Contribution of Arabs in Mathematics in Middle Ages

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Abstract: Since Islam is a complete system of life, it has encouraged people to acquire every knowledge that helps to prosper in the world, that is why the Muslim scientists of Middle Ages have worked hard in every field of knowledge and paved the way for future generations by writing countless books of which the services of the scientists in the field of mathematics are very important. So, the mathematicians like Mohammad bin Musa Khawarizmi, Ahmad bin Yusuf bin Ibrahim bin Dayah al-Misri, Abu Kamil Shuja bin Aslam, Abu Abdullah Mohammad bin Isa al- Mahani, Abu Mahmud Hamid bin al-khizir al-khajandi, Abu Bakar Mohammad bin al-Hasan al-Karji, Abul Hasan Ali bin Ahmad al-Sanusi, Abdul Qahir bin Tahir al- Baghdadi, Abul Hasan bin al-Haisham, Umar Khayyam, Thabit bin Qurrah, Abu Sahal al-Quhi, Abul wafa Abbas bin Sayeed al-Jauhari, Abul Abbas Fazal bin Hatim al-Tabrezi, Abu Raihan al-Biruni advanced the mathematics so much, that the honest and just Europeans Scholars like George Sarton, Will Durant, Max Mir Huff, Carra De openly confessed the deeds of Muslim mathematicians. The present paper is attempted to highlight the some glorious contributions of Muslims of the Middle Ages to the field of mathematics and the words of praise of just and honest European scholars.

Introduction: In the middle ages, a very long and wide region was ruled by Muslims, and they have been given the opportunity to serve the people for hundreds of years. During this time, they patronized knowledge and greatly appreciated the scholars. The establishment of Bait-ul-Hikmat (House of wisdom) in the Abbasid era is a living example of this. Due to this, while breathing in the open air, on the one hand, the Jurists and narrators got the opportunity to serve the hadith and Fiqh (Islamic Jurisprudence) and on the other hand, the scientists, under the patronize of the government, were generously engaged in promoting science and technology and they have done so much in this field that every just and honest scholar were forced to praise them. So, these scientists tested their temperament in every field of science, of which the service of mathematics is astonishing.

Significance: It has been realized looking at the current situation of Muslims that they have not done any good for the development of the world. This will send a message to the world that Muslims have all the potential. So, if they get the patronage of the government, they can do a lot for the betterment of the country, as Dr. Abdul Kalam has done a lot for India.

Objectives:

1. This paper aims to highlight the contribution of Arab Muslim Scientists of Middle Ages in propagation of Mathematics.
2. It has been attempted to highlight the names of great mathematicians' like- Khawarizmi, Razi, Ibn-e-Haisham and Ibn-e-Battar and others.
3. It has been attempted to highlight that human beings are extremely helpless to nature.
4. It has been attempted to highlight the names of some honest and just scholars of Europe like George Sarton, Will Durant and others.

Data Collection: The study based on secondary data. The data has been collected from secondary sources, like books, Journals and websites for conducting the study.

Scope of the study: This study is restricted to Muslim world of Middle Ages only.

Interpretation : In the same way that Arabs have contributed to various branches of science, their contribution to Mathematics has not been less. The work of Arab Muslims on Mathematics started from the 3ʳᵈ century (A.H) (ninth century CE). So, Georg Sarton said: *"The ninth century was essentially a Muslim Century. To be sure, intellectual work did not cease in other countries, far from it; but the activity of the Muslim scholars and men of Science was overwhelmingly superior. They were the real standard bearers of civilization in those days. Their activity was superior in almost every respect. To consider only the first half of the century, the leading men of science, al-kindi, the son of Musa, al-Khawarizmi, al-Farghani, were all Muslims; Ibn Maswaih, it is true was a Christian but he wrote in Arabic".* [1]

George Sarton named all the Muslim scientists who were very bright in the history of mathematics, among them Muhammad bin Musa al Khawarizmi can be called the inventor of Mathematics and al-gebra, and Banu Musa can be called the father of geometry, looking at the highest position of Muhammad bin Musa al- Khawarizmi in Mathematician. George Sarton named a chapter of his book "The era of Khawarimi". Al-Khawarizmi was born in 780 (CE) to a poor family in a place called hawarizm. He travelled to Bagdad in 825 (CE) and as a result of his writing an important article in Mathematics, he was selected as a member of an important institution of knowledge named Baitul Hikmah it was from there that his learning and fame began, he died in Baghdad in 850 CE after nearly twenty five years of practicing knowledge. [2] Khowarizmi wrote a book at the request of Khalifa Mamun- ur-Rashid, in which he highlighted on the formulas of Mathematics, but the Arabic version of this book is not yet available, it is preserved only as a translation into Latin. There is another book of al-Khawarizi named "Kitab-ul-Mukhtasar-min-Hisab-il- Jabar-wal-Muqabala" which is very important in the history of Mathematics; the word of algebra is taken from the little of this book given by the author himself. The book of Khawarizmi commonly known as "Al-Jabar-wal-Muqabala" in it algebra has been introduced as a permanent science; this is why he is called the founder of Algebra. George Sarton wrote about this book *"His algebra Hisab al-Jabar w'al-Muqabala is equally important. It contains analytical solutions of linear and quadratic equations and its author may be called one of the founders of analysis or algebra as distinct from geometry, he also give geometrical solutions (with figures) of quadratic equations for ex. $X^2+10ex = 39$, an equation often repeated by later writers ``.* [3] **The book of al-khawarizmi has a lot of influence in Europe. So, will Durant said;** *"This work, now lost in its Arabic form was translated by Gerard of Cremona in the twelfth century, was used as a principal text in European Universities until the sixteenth century and introduced to the west the word algebra (al-Jabr "restitution," "completion)"* [4]

According to the study of Carra De*, until the 16ᵗʰ century, the rule of theory of equations of the second degree followed by the introduction of Khawarizmi. So, he said; in his own language "The theory of equation of second degree remained down to the Sixteenth century exactly as we find it in the Arab algebraist"* [5] He further said that, Leonardo Fibbonaci of pisa, the great 18ᵗʰ century algebra scientist, admitted that he was grateful to the Arabs in this regard. He traveled to Egypt, Syria and Sicily and learned the mathematical formulas of Arabs, and thought it better than Pythagoras's formulas. [6] The Encyclopedia of Britannica thus described the

benevolence of Arab scientists on the subject of Mathematics *"The most influential algebraic work from this period was the Kitab-alJabar wa al-muqabala (''the science of Restoration and Reduction") of al-khawarizmi composed in Baghdad about 825. The influence of the book on Europe was so great that its name became synonymous with equation theory".*[7]

Invention of Zero:

One of the great achievements of Muslims in Mathematics is the invention of zero, So, Will Durant said: *"In 976 Muhammad Ibn Ahmad, in his keys of the sciences, remarked that if in a calculation, no number appears in the place of tens, a little circle should be used to keep the rows." This circle the moslems called sifr, "empty" whence our cipher; Latin scholars transformed sifr into zephrum which the Italians shortened into zero.*[8] According to William Montgomery Watt, in addition to the numbers many Arabic words have entered in the European languages, such as Chiffer in French, Ziffer in Germani, Cipher in English, thus zero of French and English is taken from Arabic word "Sifr" which means empty. [9]

The "Sifr" was introduced by al-Khawarizmi himself, his method of calculation was copied by Leonardo of Pisa in his book named "Liber Abaci" this is where Arabic numerals came into use in Europe. [10] This event was a major breakthrough in the history of Mathematics, that's why Draper said: *"The Admirable notation by nine digits and cipher occasioned a complete revolution in arithmetical computations."*[11] *To this, the dot(.) has been used in Arabic Sifr (Zero). The oldest Muslim manuscript in which the Sifr (Zero) is used was written in 873 CE, while the earliest use of zero by the Hindus found in the scriptures of Gwalior was written in 876 CE.*[12] *The system of numbers introduced by Muslims in the Europe, Westerners call it Arabic numerals, but among the Muslims themselves, they have been called Hindi numbers, this raises suspicion that the numbers are Indian origin. But the writing style of the numbers testifies to be of Arabic origin. For the example 425 is a combination of three numbers, in which 5 is unit digit 2 is tenth digit and 4 is 100th digit, it is written in Arabic from right to left in this way –*

4	2	5
100th digit	10th digit	unit digit

425   =   400+20+5

But if we write it in Sanskrit, it will go from left to right and we have to write it like this

5	2	4
unit digit	10th digit	100th digit

5+20+400 = 524

The conventional method of calculation does not conform to the rules of Sanskrit. So, it seems to be a matter of suspicion to call it the invention of India.[13] Therefore, Carra De himself has hesitated to accept the calculation method as the source of India. So, he said: *"It appears on the contrary that the numerals have a simpler and handier form among the Arabs than anywhere else; this must be their original form.*[14]

Among the Muslim mathematicians who made the content of mathematics a subject of research is Ahmad bin Yusuf bin Ibrahim bin al-Dayah al-Misri (dies 912 CE) He has written several books on mathematics, the most famous of which is "Risalat-un-fin-Nisbat-i-wat-Tanasub" Gerard of Cremona translated this book into Latin.[15] *In the Latin world this famous scientist was known as Ametus.*[16]

Some Mathematical issues have been a problem for Greeks for hundreds of years; Muslims have tried to solve them with the help of algebra. According to al- Khayyam, Mahani was the first scientist who solved an important problem of Archimedes with the help of algebra. Sarton described his contribution in this way; *"He tried vainly to solve an Archemedean problem."* *to divide a sphere by means of a plane into two segments being in a given ratio. That problem led to a cubic equation, $x^3 + c^2 b = cx^2$, which Muslim writers called al-Mahani's equation.*[17]

Al-Mahani was not entirely successful in resolving the issue, but his attempt paved the way for other Muslims mathematicians. So, the author of the Encyclopedia of Britannica said: *"The cubic equation was a favorite topic for such writers as al-Mahani, Thabit ibn Korra in the middle of the ninth century. Alhazen a hundred and fifty years later and particularly the poet and mathematician Omar Khayyam in the beginning of the 12th Century, who dealt with it extensively in his algebra; The solution were obtained by intersections of conics.*[18] After al-Khawarizmi, Abu Kamil Suja, bin Aslam (850-956 CE) was a great mathematician among the Muslims, he has known as al-Hasib-ul-Misri (mathematician of Egypt) he has written fourteen books on mathematics. W. Hartner said about him: *"They entitle us to place him among the greatest mathematicians of the Islamic Middle ages (for the development of Islamic Algebra--) through Leonardo of pisa and his followers he exercised considerable influence on the development of algebra in Europe and no less great was the impact of his geometrical writings (algebraic treatment of geometrical problems) on Western geometry.*[19] Among the books written by Abu Kamil "Kitab-ut-Taraif-fil-Hisab" is the most important book. He solved some questions in a new style like.

1 - $x^2 - 8x - 30 = y^2$

2 - $x + x^2 = y^2$
     $x - x^2 = z^2$

3 - $20 + x = y^2$
    $50 - (10 - y) = z^2$

4 - $10 + x^2 = y^2$
    $10 - x^2 = z^2$

Abu Kamil has another book which is known as "al-makhmas-u-wal-ma'shar-u". This book is preserved only as a translation into Hebrew and Latin. In this, the author solved the problems of geometry with the help of algebra. Leonardo of Pisa used the solutions of Abul Kamil in his book "Practica Geometriae".

There is another important book by Abu Kamil in the subject of algebra named "Kitab-un-fil-jabar-wal Muqabala". This book has become one of the reasons for his popularity. In this book he offered a solution to the problem of mathematics, one step ahead of al-Khawarizmi. He was the first mathematician who used a force as large as x^2. Explaining Abu Kamil's contribution to mathematics, George Sarton said: *"He perfected al-khawarizmi's work on algebra. Determination and construction of both roots of quadratic equations. Multiplication and division of algebraic quantities. Addition and subtraction of radicals corresponding to our formula ($\sqrt{a} \pm \sqrt{b} = \sqrt{a + b \pm \sqrt{2ab}}$). Study of the pentagon and decagon. (algebraic treatment). His work was largely used by al-karkhi and Leonardo of Pisa.*[20]

Fourth century Hijri (Tenth Century CE) is considered to be an important period in Muslim mathematics. Abu Jafar Mohammad bin Hussain al-Khurasani who was known al-Khazin, wrote several books in mathematics, among which "Kitab-ul-masa- ilil-adida" and "Matalib-ul-Jizyah Mail-u-Muyu-lil-Jizyah-wal-Matali-il-Kurat-il- Mustaqima" are two very important books. Sarton said about him *"He solved by means of conic sections the cubic equation which had baffled al-Mahani's efforts, the so-called al Mahani equation (q.v. second half of the ninth century)".*[21]

Al-Khazin's contemporary mathematician Abul wafa Buz-jan's contribution in this regard is very important. He wrote several books in this regard, most important of which was his book named "Kitab-u-lfima Yahtaju ilaihil kuttab-u-wal ummal-u-min ilm-il-Hisab". The book is divided into seven levels, and each level is divided into seven parts. The author has tried to explain the issues with a lot of examples. A famous man like Woepke published the book in the Asialique Journal in 1855. In the 4th century, the famous Spanish mathematician pointed to business and commerce, which was started with the writing of Maslama bin Ahmad al-Majriti. He wrote a book on exchange (al-mua-mala) which greatly benefited the merchants. All of the books on mathematics were written in the 4th century. Among them the book named "al-Fusul-

u- fil-Hisab-il-Hind" is very important. In this book, the author highlighted the Indian accounting system.

The first 50 years of the eleventh century were very important for Muslim mathematics. Sarton has said about this *"Let us pass on to Islam. It is almost like passing from the shade to the open sun and from a sleepy world into one tremendously active".*[22] The mathematician who were born in the glorious Ages of the Muslim world, among them was a particularly memorable one" Abu Bakar bin Mohammad bin al-Hasan al- Karji (died after 1019 CE) He has written many valuable books on mathematics. At the request of the Minister Fakhrul-Malik of Baghdad, he wrote a book named "Al-Fakhri-fil-Jabar Wal-Muqabala, in which he discussed the issues of large numbers. That is why he is said to be the first person to have more numbers. The second book of al-karji is "Al-Badi Fil-Hisab, in the book he has tried to make all the contents of the book called "Al Fakhri". His 3rd book is "Al-kafi fil hisab", in this book he discussed the basics of mathematics. The book of Al-Karji named Fakhri, was translated into French language by woepke, which published in Paris in 1853 CE.

His famous book named, Al-Kafi-fil-Hisab was translated into Germany language by Hoccheim, which published between 1877 to 1880 CE [23]. Ibn-ul-Haisham a renowed Egyption Scientist has written 20 books on Astronomy and Mathematics, most of the books have been translated into European languages. Ibn-ul-Haisham (Alhazen) has tried to find solutions to the problems of mathematics which could not be solved till his time. So, J. Vernel said: *"In the fifth maqala Alhazen's mathematical genious attained its highest development when he resolved the problem which today bears his name: Two points A and B are fixed on the plane of a circle with centre O and R. Find in the circle (idealized in a mirror) the point M where they ray of light emitted by A must be reflected in order that it may pass through B. Alhazen's demonstration, which is very complex, leads to an equation of fourth degree which he resolves by the intersection of an equilateral hyperbola with a circle.*[24]

Mir Huf said : *"His name is still associated with the so called' Alhazen's proble': In a spherical concave or convex, cylindrical or conical mirror to find the point from which an object of given position will be reflected to an eye of given position; It leads to an equation of the fourth degree which Alhazen solved by the use of hyperbola."*[25]

Umar Khayyam was famous as a poet in the world, but most people do not know that he was an Astronomer and Philosopher. Sarton acknowledged that the second half of the eleventh century was the era of Umar Khayyam. He has written two books on algebra, one of which is "Risalah fil Bahrain ala Masa-ilil-Jabar wal Muqabala" This book was translated into French in 1851 CE by Woepke from Paris. Sarton writes about Muslim Mathematicians in Spain; *"Passing to the East, we find there only one great mathematician but a very great one indeed, the beloved poet Umar Khayyam. His activity marks the climax of Muslim efforts in the field of algebra. He conceived a very remarkable classification of equations, for example he recognized 13 different forms of cubic equations. He tried to solve them all and gave partial geometric solutions of a number of them. He investigated Euclid's postulates and definitions.*[26]

Carra De acknowledged works of Umar Kahyyam and said: *"His skill as a geometer is equal to his literary erudition and reveals real logical power and penetration. His algebra is a book of the first rank and one which represents a much more advanced state of this science than that we see among the Greeks.*[27] *Will Durant said while praising Umar Khayyam* *"History knows little of his life, but records several of his works. His Algebra translated into French in 1857 made significant advances both on al-Khawarizmi and on the Greeks; its partial solution of cubic equations has been judged "Perhaps the very highest peak of medieval mathematics." Another of his works on algebra (a manuscript in the Leiden library) studies critically the postulates and definitions of Euclid.*[28]

There were many scientists who followed Umar Khayyam one of them was Sharfuddin Al-Zafar ibn-Mohammad Al-Maruf bih Sharfuddin Tusi (died 1213 CE) was a very important and famous person in the field of Algebra. He wrote a famous book in this regard named "Kitab-un-fil Jabar wal Muqabala " Nasiruddin was the famous scientist after Sharfuddin. He wrote a book in the subject of mathematics named "Jawami ul-hisab bittakht-i-wat turabi. Besides the book of Abu Zakaria Mohammad Al-Hisar of Morocco named "Kitab-us-sagir fil Hisab was very famous.

Among the mathematicians of the late Middle Ages, Al-Kashi and Qazizadal al- Rumi were famous scientists. The book named "Miftah-ul-Hisab written by Al-Kashi was important in many respects.

While writing the book, the author has put forward the needs of all the students, astrologers, constructors, writers and businessmen. Kazi Zadah's book. "Risala fil Hisab " is very important, because it focuses on all aspects of mathematics, algebra, and measurement etc. [29]

<u>Geometry</u> : The Arab called ilmul Hindasa or Geometria. The Arabs became aware of this science since Hajjaj bin Yusuf bin Matah of Abbasid period translated into Arabic six books related to material of the Euclids (330-275 BC). Besides that, the books Archimedes (212-287 BC) and Apotonius (262 BC) as well as other books of Greek were translated into Arabic. As a result of the translation, the Arabs, gathered a lot of information or material on this subject, and using all this, the works of Ilmul Hindasa or Geometry started from the era of Mamunur Rashid. So, Mohammad, Ahmad and Hasan three sons of Musa bin Shakir of Baghdad began to study the books of the Greeks and the three brothers together wrote many books on this subject, of which the book named "Kitab-u-Marifat-il-Masahat-il-Ashkal-il-Basit wal Kareeh" was very important, this book was translated into Latin in 12ᵗʰ Century by Gerard Cremona. This book gained popularity in the Middle Ages and after. The three sons of Musa wrote another important book named "Kitab-u-Kismat-iz-Zaviah ila Salasat-i-Aqsamin Mutasaviah". It was also translated into Latin language. [30]

Sabit bin qurra was a famous scholar of Geometry in the Abbasid period. He made geometry the subject of study; as a result, he was able to write some valuable books on this subject. The most important of which was a book named "Kitab-ul- Mafruzat" in it he described 36 subjects of geometry and algebra. Sabit bin qurra has written 50 books on mathematics. Carra De said *"He improved the translation of Euclids, Elements by Ishak b. Hunain and that of Almagest by the same. He wrote a number of short treatises or memoirs on astronomy and geometry, elucidating numerous passages in ancient works, inventing new propositions, annotating and facilitating study. Almost all the scientific subjects that could be studied in his day seem to be touched upon in his works".* [31]

Ibrahim was also a high level scientist. So, Sarton said *"Ibrahim ibn sinan was primarily a geometer; he wrote commentaries on Apolonios and on the Almagest and his determination of the area of a parabola was one of the greatest achievements of Muslim mathematics"* [32]

Abu Sahal Vijan Ibn Rustam was known as Al-Quhi. His contribution to the promotion and dissemination of mathematics is memorable. He wrote 8 book on mathematics, of which the book named "Risalatun fil Birkat-it-tam", is the most famous. Khayyam seems to be a high level mathematician. Sarton has praised him in this way *"He devoted his attention to those archimedean and apollonian problems leading to equations of higher degree than the second; he solved some of them and discussed the conditions of solvability. These investigations are among the best of Muslim geometry."* [33]

Abul Wafa was the great scientist of that period. He wrote a valuable book in this subject named "Kitab-un-fima Yahataj-u-ilaih-il-Kuttab-u-wal Ummal-u-min ilm-il- Hisab". Although his book is all about mathematics, it deals with many aspects of geometry. He wrote another book in geometry named "Fima Yahtaj-u-ilaih-is-sanna'i min A'mal-il-Hindasa " which is very

valuable. Describing the contribution of Abul Wafa Sarton said: *"Solution of geometrical problems with one opening of compass construction of a square equivalent to other squares. Regular polyhedra (based on pappos) Approximative construction of regular heptagon (taking for its sides half the side of the equilateral triangle inscribed in the same circle) Construction of parabola by points. Geometrical solution of $x^4=a$ and $x^4+ax^3=b$."* [34]

Describing the brilliant contribution of Abul wafa, Carra De said *"This is not the end of services rendered by Abul Wafa to science. A geometer of great ingenuity, he dealt with a number of problems and studied the quadrature of the parabola and the volume of the paraboloid; in algebra he translated Diophantus."* [35]

Triogonometry: *The contributions of Arabs in Trigonometry or Ilm-ul-Musallasat are very important. The contribution of Al-Battani has been considered very important. So, Carra De said:* "But his greatest claim to fame is undoubtedly that if he did not discover he at least popularized the first notions of trigonometrical ratios as we used them to-day. Ptolemy used chords for the calculation of which he had only one main theorem, a very Clumsy one. Al-Battani substituted the sine for the chord. [36]

Sarton considered Battani to be the greatest scientist of his nation and age. He added that the book written by Battani has been considered as a source book to the 16th century. *"The third chapter of his astronomy is devoted to trigonometry. He used sines regularly with a clear consciousness of their superiority over the Greek chords. He completed the introduction of the functions Umbra extensa and umbra Versa (whence our cotangents and tangents) and gave a table of cotangents by degrees. He knew the relation between the sides and angles of a spherical triangle. Which we express by the formula; Cos a = cos b cos c + Sin b Sin c Cos A.* [37]

The contribution of al Battani in the field of Trigonometry is very important. Where the Greeks left behind this branch of geometry that al Battani carried away hundreds of years ago. So, Will Durant said "Abu Abdallah al-Battani (850-929) a Sabaean of Raqqa known to Europe as albategnus advanced trigonometry far beyond its beginning in Hipparcus and Ptolemy by substituting triangular for ptolemy's quadrilateral solutions and the sine for Hipparcus chord; he formulated trigonometrical rations essentially as we use them to-day" [38]

The thirteenth century is considered to be the most successful in the history of trigonometry. Trigonometry has improved a lot in Morocco and Azerbaijan in this era. So, Will Durant said about this *"The Muslims continued in this period, their unchallenged ascendancy in science. In mathematics most signal advances were made in Morocco and Azerhbaijan. We see here again the range of Islamic civilization. In 1229 Hasan al- Marraqushi (i-e. of Marraqesh) published tables of sines for each degree, and tables of versed sines, arc sines, and arc contagents. A generation later Nasirud Din-al-Tusi (i-e. of Tus) issued the first treatise in which trigonometry was considered as an Independent science rather than an appendage to astronomy; this kitab Shakl-al-qatta remained without a rival in its field until the De Triangulis of Ragiomontanus two centuries later."* [39]

Conclusion: Islam is the religion of Muslims and the Quran is its Constitution. Therefore, Islam does not exist without the Quran. In the first verse of the Quran it has been revealed, That Allah ordered to read. And in many places in the Quran people are encouraged to reflect and research on many thing of the universe. On the other hand Mohammad said: "Al-Hikmat-u-Zaalat-ul-Momin-i-Haisuma wajadaha Fahuya Ahaqqu Biha" (Wisdom is the lost property of the believers, wherever he fined it, he has a right to it). Therefore, inspired by the verses of Quran and commandment of Mohammad, many scientists were born among the Muslim and they did the best in every field of science, of which the mathematics is very important. They learnt many things found in India, China and Greece and developed so much that they left India and China behind.

So, it would be a mistake to call the Middle Ages totally the Dark Ages, because the Middle era was the era of the rise of Muslims. But that era must have been a dark age for Europeans. Because in Europe during that era no one studied except the clergy, and the schools began to be introduced in Europe from the 12th century. The Europeans were not aware of drugs; they used to treat their patients with witchcraft and wizardry, because they had no hospital. Their first hospital was built in Rome in the 13th century. Making baths was considered Kufr (faithless) among them. On the other hand there were large numbers of Muslim Schools in every city which provided free education. There were excellent hospitals everywhere for treatment in Islamic world, and bathrooms were present in every city of Islamic world. Nowadays, the way Muslim students go to Europe and America after learning English, the situation was completely reversed in those days. So, the European scholars went to Islamic countries after learning Arabic. After all, it is a game of nature; it does not assign stability to anyone forever. Therefore, turning away from the truth is not adornment for any scholar that is why; I thank the just and true European scholars who confessed the deeds of Muslims of the Middle ages. But for a long time I was wondering why the Europeans changed Arabic names of many Muslim scientists, were they having trouble with Arabic pronunciation or they have something   else   in   their   heart?   I   want   to   know   the   truth.

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