on Greek medicine, and al-Hawi, an compendium of medicine in 20 volumes. In al-Hawi, he encompassed every single medical subject’s statistics offered from Greek and Arab sources and then added his clarifications based on his understanding and assessments. He categorized substances as vegetable, animal or mineral while other alchemists divided them into “bodies”, “souls” and “spirits”.

Al-Razi was first positioned in control of the first Royal Hospital at Ray, from where he quickly moved to a similar position in Baghdad where he remained the head of its famous Hospital for a long time. He originated a treatment for kidney and bladder stones, and clarified the nature of various infectious diseases. He also accompanied research on smallpox and measles and was the first to announce the usage of alcohol for medical purposes. An exclusive piece to his medical system was that he significantly preferred cure through accurate and controlled nourishment intake. This was pooled with his emphasizing on the impact of psychological aspects on health. He also anticipated therapies first on animals in order to assess their effects and side effects. He was also an expert surgeon and the first to use opium for anesthesia.

3. Abul Qasim al-Zahrawi

A new physician who soon tracked al-Razi was Abul Qasim al-Zahrawi (963-1013 AD) who is recognized as Albucasis to the West. A renowned surgeon in his time, at the court of Caliph alHakam II , students and patients flocked to him from the Muslim world and Europe. He

wrote 15 the medical encyclopedia al-Tasrif li man ajaz an-il-talif, which enclosed 30 segments of surgical facts and drawings of 200 surgical tools, maximum of which he designed himself. The Encyclopedia was not only a typical one for physicians, but even five eras later it was being used as the standard textbook on surgery in universities in Europe. He also accomplished many elusive operations such as Cesareans and was also the first to use silk thread for sewing wounds.

4. Al - Idrisi

Al-Idrisi was born in Cordova, Spain in 1099. His major involvement was in medicinal plants which he labeled in many books, such as Kitab al-Jami-li-Sifat Ashtat al-Nabatat. He composed plants and data not described previously and compiled this to the subject of botany. From him a large number of new medicines from plants with their assessments suited to medical doctors. Al-Idrisi also prepared unique assistances to topography, as connected to economics, physical factors and cultural aspects. He penned geographical encyclopedias, the largest called Rawd-Unnas wa Nuzhalat Nafs (Pleasure of Men and Delight of Souls). Al-Idrisi also inscribed on the themes of fauna, zoology and therapeutically features. His work was soon translated into Latin and his books on geography especially stayed famous in the East and West for more than a few spans.

5. Abu Muhammad Ibn al-Baitar

Abu Muhammad Ibn al-Baitar was working in the field of botany, also from Spain. He was one of the paramount scientists of Muslim from Spain and one of the chief botanists and pharmacists of the Middle Ages. He travelled on many wandering voyages to gather plants as far as Africa and Asia. He composed Kitab al-Jami al-Adiwaya al-Mufrada, one of the supreme botanical accumulations allocating with medicinal plants in Arabic. The encyclopedia was completed of over 1,400 items, many of which were not known before. The book discussed to the works of 150 authors, mostly Arabic and cited about 20 early Greek scientists. It was translated into Latin and printed as late as 1758.

Ibn al-Baitar's works were categorized by thoughts, investigation and classification and exercised a profound influence on Eastern as well as Western botany and medicine. Even though many of his works were translated and published late in the western languages. Many earlier scientists had deliberated numerous portions of his books and quoted a number of references to 16 it. Medicine is regarded as one of the extensive fields of life sciences to which

Muslims had noticeable influences through their prosperous cultivation. These assistances were unprecedentedly comprehensive, divergent, and educative to the amount that the spectator of these everlasting influences may have faith in that medicine had not be present earlier to the advancement of Muslims.

Reference:

1. http://irep.iium.edu.my/8415/1/Contribution_of_Muslim_Scholars_to_the_world.pdf

For more details, please go through the link -

https://shodhganga.inflibnet.ac.in/bitstream/10603/39962/8/11_chapter%202.pdf