The Milieu of Arabian Mathematician: A Journey from Classics to Modish

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Abstract:

Erick Gregersen in his edited book The History of Mathematics said that 'it seems impossible to believe that at one point in ancient time, human beings had absolutely no formal mathematical education'. The ideas for numbers and numerations were begun from scratch. Some applications were found and inventions were pursued in everyday life which later on laid down the foundation of mathematics. Mathematics is the science of structure, order and relations. They have evolved from elemental practices of counting, measuring and describing the shapes of objects. It deals with logical reasoning and quantitative calculations. They have been developed over the centuries. Mathematicians from Arab origin had contributed a lot in the field of mathematics. The present paper tries to focus on the Arabian Mathematicians Al-Khawarizmi, Al-Mahini, Thabit-Ibn-Qurra, Ibrahim-Ibn-Sinan, Al-Quhi, Ibn-Al-Haythan, Abul Hasan Al-Uqlidisi, Omar Khayyam, Sharaf Al-Din al-Tusi, Al-Faris and their contributions to the field of mathematics. We came across mathematician who pursued a mathematic topic for many years derailed to insanity for a single reason. Therefore, the present paper is a humble attempt to understand how people nurtured mathematics in its initial stage and how mathematical idea and discoveries in the fields of arithmetic, algebra, astronomy etc. yielded a new world of mathematical understanding and future learning. The objective of my paper is to study the milieu of Arabian Mathematicians and how they in a most different social environment contributed fresh knowledge to the field of mathematics. The methodology which I have applied to study the mathematical development in ancient times is based on secondary sources.

Key words: Mathematician from Arab origin, New discoveries in Mathematical field, Contribution and future learning.

INTRODUCTION:

Mathematics has made a long way to reach this modish world. Now a day one cannot think of a step ahead without Mathematics if one longs to exist in the globe. But when the journey of Mathematics was started it had crept some minds only to stir and Arabian minds were prominent among them.

A few prominent Arabian Mathematician and their contributions:

Names	Contribution in the fields
Al Khwarizmi (790 A.D)	Algebra
Al Mahini (820 A.D)	Geometry & Cube Duplication Problem in Algebra
Thabit Ibn Qurra (836 A.D)	Integral Calculus, Spherical Trigonometry & Analytical Geometry
Ibrahim Ibn Sinan (908 A.D)	Geometry, Method of Integration
Al-Quhi (940 A.D)	Greek Higher Geometry
Ibn Al-Haythan (942 A.D)	Optics
Abul Hasan Al Uqlidisi (950 A.D)	Decimal Fraction
Omar Khayyam (1050 A.D)	Geometrical solutions of Equation of 3rd degree & Astronomy
Sharaf Al Din al-Tusi (1135 A.D)	Cubic Equation
Al-Faris (1260 A.D)	Factorization

While cataloguing the above mentioned mathematicians it was always hovered to add some more Arabian names of mathematicians who had given new dimensions to this field in broader aspect, though the focusing line of this paper would be on Numeral, Geometry and Algebra.   It is worth mentioning that Arabians had a very keen interest in translation in initial days of their flourishing, and they had translated many worthy books those credited to Indian civilization. Astronomy was practiced in India in Vedic times. Muhammad Ibn Ibrahim al- Fazari had translated Brahma Sphuta Siddhanta into Arabic as Sinhind. This book was written in 628 A.D in India during the reign of king Vyaghramukha. This book was brought to Baghdad in 771 A.D by a deputation of Indian scholars, as a result of which a systematic study of stars was undertaken by Arab astronomers. Ya'qub Bin Tariq was another Arab scholar and author who made a through learning of Sinhind and became acquainted with Indian astronomy, astrology and mathematics. Al - Biruni's Ghurrat al- Zijat, a work on Indian astronomy was based on Sanskrit manuscript of Karana Tilaka. This Arabic book contains fourteen chapters on wide range of astronomical matters. The importance of this book lies in the fact that it has created a link between two Indian works 'Karana Khanakhadyake' of Brahmagupta and 'Karana Kuthula' of Bhaskaracharya respectively. Besides, Arabs had learned and adopted Indian's Numeral's system of mathematics. The numeral system was invented in India around the second century B.C. The first Arab exponent of the Indian numerals including the zero was Muhammad Ibn Musa al Khwarizmi, who wrote the al-Jam Wal Tafriq Bi Hisab al Hind in which he used the zero and the decimal notation for the first time. Worthy to mention that it was mainly through al-Khwarizmi's works that the Indian numeral system was introduced into West where these numerals became known as Arabic numerals despite the fact that the Arabs always referred to them in their writings as Indian numerals. Again, Muhammad ibn Jabir al-Battani had introduced mathematics and astronomy to the Arab world by translating the Sanskrit book Aryabhatiya into Arjband, and that way given a new dimension of understanding the fact that the earth rotated round its axis and of the foundation of algebra and geometry including the use of the ratios, sine and tangent. The Astronomical Tables which was popularly known as 'al-Sindhind al Saghir was composed by Al- Khwarizmi on basis of the Siddhanta system of astronomy Indian calendar that was later been converted to Persian calendar. Habash al- hasib was director of the observatory at Damascus and author of three astronomical tables, the first of which was based on the Sindhind system of calculation. Maslamah Bin Ahmed al Majriti the most eminent Arab astronomer of Muslim Spain enlarged amended and adapted the Astronomical Tables of al-Khwarizmi to the Cordova meridian and to the Arab Hijri calendar.

   Getting not to be more perplexed about the contributions of Arabians and other Mathematician to mathematics and its related field, it's better to get back to the specific topics which are meant to be discussed. It is deemed to give light on over all contributions of people to the field of Mathematics till date with apposite specification and discussion on three i,e, Numeral, Algebra and Geometry.

NUMERAL:

Much before introducing of Zero by and Indian, Egyptian hieroglyphics (Symbol in the form of picture) had developed symbols for mathematical purpose as early as 3500 BCE. Egyptian did not have the concept of Zero either, but without Zero they became masters of Mathematics. Around 500 BC the Greeks had developed a newer more sophisticated system to avoid repeated letters in Mathematics. Though the Roman had a number system yet it was step back from the less sophisticated Egyptian system. The Roman numeral system had an ample repetition of symbols and letters as for example to write 88 in Roman numeral, one had to write LXXXVIII which requires eight symbols and several repetitions. At around 2500 BCE, the Babylonian had used a system of two symbols which had a base on 'sixty'. They sometime used a space to represent an empty position. But about 200 CE, Babylonian had used a pair of small triangles to represent an empty position. Babylonian too had not any concept of Zero. Much later, Hindu Civilization gave an important uplift to Mathematics by inventing the use of 'Dot' to represent an empty place "Sunnya" which suggested empty. By 500 CE the Hindus had used a small circle to represent Zero and thus the circle was recognized later on as a Numeral. Since there had been good deals of understanding between Arabian and Indians so Arabic scholar had recognized the value of the Hindu system. The Arabians adopted the Indian numeral Zero and had spread the idea across the world of intellect. The Zero was then named within the Arabic world as 'Sifr'. It is worthy to mention that the actual word Zero comes from Italy. Leonardo of Pisa who was known as Fibonacci was born to merchant family living in North Africa. He brought the use of zero new computational methods in Europe in his book and thus Europeans resisted the Hindu-Arabic numerals. But the concept of Zero was not accepted in Florence, Italy because it seemed to the people of Florence that Zero (0) could be changed to look like 6 (Six) and 9 (Nine) at any time, and thus Florence, Italy passed a law prohibiting the use of the Numeral. But on the passage of time at around 1500C, Zero

took a pivotal and important role in the sphere of mathematics. Worthy to mention that the concept of Zero was invented in India yet Arabians had introduced this Indian invention with the world. Al-Khwarizmi, one of the most famous Mathematicians from Arab, had reworked on the Numeral system of India which was in cult in India then. He had worked on the Indian numerals including Zero and on Babylonian numerals and converted them into a workable system which is now in vogue.

ALGEBRA/ ARITHMETIC:

The word Algebra comes from the Arabic word "al-Jabr" which means restoration of balance in both sides of an equation. Algebra was based on previous work from Greeks, Alexandrians in Egypt and Hindus who had preserved the work from ancient Egyptians and Babylonians. In the 9th century Al-Khwarizmi wrote the first book on Algebra and the name 'Al-Jabr' (Algebra) was first used by him. Al-Khwarizmi was born about 790 in Baghdad (now in Iraq) and died about 850. His book Al-Jabr Wal Mugabala, on algebra was translated into Latin. After being translated his book was appeared in Europe in 12th Century and thus he became the 'Father of Algebra'. In the early 13th century the new Algebra was appeared in the writings of the famous Italian mathematician Leonardo Fibonacci. Worthy to mention Al-Khwarizmi's algebra was a new kind of invention in mathematical world which helped people to do the arithmetic in most easiest and useful way without putting any laborious effort. Khwarizmi rightly said that algebra requires in cases of inheritance, legacies, partition, law suits, and trade and in all the dealings with one another or where the measuring of lands, the digging of cannels, geometrical computations and other objects of various sorts and kinds are concerned. The most significant area which Al-Khwarizmi developed was the concept of fraction and its operational way of understanding.

GEOMETRY:

Omar Khayyam was a Persian Mathematician as well as Poet born in Neyshabur (Iran) only a few years before Al-Biruni's death. He later lived in Samarkhand and Esfahan. His brilliant work continued many of the main lines of development in 10th century mathematics. Omar was also a part of an Islamic tradition, which included Thabit and Ibn al-Haytham, of investigating Euclid's Parallel Postulate. To this tradition Omar contributed the idea of a Quadrilateral with two congruent sides' perpendicular to the base. Omar recognised that the Parallel Postulate would be proved, if he could show the remaining two angles are right angles. In this he failed, but his question about the quadrilateral became the standard way of discussing the Parallel Postulate. That Postulate, however, was only one of the questions on the foundations of mathematics that interested other mathematicians.

Ibrahim ibn Sinan (908 A.D) is the grandson of Thabit ibn Qurra, the famous mathematician and translator of Archimedes. His treatment of the area of a segment of a parabola is the "Simplest that has come down to us from the period prior to the Renaissance". He worked on 'Drawing the Three Conic Sections' with proofs. He also worked how to draw the Parabola and Ellipse. He also gave three methods for drawing the Hyperbola, which may be because of the interest in the hyperbola by instrument- makers.

Abu Nasr al-Farabi was one of the most impressive parts of Islamic Culture has always been the elaborate geometrical artwork showcased in wood, tile, paintings and mosaics. As geometers recognised this tradition, as well as the geometrical problems artists solved, they begun to "justify the procedures and to see how far various methods could be pushed".

Not only these, geometry is being incorporated in the construction of intricate designs that appears on architecture and tile walkways as well as patterns on fabrics. The highly stylized form of art has evolved over the centuries from simple design to fairly complex geometry involving a high degree of mathematical symmetry. The Arabians had a good account of knowledge on symmetrical architecture and their zeal of such knowledge is being reflected in their architecture. The Tajmahal of India, one of the seventh wonders of the world has been celebrating the art of that symmetrical designing of Mughal dynasty.

CONCLUSION:

Thus, history of Arabian minds has incorporated a new idea of thought in the field of Mathematics in its very cradling stage. Now the expansion of Mathematics has been expanded in such an extent that it not only remain in the table of laboratory for astronomical and other mathematical purposes but it cripple down the minds of common folks. The journey of mathematics was started in a slender way and the persons who started this journey they would perhaps never thought of that their classics endeavour in this field would get such a modish world where everything is mathematical.

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