ISLAMIC SCIENCE AND THE CONTEMPORARY WORLD

"ISLAMIC SCIENCE IN CONTEMPORARY EDUCATION"

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Caliphs as Sponsors of Islamic Sciences

Ishtiaq Ahmad

It was the consistent patronage of eminent Muslim scholars and scientists by the Abbasid rulers of Baghdad, especially Caliph Abdallah al-Mamun Al-Rasheed, and the Umayyad rulers of Andalusia (Muslim Spain), particularly Caliphs Abd ar-Rahman-III and Abd al-Hakem-II, that essentially contributed to the realization of the Golden Age of Muslims from 8th to 13th century. During this time, the rulers devoted enormous resources for the support of scientific activity in Muslim societies. In fact, until the rise of modern science, no other civilization engaged as many scientists, produced as many scientific books, or provided as varied and sustained support for scientific activity. This is in stark contrast to the present era when sustained support for scientific activity by Muslim ruling elites constitutes an important barrier to the flourishing of scientific scholarship in the Muslim world. It is, therefore, important to recall how rulers during the Golden Age of Muslims passionately contributed to the rise of Islamic sciences.

In the first half of the 9th century, Caliph al-Mamun took the Abbasid patronage of translation and scientific works to new heights by founding in Baghdad’s Bayt al-Hikma (House of Wisdom), where eminent scholars translated into Arabic the works of ancient science from Greek, Chinese and Indian civilizations. Over time, the House of Wisdom became the then Muslim world’s premier place for the production of innovative scientific works in philosophy, mathematics, algebra and astronomy by in-house scholars like Abu Yousuf Yaqoub al-Kindi, Abu Jafar Muhammad ibn Musa al-Khawarizimi and several others. Soon, other leading Muslim cities of the time like Cairo, Fez, Samarkand and Cordova became centres of scientific learning and research. In Cordova, Andalusia, Rahman-III and Hakem-II played an exceptional role in promoting educational activities and patronising prominent scholars, thereby contributing to Andalusia’s Golden Age of Muslims that eventually led to European renaissance.

Factors Guiding Rulers’ Patronage

The period of al-Mamun in Baghdad, and Rahman-III and Hakem-II in Cordova, represents the highlight of Muslim rulers’ patronage of scientific scholarship. Given that, this section focuses only on their respective contribution to the rise of classical Islamic Science and does not cover the rulers’ patronage during the entire Golden Age of Muslims spanning centuries. Before narrating how Muslim scholarship flourished under selected but most prominent Muslim rulers, it is important to mention what factors encouraged them to patronise scientific scholarship.

First, as argued by Ziauddin Sardar, the intellectual and scientific quest of these
Muslim rulers, like a number of those who preceded or succeeded them, was their “deep adherence to a faith in which the pursuit of knowledge was equated with an act of worship.” Such intricate link between the duty of faith and learning had impacted on the creation of institutions of learning: hospitals, universities, or public libraries, all taking “firm root” in Islam, “where piety and learning were in many respects inseparable.” The rooting of intellectual life in religion, the basis of Muslim society, created a respect for it such that rulers and rich men opened their doors to the representatives of the intellectual life and frequently lavished large sums of money on them. Islam is said to be responsible for “the fantastic tales of bags of jewels and gold paid for a few pages of a rare pharmacological or astronomical manuscript and also of travel of thousands of miles in search of a person who might provide an insight into a mathematical problem.”

Second, again guided by Islam, which emphasized the practical use of knowledge, the Muslims sought useful knowledge and they translated only what they believed to be of practical use to them. According to Hugh Kennedy, “just as the Islamic sciences developed because people needed to know certain things, so they chose from the classical Greek heritage what they believed to be useful. Philosophy was required as a technique for analysis of arguments and logic, but it was really logic that they were interested in more than abstract or general philosophy; and above all it was the logic of Aristotle that came to be the key text. They were interested in medicine for obvious reasons and translated medical texts like that of Galen on medicine or Dioscorides on the uses of plants—works which they believed have an obvious value in Arabic. They regarded astronomy and astrology as practical sciences, astrology especially because, as elsewhere in the medieval world, many people in the Islamic lands firmly believed in the influence of the planets and the importance of doing things at the right time; and along with astronomy came mathematics.”

Third, Islam guided Muslims to seek knowledge through istidāl (evidence), a process that, according to Al Faruqi, included “the observation of the data and their examination through experimentation, measurement and more observation. They developed instruments to correct and expand the sensory evidence, and would repeat experiments as a means to test results and avoid error. “It is this search of absolute accuracy, as demanded by the faith, which imposed itself upon Islamic sciences, and this is why Muslim science embraced the knowledge of the sky and stars (astronomy) as well as surgery and ophthalmology.” That explains why Caliph al-Mamun was...

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6 Al Faruqi, *op cit*, p 322.
so much interested in setting up observatories. In fact, “faith impacted on the acts and deeds of rulers in the scientific experience. According to the terms of his political testament, the sovereign was bound to make enquiry into all that concerned religion, the obligations it imposed and its traditions.”

A fourth factor, in the words of Ahmad Dallal, was the “growing awareness in the new society of the status of Islamic civilization as heir to world civilizations. At a more tangible level, the increasing complexity of social reorganization and the subsequent social demand for professional expertise provided opportunities and incentives for aspiring professionals to cultivate scientific knowledge. Evidence from the earliest extant scientific sources indicates that the translation movement was concurrent with, rather than a prerequisite for, scientific research in the Islamic world. Simultaneous research and translation did not take place in just one field; rather, such research was the driving force behind the translation of numerous astronomical, mathematical, and medical texts. The translation movement was not accidental; it was a result of deliberate and persistent efforts undertaken by professionals who were responding to the demands of their society—efforts that were supported by different segments of society and stimulated by the internal needs of scientific research.”

A final, perhaps more important factor, which essentially gave impetus to all of the four above-mentioned reasons underpinning Muslim rulers’ exceptional sponsorship of classical Islamic scientific scholarship was their firm belief in a strong rationalist and liberal Islamic tradition carried on by a group of Muslim thinkers known as the Mutazilis. Caliph al-Mamun and his two successors, al-Mutasim and al-Wathiq, were followers of the Mutazilis tradition, which stated that matters of belief and practice should be decided by reasoning on the basis of the Quran. This defied the literalist-orthodox Muslim position, according to which everything a believer needed to know about faith and practice was spelled out literally in the Quran and Hadith. Moreover, the Mutazilis stated that the Quran was created rather than eternal, in opposition to literalist-orthodox Muslim opinion that the Quran and the Divine were coeternal. “It was this liberal and rational religious tradition that essentially triggered the translation movement and subsequent scientific scholarship during the Abbasid rule, until the reign of Abbasid Caliph al-Mutawakkil, who crushed the Mutazilis and revived Islamic orthodoxy. By the 12th century, Muslim orthodoxy was fully reawakened, spearheaded by Imam al-Ghazali, who championed revelation over reason and predestination over free will.”

Muslimheritage.com is probably the best web-based source on the scientific contribution of Islamic civilization.

State Patronage under Caliph al-Mamun

The scientific revolution in the world of Islam reached its zenith during the Abbasid rule, and one of the principal factors that spurred this revolution was the patronage of scholarly research and activity by successive Abbasid caliphs, most prominently Caliph al-Mamun, who ruled for 20 years from 813 to 833. His father Harun Al-Rasheed had built a scientific academy, which housed a library containing a huge collection of manuscripts on arts and sciences. Al-Mamun expanded the academy, renaming it Bayt al-Hikma, which became the principal institution of Islamic scientific learning at the time. It was here that translators, scientists, scribes, authors, men of letters and writers met every day for translation, reading, writing, scribing, dialogue and discussion. Many manuscripts and books in various scientific subjects and philosophical concepts and ideas, and in different languages were translated at the House of Wisdom.

Among the famous translators was Youhanna bin Al-Batriq Al-Turjuman, who translated the Book of Animals (Kitab Al-Haywan) by Aristotle. Also, there was Hunayn ibn Ishaq al-Abadi, who translated some of the works by the Greek physician Hippocrates. Al-Mamun made Hunayn the Head of the Translation Department. The Caliph used to give him the equivalent weight in gold to that of the books he had translated into Arabic. The fact that Hunayn would receive for each book translated, its equivalent in gold, testifies to the value placed on knowledge—and the diffusion of knowledge—in Muslim culture. Al-Kindi was chosen by al-Mamun to be one of the scholars charged with the translation of the works of Aristotle. Al-Mamun is believed to have sent an emissary to the Byzantine Empire to collect the most famous manuscripts there, and had them translated into Arabic. It is said that, victorious over the Byzantine Emperor Leon the Armenian, Al-Mamun made a condition of peace that the emperor hand over of a copy of the Almagest. Al-Mamun is stated to have used the load of one hundred camels to transport from Khurasan to Baghdad hand-written books and manuscripts to include them in the library. Al-Mamun is also believed to have actively participated in discussions and discourses involving scientists and scholars at the House of Wisdom.

It was essentially the translation movement that laid the foundation of Islamic scientific civilization in Western dark ages. With consistent state sponsorship, Muslim scholars and scientists added to the translated works in astronomy, mathematics, medicine, philosophy and a host of other scientific fields produced by their predecessors in past civilizations, particularly Greek. The resulting Golden Age of Muslims, with Baghdad and Cordova becoming its two principal centres, eventually led to the rise of Western/European civilization, which is still with us. Even though this paper gives the primary credit to the Muslim rulers, particularly al-Mamun, Rahman-III and Hakem-II, Dimitri Gustav11 and Dallal in their respective works concentrating

on the Abbasid period consider other segments of society, and not just the rulers, to be prominent patrons of Muslim scientific activity.

As Dallal writes, “translations were frequently produced at the request of patrons who commissioned and financed them. In addition to such rulers as al-Mamun, these patrons included government officials and civil servants as well as scientists and physicians often employed by members of the political elite. Some of the officials who commissioned translations were involved in court politics as well as large-scale development projects undertaken in the rapidly growing urban centres. Among the most famous of this group were Banu Musa brothers—Muhammad, Hasan and Ahmad—who, in addition to their political involvement, were among the leading practicing scientists of the time.”

The most famous of these translators was Hunayn. “Directing a team of 90 translators, he introduced the method of conceptual rather than literal translation. All classical Greek works were rendered into Arabic, from the medical works of Hippocrates and Galen, to the philosophy of Plato and Aristotle, to the science and geometry of Ptolemy, Euclid, and Archimedes.”

According to Gustav, the author of the most recent work on the subject, titled *Greek Thought, Arabic Culture*, “the Abbasid translation movement...represents an astounding achievement which, independently of its significance for Greek and Arabic philology and the history of philosophy and science, can hardly be grasped and accounted for otherwise than as a social phenomenon. To elaborate: The Graeco-Arabic translation movement lasted, first of all, well over two centuries; it was no ephemeral phenomenon. Second, it was supported by the entire elite of Abbasid society: caliphs and princes, civil servants and military leaders, merchants and bankers, and scholars and scientists; it was not the pet project of any particular group in the furtherance of their restricted agenda. Third, it was subsidized by an enormous outlay of funds, both public and private; it was no eccentric whim of a Maecenas or the fashionable affectation of a few wealthy patrons seeking to invest in a philanthropic or self-aggrandizing cause. Finally, it was eventually conducted with rigorous scholarly methodology and strict philological exactitude—by Hunayn and his associates—on the basis of a sustained program that spanned generations and which reflects, in the final analysis, a social attitude and the public culture of early Abbasid society; it was not the result of the haphazard and random research interests of a few eccentric individuals who, in any age or time, might indulge in arcane philological and textual pursuits that in historical terms are proven irrelevant.”

Gustav further write: “It was precisely in the second Abbasid century that the translation movement reached its apogee with the work of Hunayn and his associates,

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12 Dallal, *op cit*, pp 159-60.
and generated, because of its great success, two very significant developments: first, scholarship in all fields covered by the translation literature became so widespread and so profound in Baghdad’s society that commissions for original works on scientific and philosophical subjects composed in Arabic became as current as commissions for translations from the Greek; and second, because of the spirit of research and analysis it inculcated, different fields of scholarly endeavour unrelated to the translations gained in sophistication, a plethora of ideas was available for ready consumption, and the areas covered by the translation literature were no longer the only ones to impress powerful minds. Intellectual debates of all sorts became the order of the day and patrons became interested not only in the transmitted knowledge from the Greeks but in the main problems posed by this knowledge and in the various ideological challenges to it.”

As for the variety of patrons, in addition to the Caliph, Gustav cites numerous examples. For instance, al-Kindi commissioned translations of scientific subjects about which he also wrote independent essays. Al-Mamun’s general Tahir was a significant patron of the translation movement and commissioned numerous translations. The Banu Musa brothers spent a significant portion of their wealth on the sponsorship of translations and scientific activities.... [They] used to pay monthly 500 dinars to Hunayn, Hubays, and Tabit ibn-Qurra “for full-time translation.” Thus, Gustav concludes that the sponsors came from all ethnic and religious groups: Arabic, Syriac, and Persian speakers, and Muslims, Christians of all sorts, Zoroastrians, and pagans. Certainly the ruling Abbasid family and its most intimate advisors appear to have supplied the initial impetus and a significant amount of the subsequent support, but had it not been for the active involvement of the other groups, it is certain that the translation movement would not have lasted as long as it did, or had the same impact. 16

Gustav may be right, but only partly. For without Abbasid caliphate state sponsorship and patronage of its rulers, particularly al-Mamun, neither the translation movement nor the subsequent production of original works of Muslim scientific scholarship could have received a widespread social backing. To argue that Muslim rulers did not play the principal role in patronizing scientific scholarship is to ignore the historical Muslim culture, whereby rulers are expected to set an example for the society to emulate. Were it not to the deep personal interest that al-Mamun showed in the growth of Muslim scientific scholarship, we might not have heard about al-Kindi, the first and perhaps the greatest Arab Neo-Platonist philosopher, who served as a tutor to al-Mamun’s son and heir, al-Mu’tasim. Al-Kindi was a mathematician and a physician, a musician and an astrologer, who wrote dozens of books on subjects as varied as optics and health and once used music to cure a neighbor’s paralysis. Like al-Kindi, al-Khawarizimi was al-Mamun’s personal discovery. The Caliph appointed

15 Ibid, pp 1, 122.
16 Ibid, pp 129-33.
him as his official astronomer. Al-Khawarizimi’s *Kitab al-Jabr wal-Muqabala* (The Book of Algebra) is considered by Arab mathematicians as well as by early and late historians as an outstanding achievement in the history of mathematics.\(^\text{17}\)

Al-Mamun took the initiative of setting up astronomical observatories in which Muslim astronomers could build on the knowledge acquired by previous astronomers. The professed purpose of al-Mamun’s programme of astronomical observations was to verify the Ptolemaic observations by comparing the results derived by calculation, based on Ptolemaic models, with actual observations conducted in Baghdad and Damascus some seven hundred years after Ptolemy. The results were compiled in *al-Zij al-Muntihih* (The Verified Tables). This program stressed the need for continuing verification of astronomical observations and for the use of more precise instruments.\(^\text{18}\) Al-Mamun gathered a group of wise men and asked them to prepare a map of the world, which they did. Named as *Al-Mamounite Picture*, the map far exceeded those produced during the lifetime of Ptolemy and other Greek geographers. He employed 20 geographers to write a book about geography. The number of higher institutes during his reign reached 332, and they were packed with students pursuing various subjects in the Arts and in the Sciences.\(^\text{19}\)

Al-Mamun also built hospitals, which were crowded with their physicians, surgeons and dentists. Like other Abbasid rulers, the Caliph employed Nestorian physicians from the city of Gundishapur. Most of their writings on medicine were based on Hellenistic medicine, but even in the very early period some new treatises contained original features that were not found in the earlier Greek sources. With his students, Hunayn translated almost all of the then known Greek medical works. At the same time these translations were made, original works were composed in Arabic. Hunayn, for example, composed a few medical treatises including *al-Masail ft al-Tibb lil-Mutaallimin* (Questions on Medicine for Students) and *Kitab al-Ashr Maqalat fi al-Ayn* (Ten Treatises on the Eye).\(^\text{20}\)

**State Patronage under ar-Rahman III and al-Hakem II**

The role of al-Mamun as an enthusiastic patron of scientific activity at Baghdad is paralleled by that of ar-Rahman III and al-Hakem II a century later in Cordova, the capital of Andalusia. From 8th to 13th century, Andalusia remained a beacon of learning in a Europe that, for most part, was languishing in the shadows of ignorance and socio-economic backwardness. It was during the period of Umayyad ruler ar-

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\(^{17}\) Dallal, op cit, p 85.

\(^{18}\) Ibid, p 164.


\(^{20}\) Dallal, op cit, p 200.
Rahman III (912-961), the first to declare himself Caliph, that Andalusia flourished as a nation and reached its high point under his successor al-Hakem II (961-976).

Apart from making pioneering achievements in agriculture, textile industry and trade, the Muslim rulers contributed to the advancement of learning in arts and sciences. None of Andalusia’s wealth in industry and trade would have been possible without a conscious state policy promoting science, as the driving force behind technological progress and overall economic growth. As with the policy pursued under the Abbasids in Baghdad, the Andalusian rulers promoted learning and patronized the arts as a means of raising the cultural level of the population. In no country and in no other cultural epoch was the drive for such extensive scientific travel so widespread, as in Muslim Spain, from the 10th century on. It was perfectly commonplace for inhabitants of the peninsula to make their way across the monstrous stretch on the North African coast, to Egypt and from there to Bukhara or Samarkand, in order to hear the lectures of a famous scholar.” This was the spirit that gave rise to public schools for needy children, as well as splendid public libraries, 70 of which were still open in the 13th century, and to such high literacy rates that “almost everyone could read and write, whereas this was a privilege restricted to the clergy in northern Europe. The Great Library of Cordoba had thousands of magnificent books and manuscripts. One can only imagine its invaluable collection when one reads that after 1492 and during the Spanish Inquisition when about half-a-million of its priceless books and manuscripts were burnt.\(^{21}\)

Ar-Rahman I started building the Grand Mosque of Cordova in 785, an immense public-works project, which established the religious and educational centre of the capital. It was enlarged and extended by his successors ar Rahman II and III, and completed by al-Hakem II. In the 9th and 10th centuries, madrasas, the mosque schools, evolved into universities, the first in Europe, which flourished in every city, drawing Jewish, Christian, and Muslim scholars and students like magnets, from all over the world. The ruler’s more obvious contribution was in the financing and promotion of the construction of thousands of learning institutions in their rich varieties: madrasas, libraries, scientific academies.\(^{22}\) The Grand Mosque is one of the most famed buildings not just for the impressive architecture, but also and above all for its intellectual role. It was by far the largest university for centuries to come. In the 9th century, in the department of theology at this university, four thousand students were enrolled, and the total number in attendance at the University reached almost eleven thousand.\(^{23}\)

Under ar-Rahman III, Cordova became the center of a thriving Jewish culture epitomized by Hasdai ibn Shaprut, a physician and diplomat who serving the king

\(^{22}\) Weissbach, op cit.
\(^{23}\) S.P. Scott, History of the Moorish Empire (Philadelphia: The Lippincot Company, 1904), p. 467
and who attracted numerous Jewish scholars, poets, and philosophers to the city.24 The Caliph was a brilliant governor who raised Muslim power in the peninsula to its apogee and who built Madinat az-Zahra,25 the royal court, where known scholars and poets of the time remained the most welcome guests. Cordova under his rule had 700 mosques, 300 public baths, numerous schools and colleges.26 Al-Hakem II extended education to the needy, by building 27 elementary schools in Cordoba for children of poor families. Three of these were located near the great mosque, and the remaining 24 in the suburbs “to impart free education.” In Cordova alone, there were 800 schools. In addition, a large orphanage was built in Cordova, as in many other towns. Thus, “the majority of Muslims could read and write.” “There were even in the smallest villages public schools and schools for the poor in such numbers, that one has good reason to assume that under Hakem II at least in the province of Cordova, no one was ignorant of reading and writing.”27

Al Hakem was himself a scholar, who had read many of the 400,000 books, which filled his famous library. Cordoba produced 60,000 books a year, facilitated by the use of paper, an invention the Arabs had taken from the Chinese, and developed in factories in every major city.28 Al-Hakem sent emissaries to Egypt and Iraq, among other Muslim countries, in search of books, and built one of the largest personal libraries in history. He also employed copyists to duplicate rare manuscripts and generally encouraged scholars in all sciences.29 The city, indeed, opened to everyone access to its public libraries; seventy of them, during the time of Hakem II.30 He was a prominent scholar who gathered scholars around him, and made the chief mosque of Cordoba a centre of study. He enriched his own personal library with the best books that a generous and lavish Caliph could buy through book agents; “in all the book-markets of the Muslim world.” The library was open to all who cared to use it; poor students and scholars in pursuit of knowledge received financial aid from the Caliph, and the learned Caliph was himself the library’s best student and scholar.31

Lessons for Contemporary Muslim World

The above description of enormous patronage offered by the three Muslim Caliphs, al-Mamun in Baghdad, and ar-Rahman and al-Hakem II in Cordova to Muslim

27 Weissbach, op cit.
eminent scholars and scientists establishes that state patronage was a crucial factor in the growth of classical Islamic sciences and for sustaining a Golden Age of Muslims for so long. It is only when traditionally guided by faith, especially a liberal and rational creed such as *Mutazilis*, the state patronage of scientific enquiry and research started to decline that the rich Muslim civilization came to an end. Other factors, as generally articulated by orthodox-illiberal circles—such as the Mongol invasion of Baghdad, the Christian inquisition at Andalusia or the flourishing of vices among Muslim ruling elites—may have played their respective role in the fall of Muslim civilization, but these cannot preclude the importance of purely internal reasons for Muslim world’s consistent decline in the past over seven centuries. In this context, the erosion or absence of state patronage seems to constitute a principal internal factor.

In retrospect, there are important lessons to be learned for the contemporary Muslim world insofar as Caliphs’ sponsorship of Islamic sciences in the Golden Age of Muslims is concerned. At present, the lack of state patronage of scientific research and scholarship is an important reason why the Muslim world is lagging behind the rest of the world in science and technology. Not only has government leadership in individual Muslim countries failed to devote necessary resources required for scientific learning and research, but Muslim world’s representative organisations, particularly the Organization of Islamic Conference (OIC), have been insensitive to the issue of patronizing Muslim scholarship. All those reasons rooted in religious tradition or determined by social needs that had led to Caliphate-sponsored translation and research activity during the reigns of Caliphs al-Mamun, Rahman III or al-Hakem II are still relevant today. The world of science and research today is a million times more competitive than was the case during the five hundred years of the Golden Age of Muslims. Despite this, the Muslim leadership, neither at the state level nor at the level of intra-Muslim world organizations, has shown any willingness to come forward to patronise scholars, scientists and educationists so that the current crisis of learning and scholarship facing the world of Islam could be addressed adequately and urgently.