

Prominent Accomplishments of Islamic Scholars in Varied Fields of Education: A Review

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Introduction:

The influence of Islam on education highlights a comprehensive approach that balances spiritual, moral, and intellectual development, with the goal of nurturing the entire individual (body, soul, spirit). Central themes encompass the fusion of faith and science, the historical evolution of institutions such as madrsas, and the advocacy for universal and accessible knowledge constitutes a broad area of study, particularly centered around the "Islamic Golden Age" (approximately 8th–14th centuries). The impact of Islam on scientific education refers to the important historical era during this period Muslim scholars played a crucial role in preserving, translating, and significantly enhancing knowledge derived from Greek, Persian, Indian, and an assortment of other cultures dole out as the basis for both the modern scientific method and the European Renaissance. This epoch witnessed the advancement of essential scientific, mathematical, and medical concepts, highlighting the importance of experimentation, observation, and empirical evidences. Islam culture emerged in the Arab (Hijjaz) Province under the leadership of Prophet Muhammad in the 7th century the civilization extended beyond Arabia and spanned huge areas such as Persia, central Asia, North Africa, Europe and India. Due to its enormous size, the Islamic civilization was composed not just of Arabs but also of Persians, Mongols, Africans, Europeans, and Indians. Conventional dates for the Islamic Golden Age, also known as the Islamic Renaissance, are believed to range from the eighth to the thirteenth century A.D., however more recent research has stretched this period until at least the fifteenth century. In addition to maintaining earlier customs, artists, engineers, scholars, poets, philosophers, geographers, and traders in the Islamic world made innovations in food production, artistic endeavors, commerce, manufacturing, statute, literary works, maritime philosophy, sciences, sociology, and technology during this time. "Muslim artists and scientific researchers, rulers and craftsmen collectively made a distinctive heritage that has directly and indirectly influenced societies on every continent," as noted by Howard R. Turner. The distinctive feature of Islamic civilization is that it was composed of several racial groups that shared the same religion. However, it should be acknowledged that not everyone who lived under the caliphate's authority was a Muslim. Historical Background and Principal Motivators Religious Mandate Muslims were actively urged by the Quran and Hadith to pursue knowledge and contemplate the natural world, creating a cultural milieu in which scientific investigation was regarded as an act of religious value. Back in the day, places like the University of Al-Qarawiyyin in Morocco, which is still around and is the oldest university out there, and the House of Wisdom in Baghdad were basically the main hubs for learning and studying. This made big cities such as Baghdad, Cairo, and Cordoba really important centers for thinkers and scholars. Also, starting around the 8th century, there was this huge effort to translate a bunch of old writings from Greek, Persian, and Indian languages into Arabic. This was super important because it saved a lot of historical knowledge that might have just disappeared from the Western world otherwise. Islamic academics did more than simply preserve antiquated literature; they applied what they learned from it to their own novel concepts, such as the use of experiments to solve problems, which is essentially how science operates today. By absorbing, improving, and preserving knowledge in disciplines like mathematics, astronomy, medicine, and chemistry, Muslim academics made important contributions to scientific knowledge during the Islamic Golden Age (about the eighth to the fifteenth centuries). Notable developments included the development of algebra, the introduction of Arabic numerals and the idea of zero, the beginning of the scientific method through empirical observation, and the establishment of colleges, hospitals, and libraries. The present paper emphasizes the Islamic influence on

scientific learning, the Islamic origins of modern science and civilization and the ascendancy of the Islamic Science and Learning for more than 600 years in the world. Therefore this paper tried to present the Islamic influence of Education.

Between the ninth and the fourteenth centuries, Islamic Science outpaced that of any other culture. The Islamic Scientist-philosophers had wide-ranging interests, most of them worked in many disciplines we consider quite distinct today-medicine, Mathematics, Astronomy, Geography, Philosophy, Optics etc. Islamic learning is celebrated for having preserved many of the texts of ancient Greece, passing over a classical tradition that might otherwise have been lost. But Islamic Scholars did not simply accept these ancient “authorities” in the way the, scholastic philosophers did in medieval Europe. Stressing experiment and observation, they questioned and tested those authorities, laying the foundation on which modern science is based. Cara de Vaux in his book “Legacy of Islam” pointed that “we must not expect to find among the Arabs the same powerful genius, the same gift of scientific imagination, the same “enthusiasm”, the same originality of thought that have among the Greeks. The Arabs are before all else the pupil of Greeks, their science is a continuation of Greek science which it preserves, cultivates, and on a number of points develops and perfects.”The Arabs have really achieved great things in science; they taught the use of Ciphers (Sc. Arabic numerals), although they did not invent them, and thus became the founders of arithmetic of every day; they made algebra and exact science and developed it considerably and laid the foundations of analytical geometry; they were indisputably the founders of plane and spherical trigonometry which, properly speaking, did not exist among the Greeks. In astronomy they made a number of valuable observations.

The Abbasid Caliph Al- Ma'mun (ruled 813-833) transformed the library in Baghdad into what he called the “House of Wisdom” (Bayt al Hikmah). Once a library and school, it also supported an observatory and a staff of copyists, translators and bookbinders. Delegations were sent to Constantinople and other cities in search of manuscripts to be bought. Within seventy five years, many Greek works had been translated into Arabic, like the philosophical and scientific books by Aristotle, Galen's work on medicine, Euclid's on geometry and Ptolemy's on geography and astronomy. In many cases it was these Arabic versions that were translated into Latin and disseminated to the west. The House of wisdom also collected and translated works by Persian and Hindu thinkers. Many of the Islamic Scholars produced commentaries and original works of their own. Probably the greatest of the scholars in Al-Ma'mun's time was the mathematician and great geographer known as Al-Khwarizmi (c.800-c.847). His book on calculation with Hindu Numerals is primarily responsible for the adoption of what we today call “Arabic Numerals”. His revolutionary work on Quadratic Equations was translated into Latin in 1145 and served as the principal mathematics textbook for the next four hundred years.

Islamic Influence on Scientific Learning:

The Islamic Influence on Scientific Learning can be described as follows-

- (1) Scientific Method and Rationalism
- (2) Mathematics
- (3) Arabic Numerals and the origin of “X”
- (4) Astronomy and Geography
- (5) Medicine
- (6) Optics
- (7) Chemistry
- (8) Social Science
- (9) Biology
 - i) Botany
 - ii) Zoology

(1) Scientific Method and Rationalism:

Centuries before the European Renaissance, Islamic thinkers combined faith and reason, establishing the groundwork for rationalism and the contemporary scientific method. They balanced theological worldviews with inductive reasoning, sensory observation, and investigation. The scientific or inductive method of inquiry was the greatest boon the Islamic culture had bestowed upon the west. Islamic thinkers were using the inductive method in their scientific investigation in different fields. Al-Ghazali: A passionate advocate of logic, mathematics, and the natural sciences, he was well-known for challenging pure Aristotelian metaphysics. He argued that in order to properly understand creation, one must engage with the material world. Al Razi and Ibn al Haytham expounded particularly this method. Ibn Hazm, in his studies of logic emphasized sense-perception as a source of knowledge. Later Ibn Taymiyah, refuting the Aristotelian logic showed that induction was the only form of reliable inference. It was the method of observation and experiment which led Al-Biruni to the discovery of reaction time, An early rationalist theological group called the Mutazilite School maintained that human reason and intelligence were the primary criteria for understanding reality and distinguishing between right and wrong. They had a significant influence on the study and translation of mathematical and physical sciences.

Al-Kindi: Known as the "Philosopher of the Arabs," he was a trailblazer in the field of logic. He encouraged the use of reason to achieve truth by striving to integrate Islamic revelation with the empirical discoveries of Greek and Indian philosophers. Ibn Rushd (Averroes): He opposed those who believed that religion was in danger from philosophy and the rational sciences. He argued that intellectual inquiry was a religious duty and emphasized the need for harmony between faith and reason.

(2) Mathematics:

The first important name in mathematics is that of Al-Khwarizmi (c.800-c.847), Muhammad ibn Musa al-Khwarizmi was significant in the development of algebra and algorithms, proposing strategies for resolving linear and quadratic equations. Another important accomplishment was the incorporation of the idea of zero into the decimal system. He was known to the Latin scholars as Algorism, from his name is derived the technical term "algorism" or "algorithm" and the founder of the science of "Algebra". A part of its title- in Arabic al-jabr (the hunt) - introduced the word algebra into al-jabr al-jabr the languages of Europe. Al-Khwarizmi's name itself gives us "algorithm". Muslim scholars really got the ball rolling with math, coming up with algebra – which word actually comes from the title of a book by Al-Khwarizmi. They also brought us the Arabic number system, which was a big deal because it included the concept of zero, something we got from Indian numerals. Alkhwarizmi was followed by many famous mathematicians like Al-Kindi, Al-sarakshi, the three sons of Shakir Ibn Musa, the "Banu musa", Al-Hazen, the Brethren of purity, etc.

The achievements of Islamic mathematics can be summarized as follow-

- The Muslims developed number theory in both its mathematical and metaphysical aspects.
- They generalized the concept of number beyond what was known to Greeks.
- The devised new methods of numerical computation reaching their height with Alkashani in the eighth/fifteenth centuries.
- They also dealt with numerical series, decimal fractions, and similar branches of mathematics connected with numbers.
- They systematized and developed the science of algebra, preserving always its links with geometry.
- They continued the work of Greeks in solid and plane geometry and developed trigonometry, both plane and solid, working up accurate tables for the functions and discovering many trigonometric relations.
- This science, cultivated previously in conjunction with astronomy, was perfected and made into an independent science for the first time by Nasir al- Din al- Tusi in his famous "Figure of the Sector" which represents major achievements in medieval mathematics.

(3) Arabic Numerals and the Origin of “X”:

Initially Arabic used letters for numbers, just as Greek, Latin and Hebrew did. But a much easier system had been devised in India that used nine digits, place notation, and zero- an entirely new concept. The new system seems to have arrived in Baghdad in the late eighth century, very likely introduced by trades. By tenth century it had reached Spain. Mathematicians like Al-Khwarizmi showed how much easier multiplication and division could be done by manipulating the new “Hindu” numbers. They were particularly suited to figuring with pen and paper (which was in abundant supply after its introduction from China in the eighth century). In 1202 Leonardo Fibonacci, a Pisa merchant who had lived in Tunis, wrote a treatise about Arabic numerals. The original Arabic forms of the numbers were modified in the west. In past this was due to European’s use of an abacus like device that put the digits on rotating blocks. The Roman numerals 2, 3, 4 and 7 are 90-degree rotations of their Arabic counterparts. While 5, 6, and 8, on the other hand, come from elsewhere: 5 and 6 from visigothic script, 8 from an abbreviation of the Latin “Octo” (eight) that placed the first and last letters one above the other. Why is it we call unknowns “X”? Al-Khwarizmi used the Arabic word “Shay”, meaning “thing”, for the unknown quantity he sought to find. In Spain, where the letter “X” was pronounced “Sh”, the word was translated as “Xay” and eventually abbreviated as simply “X”.

(4) Astronomy and Geography:

The several new features of Islamic astronomy include, besides all the refinements made in the Ptolemaic system, the star catalogue of Ulugh Begh, which was the first new catalogue since the time of Ptolemy and the replacement of the calculus of chords by the calculus of sines and trigonometry. Astrolabes, which were essential for navigation and timekeeping, were among the sophisticated astronomical tables and equipment created by scholars like Al-Biruni and Al-Zarqali. Scientists improved astronomical models, created accurate star catalogs, and invented sophisticated instruments such as the astrolabe, based on religious requirements such as determining prayer times and the direction of the qibla. The Islamic astronomers also modified the general system of the Alexandrians in two important aspects. The first modification was to abolish the eight spheres which Ptolemy had hypothesized to communicate the diurnal movement to each of the heaven, the Muslims substituted a single starless heaven at the confines of the universe. The Other modification which had a greater significance for the philosophy of Sciences, involved a change in the nature of the heavens.

The renowned Ottoman scientist Taqi al-Din (1526–1585) did, in fact, create an observatory in Constantinople (Istanbul) in 1557, close to the Galata area, during the time of Suleiman the Magnificent, according to Murad III's *Sehinsahname* (Book of the King of Kings). Although some sources refer to the more general "Constantinople Observatory of Taqi ad-Din" (1577–1580), pictures from the *Sehinsahname* show him working with other astronomers at a location that is frequently connected to the Galata region and whose establishment was impacted by the early 16th-century intellectual endeavors. Using Al-Khwarizmi’s work in Geography, he specified the number of miles in one degree of the earth’s surface – Islamic Scientists improved on previous Geographies and were able to determine the circumference of the earth with remarkable accuracy. Their figure was only forty-one meters off modern measurements. Geography and the related science of astronomy were important to the rulers with vast empires and also to every Muslim, who needed to know the direction of Mecca and times for prayer.

(5) Medicine:

Some of the most significant contributions of Islamic Science were in medicine. Back in the day, doctors like Ibn Sina, also known as Avicenna, and Al-Razi were real pioneers. They set up the very first hospitals with separate rooms, put together massive books on all sorts of medical stuff, and even came up with concepts like quarantining people and doing clinical trials. And get this, long before anyone in the West figured out how blood circulates through the lungs, Ibn al-Nafis had already discovered it. Islamic medicine is one of the most famous and best known facets of Islamic civilization, being one of the branches of science which the Muslims most excelled. The Muslims Physicians were studied in the west until the 19th century. In the East, despite the rapid spread of western medical education, Islamic medicine continues to be studied and practiced on a minor

scal Islamic school of medicine which came into being early in the history of Islam is of great significance, first for its intrinsic value, secondly because it has always been closely allied with other sciences, and especially philosophy. The wise man or Hakim, who has been throughout the Islamic history it was the central figure in the propagation and transmission of sciences, has usually been a physician. The fact that both the sage and the physician are called Hakim shows the relationship between the two. Many of the best known philosophers and scientists in Islam, such as Avicenna and Averroes, were also physicians. The same thin holds true for the Jewish philosophers in the world of Islam. Maimonides besides being a great thinker was also the physician to Saladin.

Islamic Physicians enjoyed particular renowned during the Crusades Salah al-Din (Saladin) sent his personal physician to tend the ailing Richard the Lionhearted, King of England. While contemporaries in many parts of the world sought super natural causes of disease, Islamic medicine drew on the rational approach of ancient Greek writers such as Galen and Hippocrates and that of the Persian medical school at Jundishapur. While bacteria and the germ theory of disease were unknown, Islamic Scientists emphasized the importance of hygiene. When the first hospital was built in Baghdad in the ninth century, the site was selected following experiments in which pieces of meat were left in various locations to determine where decay was slowest to set in. Around the same time, the Caliphate began to examine physicians about their knowledge and to license them. Close control was also maintained over the production of medicines. Baghdad Pharmacies provided a range of remedies based on plants as well as sophisticated inorganic compounds. Surgeons removed cataracts and tumors, and performed delicate vascular operations.

Islamic Doctor Al-Razi (865-925) considered the circulation of blood in the heart. His work contradicted the accepted theories of Galen and anticipated the work of English physician William Harvey by 350 years. Al-Razi was the first scientist ever to isolate the clinical symptoms of a particular disease "Smallpox". He enumerated seven principles for good health, including moderation in food and drink, cleanliness, and good material and physical habits.

The most widely studied work on medicine and disease was produced by Ibn Sina (980-1037) from Persia, better known in the west as Avicenna. The cannon of medicine, translated 87 times, remained the most important medical text in Europe until the 17th century. Said to have written some 275 books in Arabic and his native Persian, Ibn Sina was called the "Prince of Philosophers" by his contemporaries, but some of his ideas also drew criticism as contrary to the teachings of Islam. He studied Aristotle, in a neo-platonic spirit, believing (like Plato) in the existence of universal concepts. He distinguished the possible from the necessary- and made a proof of the primacy of God's existence.

Another Islamic interpreter of Aristotle was Ibn Rushed (1126-1198) from Spain (called Averroes in the west). Like Ibn Sina he was a physician as well as philosopher. His philosophical works made their greatest impact in the west. Believing both religion and philosophy to be true, he sought to harmonize them. His ideas would help to secularize western science and philosophy, separating them from theology and the limits of church dogma. With medical text of Greek, Pahlavi and Sanskrit origin translated into Arabic, and a sound technical vocabulary firmly established, the ground was prepared for the appearance of those giants whose work have dominated Islamic medicine ever since: Al Tabari, Al Razi, Ali Ibn al Abbas, Avicenna, Averroes, Me sue Senior (Yuhanna ibn Masawih), Me sue Junior (Masawih al Marindi) and many others. The Muslim Physicians taught their science in schools, mosques, and hospitals. There were the theoretical teaching and the practical one. The hospitals were very cared for and all the sick persons were admitted and were receiving all the care needed, plus clean and new clothes and enough money to live with until they were able to resume working.

(6) Chemistry and Alchemy:

Jabir ibn Hayyan, famed as the 'Father of Chemistry' also known as Geber, along with Al-Razi, were pivotal figures in the realm of Islamic alchemy, facilitating the evolution of the discipline into modern chemistry through meticulous experimentation and systematic classification. They developed laboratory methods such as distillation and sublimation, as well as a systematic classification of chemical substances. Jabir, who lived in the

8th century, focused on laboratory techniques such as distillation and was responsible for the creation of early acids. In contrast, Al-Razi, active during the 9th to 10th centuries, enhanced these techniques, transforming them into organized, empirical practices and comprehensive laboratory manuals. These scientists made important contributions to chemistry (alchemy), which influenced European chemistry throughout the Renaissance period, by experimenting with these distinct investigational techniques. Invented the alembic (still) and retort, while refining methods such as sublimation, crystallization, and distillation. Islamic Scientists, like those in the west, pursued Alchemy, hoping to turn base metals into gold. Many of the techniques of chemistry can be traced to their researches. Jabir transitioned alchemy from mystical practices to empirical laboratory science through the implementation of controlled experiments. He further recognized for the discovery of hydrochloric acid, nitric acid, and Aqua Regia. He also suggested that metals are composed of sulphur and mercury, thereby establishing a basis for alchemical transformations and Categorized substances into Spirits, Metals, and Stones. Their influence is reflected in the large number of Arabic terms adopted by European languages.

• 7)Physics and Optics

From the eighth to the thirteenth centuries, Islamic academics revolutionized physics by using experimental scientific methods (ilm al-manazir) to study motion, mechanics, and optics. Ibn al-Haytham (optics/scientific method), and Al-Biruni (973–1048) emphasized density/mechanics, He orchestrated sophisticated investigations for precisely determining the particular density of different metals and minerals. He also made important contributions to astrophysics and physics. Ibn Sina (Avicenna, 980–1037): By creating the theory of *mayl* (inclination), a moving object acquires an internal "inclination" or impetus from a mover, which sustains its motion which is seen to be a forerunner to the idea of momentum in classical physics. Ibn Sina identified three Types of *Mayl*:

- **Psychic** (*mayl nafsani*).
- **Natural** (*mayl tabii*).
- **Unnatural/Violent** (*mayl qasri*).

He improved our understanding of motion. By contending that acceleration is proportional to force in lieu of velocity, Abū al-Barakāt al-Baghdādī (12th century) challenged Aristotelian physics.

The Book of Ingenious Devices, a seminal work on mechanical engineering, automation, and pneumatics, was written by the Banu Musa Brothers in the ninth century.

Al-Khazini (12th Century): He concentrated on the domains of mechanics and hydrostatics, with particular emphasis on the analysis of force equilibrium and the determination of the center of gravity.

Abbas Ibn Firnas (810–887): A polymath renowned for his contributions to aviation, he engineered a glider, thereby demonstrating an early understanding of the principles of aerodynamics and the mechanics of flight. Ophthalmology was a particular specialty of Islamic medicine, beginning with Al-Kindi (c.800-870), who first identified the parts of the eye. You know, when it comes to optics, a lot of people give credit to Ibn al-Haytham, or Alhazen as some call him, for kicking off the whole modern scientific way of doing things, especially when it came to how we see. Later on, European scientists like Johannes Kepler, they really got a lot out of his book, the Book of Optics. It was pretty spot-on in explaining how vision actually works. Ibn al-Haytham (c.965-1039) explained how human vision operates and is regarded as the “Father of Optics”. By proving that light enters the eye and travels in straight lines rather than radiating from it, his groundbreaking book, the Book of Optics (Kitab al-Manazir), corrected ancient Greek views. In other words it had long been thought the eye send out rays that struck the object seen-much in the way a bat echo locates. Ibn al-Haytham was able to demonstrate that the eye instead only perceives light reflected from the object. He proved his point by making a pin-hole camera. Many people consider Ibn al-Haytham (Alhazen, 965–1040) to be the founder of modern optics. He also

pioneered the scientific method, emphasizing the value of repeatable experimentation. Physicians such as Ibn Sina (Avicenna) and Al-Razi (Rhazes) produced significant advances in anatomy, pharmacology, and pathology, setting the foundation for modern medicine. Specialized wards in hospitals were constructed, and the diagnosis of contagious diseases was obtained.

8) Social Science:

Ancient Islamic intellectuals laid the groundwork for modern social sciences, with Ibn Khaldun (1332–1406) recognized as a seminal figure in the emergence of sociology, historiography, and economics, particularly attributed to his pivotal work, the *Muqaddimah*. Other noteworthy contributors encompass Al-Biruni (anthropology, comparative religion), Al-Mawardi (political science), and Ibn Miskawayh (ethics).

The principal contributions from the Islamic Golden Age to the field of social sciences include: Al-Biruni (973–1048): Conducted extensive anthropological inquiries regarding 11th-century India, thus pioneering the disciplines of comparative religion and cultural studies. Al-Mawardi (1075–1158): Composed comprehensive treatises on political science and governance, notably exemplified in *Al-Ahkam as-Sultaniyyah* (The Laws of Islamic Governance). Ibn Miskawayh (932–1030): A precursor in the realm of ethics and moral philosophy, focusing on the enhancement of human character within a societal context. Al-Ghazali (1058–1111): Contributed profoundly to social philosophy, ethics, and economics, analyzing the intricacies of labor division and market exchange. These scholars employed systematic empirical methodologies, rigorous source evaluation, and interdisciplinary approaches to examine human society. Ibn Khaldun (1332–1406): Developed theoretical frameworks concerning social solidarity (*Asabiyyah*), the cyclical nature of civilizations, and economic principles such as the value of labor and the dynamics of supply and demand, well in advance of European intellectuals. He was born in Tunis, is considered Islam's greatest historical philosopher and the creator Social Science- his histories sought not only to present an accounting of events but to explain the social, economic, geographic and cultural factors that influence them. His researches led him to a cyclical view of history and a belief in the rise and fall of empires.

Biology:

The Islamic Scientists developed a strong worldview built upon pure research and often investigated scientific phenomena for the sake of finding answers. However, as with modern society, much of their research was applied science, designed to hone techniques and increase the pool of knowledge in areas that improved everyday life. One of these areas was Botany, where much of the research was concentrated upon improving farming techniques and methods, essential in areas where farmers had to contend with thin soil and water shortages. The research of the Islamic scientists fueled the medieval Islamic Agricultural Revolution and developed many techniques that modern farmers still use today, especially in hot, dry regions.

Ibn al-Baitar (d. 1248): A preeminent botanist and pharmacist in the Islamic world, he documented over 1,400 plants and medicines in his book '*Kitab al-Jami' fi al-Adwiya al-Mufrada*'.

Ibn al-Nafis (1213–1288): He detailed the pulmonary circulation of blood, a pivotal breakthrough in anatomy and physiology.

Jabir ibn Hayyan (c. 721–815): His work laid the groundwork for biochemistry, with writings exploring the chemical composition of plants and animals.

Al-Damiri (1344–1405): Author of '*Hayat al-Hayawan*' (The Life of Animals), a comprehensive zoological encyclopedia.

Abu Ubaidah (728–825): Conducted detailed research into equine anatomy and zoology. Al-

Ghafiqli (d. 1165): An esteemed Andalusian botanist who specialized in identifying medicinal plants. These scholars, alongside philosophers like Ibn Miskawayh and Al-Biruni, often presented early evolutionary ideas concerning the organization of life, from minerals up to humans. **The agricultural science of the Islamic Scientists incorporated a two stage process:** The first involved gathering all of the available data and knowledge of farming techniques and the second involved using scientific techniques to improve and refine these processes, publishing the results and disseminating the knowledge far and wide. Other additions of the Islamic Botanists were the introduction of cotton into Europe, giving Mediterranean farmers the chance to grow a cash crop and allowing merchants to export goods to Northern and Western Europe.

(i) Botany:

The Islamic Scholar, Al-Dinawari (828-896), is one of the leading botanists from this period and his work “The Book of Plants”, was a landmark book, earning him the epithet, This is considered a pivotal text, which led to him being referred to as ‘The Father of Islamic Botany.’ Following in the footsteps of the Greeks and Romans, he meticulously studied and recorded information on at least 637 plant species. Notably, he also explored the evolution of plants, detailing how various species have developed and diversified over time. In the 13th century, the Andalusian Islamic Scholar Abu al-Abbas al-Nabati, took the scientific methods developed by the Muslim thinkers and applied them to botany, concentrating upon the medicinal plants. The work of Al-Nabati was soon overshadowed by that of his pupil, Ibn Al-Batar, who wrote a book that became the reference work for botanists until well into the 19th century. His book contained detailed descriptions of over 1400 plant species, many of them essential food sources or of use of drugs, importantly, at least 300 of these plants were his own discoveries. Abu Zakariya Yahya Ibn Muhammad Ibn Al-Awwan, a 12th Century Islamic scholar from Seville, Spain, was a significant figure in the history of biology, particularly in the realm of agriculture. His Kitab al-Filaha provided guidance to agriculturalists on the cultivation of nearly 600 plant species, encompassing more than 50 varieties of fruit trees. This work elaborated on the techniques, optimal growing conditions, fertilizers, and the diseases and pests that affected the plants. Ibn al-Suri, a 13th-century botanist from Syria, was renowned for his meticulous, practical, and illustrated documentation of plants. Additionally, there was Al-Qazwini, whose complete name was Zakariya al-Kaiwini, who died in 1283 AD. producing plant encyclopedias, he compiled several well-known encyclopedias concerning the universe, which included detailed sections on plants and agriculture. Other Islamic botanists are Ibn-Sauri, Al-kaiwani,

(ii) Zoology:

The most important contributor to Islamic evolutionary theory , and a leading Scholar of Zoology, was Al-Jahiz (776–868): Celebrated for his groundbreaking publication, Kitab al-Hayawan (Book of Animals), which delved into the complexities of food chains, the impact of environmental elements on animal behavior, and the early concepts related to the theory of natural selection. He wrote a detailed treatise. This became one of the most important works in the history of biology. This book contained detailed descriptions of over 350 species of animal. Al-Jahiz was the first scholar to realize the importance of the environment upon animals and he understood that the environment would determine the likelihood of an animal surviving. As a result, he proposed a theory called the “Struggle of Existence”, the forerunner of Darwin’s “Survival of Fittest”. Al-Damairi, a 13th century Islamic scholar based in Cairo and influenced by Al-Jahiz, wrote a treatise called Hayat Al Hay wan (The life of animals), an encyclopedia that contained details of many animal species and became a formative work on the subject. Abu Ubaidah (728-825) wrote over 50 volumes concentrating upon horse breeding and animal husbandry, most of which later passed into the hands of the Europeans. Ibn al-Awwan’s 12th century work “The Book of Agriculture”, contained detailed sections concerning animal husbandry and bee-keeping. Finally, Ibn al-Baytar wrote a book of Pharmacology that included details about the veterinary care of animals.

Conclusion:

It would be long to describe all the sciences invented by Muslims, including history, geography, cosmology and cosmology, humanities, urban planning, engineering, architecture, and art. European universities, especially those in northern Italy and France, taught the work of Islamic scholars in botany, zoology, physics, and alchemy. Muslims led the West in many areas of medieval philosophy and were pioneers in virtually every scientific field. In the words of George Sarton, "Muslims have fulfilled humanity's mission." Al-Farabi, the greatest philosopher, Abu Kamil and Ibrahim ibn Sina, the greatest mathematicians, Al-Musudi, great geographer and encyclopedia and Al-Tabari, the great historian, were all Muslims. In practically every aspect of medieval Western life, Islamic influence on scientific knowledge may be found. The sciences of Jabir, Kindi, Jahiz, and Vitalin were among the most brilliant lights of the Middle Ages. Ibn Sina, Zahrawi, Zakaria, and Razi in the medical domain. In mathematics and Astronomy, Khorezmi, Omar Khayyam, Abul Wafa, and Nasiruddin Tusi. In philosophy, Farabi, Ibn Sina, Ghazali, Ibn Rushd, Ibn Arabi, and Fakhruddin Razi. In their different fields of expertise, they left their brilliant stamp on the pages of history. The House of Wisdom (Bayt al-Hikma): Established in Baghdad, in the 8th and 9th centuries, this was a key intellectual hub for translating, preserving, and expanding upon old knowledge.

Institutionalizing Education: The notion of the contemporary university can be attributed back to Islamic structures, such as the University of al-Qarawiyyin in Morocco, set up by a woman, Fatima al-Fihri, in 859. **Scientific Vocabulary:** Algebra, algorithm, azimuth, zenith, nadir, alkali, and elixir are just a few of the English words used in science and math that have Arabic origins. **Transmission through Al-Andalus:** Islamic Spain (Cordoba and Toledo) served as a primary gateway for passing on scientific knowledge, manuscripts, and instruments to Europe. **"Miracle" Literature (Tafsir'ilmi):** A modern movement designed to interpret Quranic verses as expressing scientific truths (e.g., in embryology) in advance of their time, however this is questioned by some scholars. Thus the real pioneers of global Education were Islamic thinkers and scientists. The concept of divine unity, which is fundamental to Islamic revelation, is the foundation of Islamic arts and sciences. All Islamic science exposes the unity of nature, which is an image of the unity of the divine essence, just as all authentic Islamic art offers a plastic form in which to study the unity of God exhibited in its diverse forms. It is imperative that this reality of the Islamic civilization of the West during the middle Ages be thoroughly examined, acknowledged, and integrated into professional literature and instructional materials in educational institutions worldwide.

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