

writings. Muslim chemists discovered and isolated 20 of the basic elements of the Element Table.

In the darkest of occidental dark ages, Ibn al-Haytham dissected vision and seeing, “recognized the persistence of images on the retina” and “began treating the eye as a piece of machinery.” And had a camera obscura, a dark-room. Al-Biruni defined the nature of finite matter 700 years before Lavoisier. The encyclopedic physician Ibn Sina astoundingly determined that light “originates from the dissemination of particles from a light source,” concluding that the speed of light was finite.

We know that Al-Battani’s changing orbit calculations anticipated Kepler’s planetary motions; that Islamic astrolabes guiding by stellar position revolutionized navigation. That Omar Khayyam’s Persian calendar calculations still permit us today to compute to the second the end of the earth’s revolution around the sun each year.

In mathematics, the Islamic legacy is nothing short of momentous. Founders of arithmetic, trigonometry, even the beginnings of the non-Euclidian geometry which Albert Einstein used for the Theory of Relativity. Where would the world be without Al-Uqlidisi’s and Abul Hasan’s decimal point? What would the world without al-Jabr (Al-Jabr Wal Mukabala, the textbook creation of algebra [Jabr=reduction to simpler forms] by al-Khwarizmi? The most accomplished mathematician of the Middle Ages, whom the West called Algorismus, is not a household name, though his invention is, especially when homework time rolls around...

Islam’s followers gave the world the first road maps, atlases (Ibn Khirdazbah), almanacs (al-manaq), encyclopedias. The Moroccan Ibn Battuta (1304-1374), who claimed never to have travelled the same road twice, outdistanced and outdescribed Marco Polo by leaps and bounds. The Amir-al-Bahr (Chief of the Waters: Admiral) of the Ocean Sea, Captain Columbus himself, confessed learning from Ibn Rushd (Averroes/Aventuez) to believe Rushd’s “New World beyond the Sea of Darkness.” Vasco de Gama’s pilot to India was the Arab Ahmad Ibn Majid, “the Lion of the Sea in Fury.” It is ironic that this navigator who wrote the 1490 Nautical Directory (Kitab al-Fawaid) of the Red Sea and the Indian Ocean guided the ships that would lead to the demise of Arab control over those shores. “The inventors of the globe, the encyclopedia and the

almanac are indisputably and solely the founders of modern geography.

Muslims were the originators of toxicology, cardiology, parasitology, dermatology, trauma or emergency medicine (Egyptian Ibn Al-Quff, 13th century). Also embryology, ophthalmology, orthopedics, obstetrics (and emergency caesarean sections), urology, public health, preventive medicine, medical ethics. They single-handedly jump-started surgery and anesthesiology. Abul Qasim as-Zahrawi of Spain ligated blood vessels 5 centuries before Ambroise Pare. Muslim surgeons perfected narcosaturated sponges. Al-Nafis of Egypt described blood circulation 400 years before Harvey.

The next time anyone mentions Leonardo da Vinci and the first flying machine, readers can cite Ibn Firnas, the master tinkerer: his flying device dates from the 800s.

Sociology was a revolutionary and original Muslim field, and ever more pertinent to the modern world and all our futures. It is acknowledged that Ibn Khaldun, Tamerlane’s North African “consultant on the Muslim World,” provided a “classic statement of a destiny unfolding not only in time but in space.” Ibn Khaldun “proved to be the Herodotus and the Thucydides of Muslim historiography.”

There are those who believe that science is like a wind of thought that blows through the human collectivity in simultaneous waves, and that the determination of intellectual primacy is futile, or irrelevant. But this is not the issue. At issue are the forgotten Muslim scientists who must be forgotten no longer, in the interest of truth and history. The rise of Muslim science was indeed “a miracle, indubitably,” as George Sarton has said. Without Islamic science, the intellectual fate of the world might have remained a barely unsealed cipher. Cipher. Sifr, empty; passing into Italian as “Zephyro”; passing into a scribe’s shorthand as “Zero.” Zero, born Sifr, concept and non-number invented by Muslim geniuses. Geniuses whose ideas flourished because of the Quran. And to the Prophet’s (peace) words: “Knowledge is beneficial to its seeker in this world and in the Hereafter as well.”

The achievements of these luminaries have faded into oblivion due to our indifference and apathy. There is an urgent need to reclaim these achievements and, as their heirs, it is our duty to hold aloft the torch of knowledge lighted by these illustrious personalities. We must, therefore, bring their works into the limelight once again.

*Sifr*. Definitely not the word to define Islamic science.

# Incredible Scientists

**Millions upon millions  
around the world  
speak Arabic  
every day  
without realizing it,  
in words used  
without pausing.  
Without  
Islamic Science,  
there may  
have been  
a delayed  
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There was once a civilization that was the greatest in the world. It was able to create a continental super-state that stretched from ocean to ocean, and from northern climes to tropics and deserts. Within its dominion lived hundreds of millions of people, of different creeds and ethnic origins. And this civilization was driven more than anything, by invention. When other nations were afraid of ideas, this civilization thrived on them, and kept them alive. Its architects designed buildings that defied gravity. Its mathematicians created the algebra and algorithms that would enable the building of computers, and the creation of encryption. Its doctors examined the human body, and found new cures for disease. Its astronomers looked into the heavens, named the stars, and paved the way for space travel and exploration.

Look up at the sky tonight. See Altair, (from the Arabic *altair*, the bird), star of the first magnitude in the constellation of Aquila. Or Aldebaran, the orange one, in Taurus (al dabaran: follower (of the Pleiades); naranj: orange). And Betelgeuse, the red giant (bait al jauza: shoulder of the giant (Orion). No ghouls to fear (al ghul: those who seize, vanish) in Algol (same origin), the first known eclipsing binary star, in the constellation of Perseus. Millions upon millions around the world speak Arabic every day without realizing it, in words used without pausing.

If you reached for your eyeglasses to contemplate the starry night, you may also thank two Islamic scientists: Ibn Firmas, who invented them in 9th century Spain, where they were manufactured and marketed from then on, and the great Ibn al-Haytham (Alhazen), the 11th century originator of the science of optics. An entire civilization, the West, is taught that the English scientist Roger Bacon (d. 1292 CE) is owed this credit. The history books, the science books do not say that Ibn Firmas' invention of the magnifying glass stimulated the work of Kepler and Galileo; that Ibn al-Haytham's treatise on optics preceded Newton's by 600 years in the exact study of lenses, prisms and light. That refraction, and the famous 17th century Newtonian experiment which proved that white light consisted of the commingling

colour bands of the spectrum, had been demonstrated by Kamal ad-Din, in the 14th century. The eminent Danial J. Boorstin, in "The Discoverers," grants at best that "Arab scientists were in the mainstream of optical science." In the book "The Miracle of Islamic Science," Dr. K. Ajram sets out to set the record straight. He gives 45 entries of What is Taught/What Should be Taught." And these are not esoteric, scholarly, dusty and dry items. They constitute the utterly basic ingredients that have shaped our modern life.

A few more examples (they are irresistible): Looking at yourself in the mirror? No, it is not from Venice in 1291, as is held, but Syria 9th-10th centuries. Consulting the town clock, jogging with your chronometer? Ibn Firmas, again, for the chronometer, and Muslim mechanical engineers, whose weight-driven clocks ushered in modern time, not the 1335 Milan clocktower. And the pendulum too was not Galileo's brainstorm but the Egyptian Ibn Yunus al-Masri's. The stern rudder, the compass, Islamic mechanical wizards and experimenters gave them to us. The Chinese found the magnetic needle. It was Muslims who applied it, who "invented" its practical use in navigation.

**Substances & Devices:** These were introduced by Muslims to the West. Guitars and cotton (*qutn*), street lamps and pianos, tongue depressors and artificial teeth, paper money and postage stamps, soap, plaster casts, gauze (*kazz*) dressings. Moveable type (Gutenberg notwithstanding, Islamic Spain had brass type 100 years before his). Paper: The first industrial paper-mill operated in Baghdad in the early 8th century. Paper was used in Makkah in 707 CE. It appeared in England in 1309. You are beginning to get the picture. It's being painted squarely, fairly, in non-polemic terms. Without Islamic science, there may have been a delayed industrial revolution, another astrophysical picture. No trips to the moon and beyond. A different world.

Muslim scientists were the real founders of science as we know it today. They were not only brilliant theoreticians, they were the first historians and philosophers of science, the first methodologists of science, the first experimenters. We have been given a history of the world clouded by misinformation.

Let's examine the rise of science in Islam and

Islam's role in rising science. The Chief Chemist is the One Who is Creator of the elements. The most Insightful Astronomer is the One Who created the laws of celestial motion and matter. The most learned Biologist is the One Who built the human biological system, the structure and function of which intrigues the mind of the philosopher and earns the admiration of the physiologist. The early Muslim scientists had the Quran as the fountain head of their inspiration and their secondary spring of knowledge was the Prophet of God. Two potent fountain heads. Two powerful stimuli.

When the first millennium dawned, the Persian genius Al-Biruni and his prodigious contributions: 400 years before Leonardo da Vinci. He is called the Leonardo of Islam by Harvard historian George Sarton. But it would be more correct to say that Leonardo was the Al-Biruni of Christianity. Abu al-Rayhan Muhammad ibn Ahmad al-Biruni created the scientific method backed by the rigour of experimentation, a physicist and an astronomer who identified gravity, motion and momentum, a botanist and a geologist who, knowing the aquatic origin of the earth from the Quran, postulated the primordial sea that once covered the Indus Valley system; a mathematician who computed the earth's solar orbit. Al-Biruni seems to have combined the genius of da Vinci, Galileo, Newton and Copernicus together.

Modern chemistry begins with Boyle and Lavoisier in the 17th/18th centuries, we are commonly told. Not so. Al-Kimiya for Islamic scholars was not alchemy, the cult of transmutation. In the Islamic era, al-Kimiya was precisely what it is today: the study of chemicals. The discipline is still saturated with Arabic terms from the instruments of research to the substances & chemical processes themselves. Al-Jabr (9th century) is considered the father of chemistry. The al-kili alkali acid base principle identified by Muslim scholars is the direct forerunner of the crucial pH scale. Sulfuric acid, often called the single most important industrial chemical in use today was first described in 1200 CE in Arabic

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and in the Hereafter as well

Prophet Muhammad (peace)