



The Western University and the Arab Tradition

A 'Secret' History

by Jonathan Lyons



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Foreword

For anyone deeply involved with an American university in the Middle East the contributions of the Arab world to the history of higher education does not immediately come to mind. And there is a good reason for that. After all, various U.S. and other international universities have been setting up shop in the Arab world for generations, largely transporting Western knowledge, scholarly and professional instruction as well as a pedagogy to the region. As it turns out, failure to understand and reflect on the Arab tradition in knowledge creation affecting the West and by extension much of higher education everywhere is part of what Jonathan Lyons calls, “a secret history.”

It is no accident, however, that Dr. Lyons has rediscovered this rich tradition, studied it, and made it accessible in two notable books and in lectures on college campuses. Unlike many worthy scholars who write about the Middle East based on years of study, but often little time on the ground in the region, he began his journey of discovery as a journalist and editor for the Reuters news service, with assignments in the Middle East and beyond. As a trained observer looking at the Middle East through the lens of breaking news, he covered stories of this dynamic region and longed to learn more than his assignment and endless deadlines allowed or welcomed. A wire service reporter and bureau chief in the days before digital media created the 24/7 environment that came with the Internet and social media. He found himself looking at the region in fragments and singular instance reports, although against a rich tapestry of understanding, but with full knowledge that there was always “more to the story,” than time or circumstances allowed.

Fortuitously, Lyons made a decision to leave the world of continuous 24-hour journalism and pursue a doctorate in history, a platform to dig deeper and understand the world more thoroughly. The result of his graduate study has been several books with innovative themes and counter-intuitive assumptions. Two of them, *The House of Wisdom: How the Arabs Transformed Western Civilization* and *Islam Through Western Eyes: From the Crusades to the War on Terrorism*, have been transformative windows on a little-known history and counter to what many western scholars, journalists, and visitors had come to know.

I have myself been a heavy user of Dr. Lyons work as one eager to know and understand more about the Middle East, which goes beyond conventional wisdom and even received history. The West, he points out, has no monopoly on the origins of science or technology

and current state, as he tells the story of the migration of European scholars to the Middle East from early times forward.

It was this perspective with the evidence and analysis Dr. Lyons offered, that caused me to invite him to be part of an advisory panel to assist Northwestern University in Qatar in developing a digital museum of media and communication with a Middle Eastern accent. A search for advisers led me to Dr. Lyons and others with deep knowledge and a desire to communicate it. His help on that venture was important and valued. It was, therefore, not such a stretch to invite Dr. Lyons, an independent scholar and author, to Northwestern University in Qatar (NU-Q) in 2015 as convocation speaker and visiting scholar. During his time on campus, he engaged students, faculty, and staff in classroom visits, colloquia, and special seminars as well as giving the 2015 convocation address. That remarkable presentation was an inspiration for the NU-Q community, including many parents of our students who expressed appreciation for what was a recognition of Arab culture and history.

He met with our Middle East studies and Middle East media studies faculty and others in a running dialogue over several days, and there were always enthusiastic comments and questions, reflecting different points of view. With that feedback, I asked Dr. Lyons to transform his thoughtful, but brief, talk into a more expansive essay appropriate for our Occasional Papers series. He did so with this article/essay that covers a search for the Arab tradition, how Islam deals with the spirit of inquiry, the core mission of scholarship and education, knowledge transfer, connections with classical scholarship, and even the impact on the core curriculum as well as lessons for modern times.

This work contributes to understanding at an opportune time when knowledge about the Middle East region is greatly needed to address considerable misinformation and even prejudice due to a lack of knowledge on the rich history that stands hidden in our midst. I am grateful to Dr. Lyons for undertaking this assignment and for producing the paper that follows. Some of his arguments and interpretations are provocative and will, I trust, stimulate discussion that informs the continuing debate about the Middle East and its role in a global environment.

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Introduction¹

Traditional Western history of science is dotted with landmarks, milestones, and “firsts,” each a distinct and sharply delineated step along the road to what is celebrated today as Modern Science. Those developments that appeared to have furthered this journey are slotted seamlessly into the narrative of our scientific advance—and of modernity in general—and the figures responsible are assured of a secure place in the pantheon of a shared intellectual history, often after a lonely, promethean struggle with the forces of ignorance, outdated tradition, and outright darkness. And those projects that appear to have no importance today, such as the traditions of alchemy and astrology, are written off as dead ends and not worthy of modern scholarly attention. This makes for an excellent *story*, as the much-told tragedy of Galileo’s mistreatment at the hands of a vindictive and intransigent Catholic Church and his eventual vindication illustrates. But is it also good *history*?

One does not have to go quite to the extremes of the French philosopher and social critic Michel Foucault, who dismisses underlying demands for such “firsts” as “harmless enough amusements for historians who refuse to grow up.” It should suffice simply to point out that this approach is dangerously teleological and invariably produces what Paul M. Sweezy famously called a history of the present.² That is traditional Western historiography privileges those developments that contributed to our contemporary notion of what is properly scientific while slighting or disregarding altogether others that have fallen by the wayside or otherwise been abandoned as failing to meet modern needs, requirements, and attitudes.³ The history of science is perhaps particularly vulnerable in this regard in comparison to other intellectual traditions; its practitioners are almost invariably enthusiastic students and proponents of Modern Science, whereas sociologists of religion, for example, may not themselves be particularly religious, or even believers.

The result is a notion of intellectual and scientific progress in which the stages of historical development, and thus its analytical framework, are defined in advance. This, in turn, determines those ideas, achievements, and theories worthy of historical notice, academic study, and ultimately inclusion in the discourse of modernity. They make up what is known as “serious speech” within the field, to the virtual exclusion of all other approaches. What ostensibly begins as a history of science, in reality, emerges as a history of Western technological and, ultimately, political and cultural hegemony. Missing, then, are entire swathes of intellectual achievement, primarily from non-Western societies; some have a clear intrinsic value of their own while others point in potentially fruitful directions that merit further exploration and attention. Increased interest in ‘alternative’ medicine as a supplement or even replacement for today’s dominant biomedical approach offers a good example of the latter.

Either way, the net effect is to reinforce the West’s monopoly claim on the idea of science and, simultaneously, to strengthen the narrative of the relative backwardness or even outright failure of non-Western traditions—Arab, Chinese, Hindu, and others.⁴ This is not only a failing on the part of our intellectual history, but it has serious ramifications for the West’s general approach toward the rest of the world. In the resulting intellectual and political atmosphere, it is no wonder that opposition voiced by many Muslims to globalization and other associated Western ideals of modernity is often dismissed simply as the uncritical product of “religious fundamentalism” or other retrograde attitudes. In a similar fashion, this same discourse of science has created the widespread public perception that Islam, its ideas, values, and history are inherently alien to Western culture. Public opinion surveys in North America and Europe that consistently show that few believe Islam has anything in common with the Western experience or indeed has anything whatsoever to offer the world, would appear to support this reading.

1. This paper first took shape as a Convocation Address to the Class of 2019 at Northwestern University in Qatar, on August 24, 2015. It draws on my earlier books *The House of Wisdom: How the Arabs Transformed Western Civilization* (Bloomsbury Press, 2009) and *Islam Through Western Eyes: From the Crusades to the War on Terrorism* (Columbia University Press, 2012). I would like to thank Everette Dennis, dean of Northwestern University Qatar, for his support for this project.

2. Paul M. Sweezy, *The Present as History* (New York: Monthly Review Press, 1953).

3. Shlomo Pines, *Studies in Arabic Versions of Greek Texts and in Medieval Science* (Jerusalem: Magnes Press, Hebrew University, 1986), 352; J. J. Berggren, “Islamic Acquisition of the Foreign Sciences: A Cultural Perspective,” in F. Jamil Ragep and Sally P. Ragep, with Steven Livesey, eds., *Tradition, Transmission, Transformation*, 263–283 (Leiden: Brill, 1996), 266.

4. For an explicit example of just such a critique of Arab science, see Toby Huff, *The Rise of Early Modern Science: Islam, China, and the West* (New York: Cambridge University Press, 2003). At the core of Huff’s argument is the established Orientalist notion that Islam is inherently hostile to rational thought and thus ill-suited to the demands of science. Huff also takes Muslim science to task for failing to produce Modern Science.

Locating the Arab Tradition

The so-called Copernican Revolution, with its fundamental shift, beginning in the sixteenth century, from the Classical geocentric world of Ptolemy to the heliocentric one, serves as one of these great landmarks in the Western history of science. The ensuing battle with the forces of reaction within the Catholic Church, a struggle that saw Galileo ensnared in the Inquisition for his defense of the new astronomy, helped establish the emerging scientific worldview as a legitimate intellectual and social force of almost unrivaled power and influence. This process was completed with the findings of Johannes Kepler on elliptical planetary orbits and Isaac Newton's later theory of gravitation, developments that effectively sealed the victory of Europe's scientific revolution.

Yet, to see this as a strictly Western drama played out solely across the Western history of ideas, is to miss at least half the story. In fact, much of the groundwork was laid centuries earlier by the Muslim astronomers, mathematicians, and philosophers who steadily eroded the established earth-centric cosmology by highlighting discrepancies that plagued its mathematical model and its predictive powers when confronted with their new and more accurate celestial observations. The Muslims proved astute and critical readers of the Classical works of astronomy and cosmology, and they repeated old experiments and devised new ones in order to understand and improve the received wisdom. The central problem, the Muslim scholars, soon pointed out, lay with the failure of the Ptolemaic mathematical models to honor their own fundamental theoretical requirement: that all celestial objects move in uniform circular motion, as decreed by Plato and Aristotle and then accepted for almost 2,000 years.

The roots of this critical tradition—known as *shukuk*, or objections—have been traced back as early as the ninth century and reached theoretical and stylistic heights two hundred years later with the work of Ibn al-Haytham.⁵ Behind it lay centuries of cutting edge

observations and theoretical work that slowly picked apart the Ptolemy's Classical model and left it ripe for wholesale revision. The great Muslim philosopher Ibn Rushd, known in Latin as Averroës, later popularized this critique of Ptolemy among the Europeans, who were also heavily reliant on his Aristotelean commentaries and other works for their basic understanding of science and philosophy: "The science of astronomy of our time contains nothing existent," complained Averroës. "Rather the astronomy of our time conforms only to computation and not to existence."⁶

True, those within the *shukuk* tradition never seriously considered anything as radical as a sun-centered universe, although some Greek and Arab astronomers had pondered the idea. Yet, almost two hundred years before Copernicus, the official timekeeper at the great Umayyad mosque in Damascus, Ibn al-Shatir, proposed a model that preserved the Classical requirement of perfect circular motion for the moon and most of the known planets, while retaining the centrality of the earth. Al-Shatir's work, which may have come to Copernicus' attention in the late 1490s while a student in Bologna where Arab astronomy prevailed, would have eased his conceptual breakthrough by allowing him to shift the center of the universe to the sun without having to reconstruct an entirely new planetary model.⁷

Seen in this way, the Copernican Revolution was not so much a singular moment in Western civilization as it was the continuation of a scholarly tradition that brought to bear contributions from Classical Greek and Hellenistic science, the great Muslim centers of learning such as Baghdad and Cordoba, as well as Sassanian, Hindu, and pre-Islamic Arab sources. Regrettably, much of this "backstory" has gotten little scholarly attention, outside a tiny handful of specialists, and virtually none has entered into the contemporary public sphere.⁸

5. George Saliba, *A History of Arabic Astronomy: Planetary Theories During the Golden Age of Islam* (New York: New York University Press, 1994), 19–20.

6. George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, Mass.: MIT Press, 2007), 179.

7. *Ibid.*, 164.

8. For some notable exceptions, see Saliba, *A History of Arabic Astronomy and Islamic Science*; E. S. Kennedy and Victor Roberts, "The Planetary Theory of Ibn al-Shatir," *Isis* 50, no. 3: 227–235; and Willy Hartner, "Copernicus, the Man, the Work, and Its History," *Proceedings of the American Philosophical Society* 117, no. 3: 413–422.



Statue of Averroës in Cordoba



Statue of Copernicus

This is all the more remarkable for the fact that Western researchers have known since the late 1950s of highly suggestive links between details of Copernicus's "revolutionary" planetary theory and the work of Muslim astronomers two hundred to three hundred years earlier. In fact, the only mathematical proof deployed by Copernicus in support of his contention that the universe revolved around the sun appears to come straight from earlier Arab and Muslim texts—even down to the use of identical labels on its geometric points.⁹ As with the contents of tens, or even hundreds, of thousands of mostly forgotten scholarly manuscripts produced over many centuries in the main Muslim languages—Arabic, Persian, Urdu, and Turkish—this problem has never been satisfactorily studied or explored.¹⁰

It is perfectly plausible that such an examination would require a wholesale rewriting of intellectual history and a radical reconsideration of the place of the

Muslims in world culture, as well as a reconsideration of the trajectory of Western civilization itself. After all, Copernicus' text, published shortly before his death in 1543, set in motion a tectonic shift in religious, cultural, and psychological ideas and attitudes as humankind was forced to adjust to the unsettling notion that its earthly home was not, it turns out, the center of existence. However, such a revisionist project within a discipline, in this case the history of science, remains a remote prospect, for the implied conclusions about the sheer scale of the Western debt to Muslim science and philosophy even to be considered they must first fall within the accepted truths of that field and then be validated by what Foucault calls the "rules of formation" at work. "In short, a proposition must fulfill some onerous and complex conditions before it can be admitted within a discipline; before it can be pronounced true or false it must be ... 'within the true.'"¹¹

9. Hartner, 413-22.

10. Emelie Savage-Smith, "Gleanings from an Arabist's Workshop: Current Trends in the Study of Medieval Islamic Science and Medicine," *Isis* 79, no. 2: 246-272; Roshdi Rashed, *The Development of Arabic Mathematics: Between Arithmetic and Algebra*, trans. A. F. W. Armstrong (Dordrecht: Kluwer, 1994), 2.

11. Michel Foucault, "The Discourse on Language," in *The Archaeology of Knowledge*, 215-237, New York: Pantheon, 1972, 224.

Islam and the Spirit of Inquiry

Other trends and developments within the history of ideas have also been overlooked for their failure to fall neatly “within the true,” also to the great detriment of our understanding and appreciation of the world around us. These, in turn, have serious knock-on effects on our ability to formulate appropriate responses and policies toward the Muslim world in a period of renewed contestation between East and West. One instructive example lies with the history of education or, more specifically, with the creation of the university and the tradition of Liberal Arts which it embodies. A glance at almost any textbook or academic monograph on Western intellectual history will likely portray the rise of the university in Europe as a defining moment in the emergence of Western civilization. Edward Grant, the celebrated historian of science, for example, calls the rise of the universities a “peculiarly Western phenomenon.”¹² This was also the view of the Belgian émigré scholar George Sarton, who almost single-handedly created the discipline of history of science in the United States.¹³

These and other like-minded scholars all see the idea of the university, an institution to which many devoted their professional lives, as central to their own identities. They were, of course, heirs to the intellectual legacy of the Enlightenment and its notions of inevitable scientific and social progress and an accompanying general disdain for religion, particularly its intellectual or philosophical aspects. As a result, there has been little incentive to delve deeply into the evolution of the university as an institution or to challenge its established pedigree, preferring to accept it as a natural birthright of modern, that is Western, intellectual life.

Yet Muslim traditions dating to before the advent of Europe’s universities include a number of familiar practices and recognizable institutional arrangements. These include the wearing of distinctive dress or gowns by the teaching masters, such as those still in use on a regular basis at English universities such as Oxford and Cambridge, and at graduation and other formal occasions on American campuses; the awarding of a chair as a seat

of honor for a distinguished teacher or senior scholar; the grouping of foreign students into associations, or “nations,” as was common medieval practice at the University of Paris and elsewhere; and the granting of a recognized degree, in this case the teaching license—in Arabic, the *ijazah*—to signify that students had been deemed ready to take on pupils of their own.¹⁴

It has also been suggested that the notion of the baccalaureate, or Bachelor of Arts degree, can trace its roots back to medieval Arab practice, as can the very establishment of what we might call a university culture that transcends specific space and time. This became known in Latin as the *Studium generale* and meant that students and professors of one institution were essentially accredited to study or teach at other institutions outside their home base.¹⁵

As with the centuries-long gestation of Copernicus’ heliocentric thesis, presented in his *On the Revolutions of the Celestial Spheres*, serious investigation into any possible links between the Arabs’ educational institutions and practices and the development of that treasured Western cultural accomplishment, the university, has been wanting. Moreover, a sophisticated and well-argued analysis making the case for just such links, by the late medievalist George Makdisi, has been effectively rejected out of hand.¹⁶ Once again, these arguments were not “within the true,” and so not open to serious consideration.

So far, I have only touched upon organizational or institutional trappings of the university. *But what about its core mission? What about the spirit of inquiry that has animated the university from its roots in the Middle Ages to the present day?* Here, too, the Arab contribution was both invaluable and unmistakable, for the scholars of Baghdad, Cairo, Cordoba, and other centers of medieval Muslim learning helped free their Western counterparts from the confines of religious speculation and directed them toward the study of what the philosophers of the day called The Nature of Things—in other words, toward Science.

12. Edward Grant, *The Foundations of Modern Science in the Middle Ages* (Cambridge: Cambridge University Press, 1996), 34.

13. Sarton separately noted, however, that science and philosophy flourished among the Muslims far longer than it did among either the Greeks or the medieval Latins. See his *Introduction to the History of Science* (Baltimore: Williams & Wilkins, 1927–1948), 2:1:1.

14. George Makdisi, *The Rise of Colleges: Institutions of Learning in Islam and the West* (Edinburgh: Edinburgh University Press, 1981).

15. *Ibid.*

16. For a discussion of the Makdisi case and its failed reception among Western scholars, see Wael B. Hallaq, “The Quest for Origins or Doctrine? Islamic Legal Studies as Colonialist Discourse,” *UCLA Journal of Islamic and Near Eastern Law* 2, no. 1: 1–31.

One of the most interesting aspects of medieval history of science is the relationship between sacred and profane knowledge. Early Christian leaders took pains to turn believers' attention away from the workings of the natural world and toward the spiritual realm. Paul's Letter to the Galatians, for example, decried the keeping of time and calendars as too worldly a pursuit. "Now that you have come to know God ... why do you turn back again to the weak and miserable elemental principles? You observe days, months, seasons, and years (Galatians 4:9–10). "For Latin Christendom as a whole, the great Church Father Augustine set the intellectual tone by the fifth century in *The Confessions*: "Men proceed to investigate the phenomena of nature ... though the knowledge is of no value to them: for they wish to know simply for the sake of knowing." Upon his conversion to Christianity, Augustine then effectively rejects both art and science, in order to concentrate on the spiritual plane: "Certainly the theaters no longer attract me, nor do I care to know the course of the stars."¹⁷

Augustine, an educated man of his times, was well-versed in Classical philosophical thinking, and he introduced into early church doctrine selective teachings of Plato and, perhaps more crucially, those developed in the third century CE by Plotinus and his followers. The end result was the establishment of two very powerful and lasting trends in Christian thought: a sharp distinction between the divine kingdom of heaven and the "vile" existence here on earth, that is, the earth of "days, months, seasons, and years"; and the futility of humans' attempts to apprehend, let alone come to understand, God's creation through the rational senses.

Muslim thinkers, among them many religious scholars and jurists, took a very different approach toward the physical world. No doubt, this was inspired in part by the attitude toward knowledge among the earliest Muslims, whatever its source. According to reliable accounts, the Prophet Muhammad entreated his followers, "Seek for science, even in China." Theologians also found in the Qur'an, the revealed Word of God, plenty of support for legitimate curiosity about the Nature of Things. Several verses in the Qur'an refer

explicitly to the order inherent to God's universe, as well as to man's capacity to comprehend and then exploit this order for his own needs, such as timekeeping and cartography. Unlike the early Christians, early Muslims were openly encouraged in the pursuit of real-world knowledge.

"He [God] it is who appointed the sun a splendor and the moon a light, and measured for her stages, that you might know the number of the years, and the reckoning [of time]. ... He details the revelations for people who have knowledge" (10:6).¹⁸ Elsewhere, the Qur'an advocates the use of elements of God's creation for orientation amid featureless deserts and oceans: "He has appointed the night for stillness, and the sun and the moon for reckoning. ... And He it is Who has set for you the stars that you may guide your course by them amid the darkness of the land and the sea" (6:97–98).

This helped create the necessary social consent and widespread support for the pursuit of the knowledge, with little of the overt tensions between "faith" and "reason" that characterized some of the medieval Western experience; among the Muslim theologians, only astrology, which purported to reveal the future and thus appeared to usurp God's omnipotence and displace man's free will, prompted a serious backlash, and even that failed to stem all work in the field. The other sciences were generally seen as compatible with the teachings and practices of Islam and many of their practitioners were also religious scholars or jurists in their own right.

Just how important was the concept of *ilm*, or knowledge, among the First Muslims can be seen in a textual analysis of the Qur'an by the Arabist Franz Rosenthal. He found that *ilm* and its derivative forms represent almost one percent of the Qur'an's 78,000 words—among its most frequently used terms and phrases.¹⁹ Rosenthal recognizes that concepts of knowledge and wisdom were also important to the intellectual and moral life of Classical Antiquity, but adds: "Yet, nobody would wish to argue that the attitude toward knowledge in the Ancient world as a whole or in any particular region or epoch of it was inspired and sustained by the same single-minded

17. Augustine of Hippo, *The Confessions of St. Augustine*, translated by F. J. Sheed (New York: Sheed and Ward, 1942), 247–48.

18. Translations from the Qur'an are from Marmeduke Pickthall, *The Meaning of the Glorious Koran: An Explanatory Translation* (New York: Alfred A. Knopf, 1909).

19. Franz Rosenthal, *Knowledge Triumphant: The Concept of Knowledge in Medieval Islam* (Leiden: Brill, 2007), 19–21.

devotion that existed in medieval Islam. ... Nor was the sphere of religion ever fused with that of knowledge as inseparably as happened later on in Islam.”²⁰

Islam also enjoins believers to care for the weak and infirm, which stimulated the field of medicine and the creation of the first recognizable hospitals, complete with separate wards, doctors’ rounds, surgical and pharmacological innovations, and protections for indigent patients, all backed by a basic understanding of germs and the importance of sanitary precautions. Leading medical schools were regular features of major Muslim cities such as Baghdad, Cairo, Damascus, and Cordoba, and over time, much of this specialized knowledge began to seep into Western practice. It should not be surprising, then, that Avicenna’s Canon of Medicine, written in the early eleventh century CE, served as the standard European medical text into the seventeenth century. Many of Europe’s leading princes, particularly those whose domains bordered the Muslim lands, featured court physicians, often Arabs or Jews, schooled in the traditions of Islamic medicine.

Reliance by these Arabized European rulers on Muslim learning in other fields was also notable. Frederick II of Sicily, who claimed the disputed title of Holy Roman Emperor, hired Arab agronomists to help revive the sugarcane industry that had fallen on hard times after his forebears drove out many of the area’s skilled Muslim sugar farmers.²¹ Frederick, known among the Arabs as *al-Emberator*, also kept Muslim philosophers on hand to tutor him in Aristotelean logic and other intellectual pursuits. “He was distinguished among all the kings of the Franks for his talents and his taste for philosophy, logic, and medicine,” recalled one Arab envoy to the court in Palermo. “He had an appreciation of the Muslims since he had been reared in Sicily where the majority of the inhabitants profess Islam.”²²

Further, Islam’s religious rituals and obligations require from believers a relatively sophisticated understanding of the natural world. Muslim practice demands

knowledge of the proper times of the five daily prayers, the start of the lunar fasting month of Ramadan, and the proper direction of Mecca. In short, Muslims could not simply follow the advice of Augustine and close their eyes “to the course of the stars.” Over time, imprecise but generally accepted folkways—such as the use of prevailing winds or the position of the sun to gauge approximate direction, or reliance on known architectural features or natural formations for basic orientation—gave way to strictly scientific approaches to religious questions. In short order, the early Muslim world developed a theoretical understanding of these and related problems, pursued innovative research to address them, and then broadened this new understanding to encompass a truly scientific worldview.

Al-Biruni (973–1048) produced one of the medieval world’s greatest treatises on mathematical geography in order to ascertain the direction of Mecca—an important ritual requirement for reciting the daily prayers, the burial of the dead, and the sacrifice of animals—from Ghazni, a city in distant Afghanistan. His *Determination of the Coordinates of Cities* was the first known application of spherical trigonometry to produce accurate geographic values of various locales. Muslim mathematicians introduced the full suite of trigonometric functions—sine, cosine, tangent, cotangent, secant, and cosecant²³—to replace the cumbersome use of geometric chords and thus greatly simplified the work of geographers, and astronomers.²⁴ Travel to the holy city for the annual Hajj pilgrimage from points across the now-vast Muslim lands was also greatly aided by related innovations in navigation and mapmaking.

Keeping track of the shifting times of the five daily prayers also became the focus of intense scientific study, in order that Muslim communal practice be as correct and uniform as possible. “There is no virtue in a person who is neglectful of the prayer times, and he has no knowledge of Him who is to be worshipped,” warned the medieval astronomer Ibn Yunis.²⁵

20. *Ibid.*, 336–37.

21. Andrew Watson, *Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farming Techniques, 700–1100* (Cambridge: Cambridge University Press, 1983), 82–83.

22. Quoted in Thomas Curtis van Cleve, *The Emperor Frederick II of Hohenstaufen: Immutator Mundi* (Oxford: Clarendon Press, 1972), 225.

23. Only the sine function was a foreign import, from Hindu astronomy; the others were all Arab discoveries.

24. David A. King, *Astronomy in the Service of Islam* (Brookfield, VT.: Variorum, 1993), 257.

25. Quoted by David A. King, *In Synchrony with the Heavens: Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization* (Leiden: E. J. Brill, 2004), 215.

The early muezzins, selected for their good moral standing in society and strong voices with which to summon believers to the mosque, gradually gave way to professional timekeepers with sophisticated training in mathematics and astronomy. “The muezzin must know the [twenty-eight] lunar mansions and the shapes of the star groups in them, so that he may be able to tell time at night,” advised the Egyptian commentator Ibn al-Ukuwwa.²⁶ Many large mosques featured professional scientists, who designed and built astronomical instruments, taught students, and produced meticulous tables—almanacs, from the Arabic *al-manakh*—that listed the correct prayer times for each day of the year from Spain and North Africa to China. One prominent mosque in Cairo featured just such a handbook with more than 200 pages of details prayer times around much of the known world.

Likewise, the importance that Islam places on personal hygiene, as seen in the ritual washing of the hands, face, and feet before each of the five daily prayers, stimulated the development of extensive water-delivery and sanitation systems and associated engineering marvels, including automatic controls, complex feedback mechanisms, the twin-cylinder pump, and the crankshaft for the efficient transmission of power. The pioneering mechanical engineer Ibn al-Razzaz al-Jazari (1136–1206) deployed these and other technologies to contrive ingenious devices—water clocks and automated fountains, games, and musical instruments—that were, at least, two hundred years ahead of his European counterparts.²⁷

Even the art of algebra found religious sanction; its leading proponent, Muhammad ibn Musa al-Khwarizmi (ca. 780–ca. 850), informed his readers that his work was motivated by the search for improved ways to correctly implement Islam’s highly fragmented and complex inheritance laws.

Significantly, religious opinion typically deferred to the astronomers, mathematicians, and other scholars on these and other matters of proper religious practice. In the case of the *qibla*, the sacred direction of

Mecca, the theologians accepted the arguments of the mathematical geographers that the proper direction for prayers and other rituals was not the common-sense straight line but the shortest possible route, which took into account the curvature of the earth. The failure to recognize this symbiotic relationship between early Islamic scholars and the doctors of religion, as well as an overriding tendency to see the struggle of “faith versus reason” in the late medieval and early modern European experience as a universal template that holds sway in other societies, may help explain why much of Islamic science and philosophy too often remain hidden from Western view.²⁸



A minaret of the Blue Mosque in Istanbul

26. Quoted in *ibid.*, 637–38.

27. Donald R. Hill, “Arabic Fine Technology and Its Influence on European Mechanical Engineering,” in Dionisius A. Agius and Richard Hitchcock eds., *The Arab Influence In Medieval Europe*. (Reading, UK: Ithaca Press, 1994), 29–30.

28. For an in-depth discussion of the Western apprehension of the matter of “Islam and Science,” see my *Islam Through Western Eyes: From the Crusades to the War on Terrorism* (Columbia University Press, 2012), 73–110.

Knowledge Transfer: From East to West

Today, the full scope of the Arab and Muslim contributions to Western science and philosophy—and the very real contributions these scholars made to world civilization in general—gets far too little serious attention. At the time, however, the emergence of the Muslim world as a scientific and cultural superpower was not a secret among the small but rising new class of European intellectuals of the late Middle Ages. Several of these intrepid scholars have left behind accounts of their single-minded pursuit of cutting-edge science and philosophy, then available only in the Muslim world.

At the time, Western learning was in crisis and relied on a few Classical teachings and texts, mostly scraps of Aristotle's system of logic, several works on music, and some basics of practical geometry, as well as a partial Latin translation of Plato.²⁹ The ability to read Greek was effectively lost, cutting off would-be scholars from centuries of invaluable collective knowledge.³⁰ Existing learning was transmitted largely by rote and accompanied by little true theoretical understanding. Western Christendom had also lost the ability to tell accurate time or to date its most important religious holidays, such as Easter. The few timekeeping methods then in use were badly undermined by a complete lack of understanding of their fundamental principles. In short, intellectual exploration and innovation were at a standstill, in marked contrast to the cultural ferment in the nearby Muslim world.

This state of affairs did not sit well with the new cohort of young scholars that grew out of social, economic, and political changes afoot in tenth-century Europe. These changes included the development of a money-based economy and the rise of towns and cities, which steadily absorbed peasants escaping bondage to the land.³¹ Here, they could build new, more independent lives as petty merchants or artisans and other skilled tradesmen, their steady rise fueled by expanding commerce and other opportunities presented by this new urban life. Accompanying these demographic and social shifts was a growing demand for education that went beyond the staid, conservative

teachings offered in the so-called cathedral schools, whose main achievement had been to churn out barely competent functionaries for church and state. Besides, the standards of training in these religious schools were extremely low; even the most basic arithmetic textbook of the day has been found to contain numerous rudimentary errors.³²

Gradually, these new urban communes began to organize to defend their interests against the aristocracy, the Crown, and the church. Teachers and tutors began to work informally with groups of students, and together they comprised an expanding cohort of educated and mobile “knowledge workers,” willing and able to travel in pursuit of their scholarly activities. Following the lead of artisans and other urban professionals, the teaching masters formed independent corporations to regulate membership, limit competition, ensure quality, and protect their livelihood. The totality of members of any guild or profession was called a *universitas*, and this is the origin of the modern term *university*.

In the twelfth and thirteenth centuries, the rollback of Muslim power in Spain, celebrated by Christian Europe as the Reconquista, as well as Norman expansion into southern Italy, and the establishment of the so-called Crusader States in and around the Holy Land increased the contact points between East and West and placed the wonders of Arab learning within reach. Once-Muslim cities fell to European control, ceding with them their great libraries, some with hundreds of thousands of volumes at a time when the West's biggest collections might number in the dozens. Increasing trade which followed periods of open hostilities furthered cultural and linguistic exchange and opened new regions to Western travelers and would-be scholars. Arabic books were much in demand among European merchants and their customers, as were spices, gold, glassware, and other products of the Muslim world. Europe's religious leaders, wary of the danger of new ideas and new technologies, sought unsuccessfully to limit or even ban this trade with the Arabs.

29. David C. Lindberg, *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, 660 B.C. to A.D. 1450* (Chicago: University of Chicago Press, 1992), 39.

30. The aristocracy of the former Roman Empire were all well-schooled in Greek and read the masters such as Plato, Aristotle, Archimedes, and Euclid in the original. As a result, there was no need at the time for Latin translations. This fact left medieval Europe largely bereft of direct access to these important texts.

31. Grant, *Foundations of Modern Science*, 34.

32. Louise Cochrane, *Adelard of Bath: The First English Scientist* (London: British Museum Press, 1994), 24.

Among the earliest Western pioneers to take advantage of these new educational opportunities was a young Englishman known as Adelard of Bath—the prototype of the medieval wandering European intellectual. Adelard was born around 1080 in England’s West Country, the son of a prosperous religious functionary. He hunted with falcons, a pursuit reserved for the privileged few. He tells us that he once played the guitar for the Queen, and enjoyed the best education the West then had to offer, at the cathedral schools of France. But he was also a restless young man, clearly dissatisfied with the state of the world around him.

In his first-known essay, Adelard condemned all contemporary European scholarship: “When I examine the famous writings of the ancients—not all of them, but most—and compare their talents with the knowledge of the moderns, I judge the ancients eloquent, and call the moderns dumb.”³³ Soon, he resolved to travel east and study the language of Arab scholarship before returning home with the secrets of Muslim learning. Before setting off in 1109, Adelard deposited his nephew and other students in his charge at the cathedral school of Laon.

Another dissatisfied student rudely denounced his professors in Paris as “statues” who stood motionless in class rather than reveal how little they actually knew. This same student, Daniel of Morley, then declared he would seek out the Arab scholars, whom he called “the wisest philosophers in the world.” He returned home with “a precious multitude of books” and then proceeded to provide the West with its first organized cosmology fully informed by Arab science.³⁴

We do not know exactly when Adelard arrived in the region, and his own writings provide almost no autobiographical or other personal insights. He does tell us, however, that four years after leaving behind his nephew and other charges he huddled on a “trembling bridge” outside Antioch, in modern-day Turkey, on November 13, 1114, the date of a major earthquake. Nor do we know the route that he took, although it seems likely that he had the help from his father’s connections to the Benedictine Order, which had a strong presence in and around Antioch, then beginning to emerge as a major center of learned translation from Arabic to Latin, especially in medical matters.

Adelard survived the ordeal on the bridge and continued his travels before making his way back to England, around 1116, now a changed man. Among his intellectual finds were the geometric system of Euclid; an elaborate table of the movements of the stars; several books of Arab astrology, which served as Europe’s gateway to Aristotle’s work on the cosmos; and a text on alchemy—essentially early chemistry—revealing ways to dye leather, tint glass, and produce green pigment—his favorite color. Adelard tells us that upon his return from the East he took to wearing a green cloak and a prominent signet ring, set with an obscure astrological symbol, in the same rich emerald hue.

About a dozen works attributed to Adelard have survived, addressing everything from the art of falconry and applied chemistry to mathematical astronomy, and the mysteries of astrology and his lasting contribution to Western science was considerable. He returned from travels as a respected scholar and intellectual elder statesman, and he inspired a stream of brilliant scholar-adventurers who set off in search of Arab learning on everything from algebra to zoology. Soon Europe was awash in Latin translations of all the great works of the Arabs, as the West’s new scientists struggled to catch up to the East.

Such figures as Gerard of Cremona, Robert of Ketton, Michael Scot, and Hermann of Carinthia followed in Adelard’s footsteps and devoted much of their lives to translating and transmitting Arabic texts, particularly works on astronomy, philosophy, and cosmology, to an increasingly knowledge-hungry Latin-speaking world. A eulogy for Gerard, written by his students, noted the scholar had been captivated as a young man by the riches of Arab science, available in the formerly Muslim-ruled city of Toledo and then devoted his life to translation: “To the end of his life, he continued to transmit to the Latin world (as if to his own beloved heir) whatsoever books he could ... as accurately and as plainly as he could.”³⁵ Working in the second half of the twelfth century, Gerard and his team of assistants rendered into Latin more than seventy major Arabic texts.

Interwoven with the new science was a new approach to the world in general, including that of politics and civic administration, long the province of kings demanding

33. Adelard of Bath, *Conversations with his Nephew: On the Same and the Different, Questions on Natural Science and On Birds*, trans. and ed. Charles Burnett (Cambridge: Cambridge University Press, 1998), 3.

34. Theodore Silverstein, “Daniel of Morley, English Cosmologist and Student of Arabic Science,” *Medieval Studies* 10 (1948), 179.

35. For the full text of the eulogy, see Edward Grant, ed., *A Sourcebook in Medieval Science* (Cambridge, MA: Harvard University Press, 1974), 35.

absolute authority and unchallenged obedience. One of Adelard's works, *On the Use of the Astrolabe*, explained to readers the medieval world's most powerful analogue computing device, which was invented by the Ancient Greeks but then perfected by the Muslims. The device, which can be used to tell time and direction, take astronomical observations, determine the heights of buildings and the depths of wells, and for related calculations, had been quietly introduced into Europe in the late tenth century by the future Pope Sylvester II, whose formative education took place at a monastery abutting Muslim Spain. Yet, it was Adelard who not only explained the workings of the astrolabe but also detailed the Arab science of the stars on which it was based.

Adelard also used this text to propose a radical new social model to King Henry II of France, whom he may have tutored before his ascension to the throne.

Henry's realm, he suggests, should be ruled by a philosopher-king, for philosophers tell the truth and are guided by natural justice and reason. It should be tolerant of all religions and beliefs. And it should recognize the authority of the Arabs—that is, of the scientists and thinkers—and not that of the rigid Church Fathers.³⁶

In the end, Adelard's lasting contribution lay in bequeathing to the West the spirit of Arab scientific inquiry, which had so far failed to take hold in a Christian society oriented toward the afterlife and inclined to see the physical world only as a pale imitation of God's heavenly rewards. "Of course God made the universe," Adelard assured his Christian readers after his return home, in what amounted to a rebuke of St. Augustine's call to not to pursue knowledge of the stars and, by implication, the rest of God's Creation. "But we may and should inquire into the natural world. The Arabs teach us that."³⁷



The astrolabe was invented by the Ancient Greeks but then perfected by the Muslims

36. Charles Burnett, *The Introduction of Arabic Learning into England* (London: The British Library, 1997), 46.

37. Margaret Gibson, "Adelard of Bath," in Charles Burnett, ed., *Adelard of Bath: An English Scientist and Arabist of the Early Twelfth Century* (London: Warburg Institute, 1987), 16.

Unpacking the ‘Classical’ Narrative

The importance to the development of Western science and philosophy of such leading translators and interpreters as Adelard of Bath, Gerard of Cremona, and Michael Scot is familiar to historians of the period. What is perhaps less well understood is the nature of the Arabic texts which they so lovingly transmitted to their Latin readers. Too often, the Muslim authors of these texts are seen primarily as caretakers of the older, Classical tradition (Greek, Sassanian, and Hindu) rather than as creative scientists and thinkers. In the same vein, those Islamic intellectual achievements that are accepted are typically sequestered in a so-called Golden Age, whose endpoint is defined by what is seen as the rise of clerical reaction somewhere in the early twelfth century. In fact, many of the leading Muslim intellectuals were also pious believers and serious religious scholars, a reflection of the lack of separation in Islam among different branches of knowledge—religious, scientific, and philosophical. What’s more, significant scientific and philosophical achievement continued in the Muslim world for centuries thereafter, until it succumbed to many of the same forces and factors that have plagued other traditions and societies across time—economic malaise, foreign invasion, the outbreak of major disease, the collapse of vital infrastructure, imperial decadence, and so on.

As already noted by Franz Rosenthal, the medieval Muslims evinced a “single-minded devotion” to the pursuit and collection of knowledge. Over a period of 150 years, they translated virtually all known Greek works of science and philosophy. Arabic, it turns out, is well-suited to conveying subtle shades of complex ideas and to developing the new technical vocabulary that such a venture required. That legacy has provided the Western lexicon with many of its enduring scientific and technical terms: from *alcohol*, *alembic*, and *azimuth* to *zero* and *zenith*. While many of the leading scholars were native speakers of Persian, Syriac, Aramaic, or other local tongues, Arabic became the shared language of intellectual activity across much of the world. One tenth-century Persian mathematician produced a manuscript in his native language, only to turn around and rewrite it

in Arabic in order to convey its exact meaning while Syriac Christian scholars regularly published in Arabic for the same reasons.

The rulers of the vast, multi-ethnic Abbasid Empire, centered in Baghdad from 762 until its fall at the hands of the Mongols in 1258, deliberately promoted scholarship as part of a state intellectual policy designed to shore up their own legitimacy and status. Among the earliest state-sponsored translations was a work of Aristotle on dialectics to fortify the debating skills of Abbasid theologians as they took on Muslim heretics and followers of the empire’s many competing faiths, all of whom were skilled at religious polemic. At the center of this effort was the *bayt al-hikma*, or House of Wisdom, a royal library and repository established by the Abbasid rulers and modeled after institutions founded by the Persian kings of antiquity. Activities affiliated with the House of Wisdom included translation, celestial observations, and scientific experimentation, but its primary function was apparently the safeguarding of invaluable knowledge, a fact reflected in other terms applied at times by the Arab historians to describe the project. These include the Treasury of the Books of Wisdom and simply the Treasury of Wisdom.³⁹

Upward mobility for Arabs and minorities alike at the Abbasid court could be achieved through original scholarly achievement or, for those less talented, through lavish support for the work of others. The best and the brightest commanded large sums of money or were rewarded with appointment to high office. Legend has it that at least one famed translator exchanged his work for the manuscript’s weight in gold. The resulting social movement produced centuries of organized research and steady advances across a wide range of topics, from astronomy, mathematics, and optics to engineering, medicine, philosophy, and geography. The development of this dynamic intellectual tradition, what we must rightly call Arabic Science, fostered an ever-increasing demand for extensive translations from Greek and other traditions. It was not, as it is often portrayed, a matter of the translations giving rise to Arab science and philosophy.⁴⁰

38. J. H. Kramers, “The Language of the Koran,” *Analecta Orientalia*, vol. 2 (Leiden: E. J. Brill, 1954), 164–65.

39. Aydin Sayili, *The Observatory in Islam* (Ankara: Turk Tarih Kurumu Basimevi, 1960), 53.

40. Dmitri Gutas, *Greek Thought, Arabic Culture; The Graeco-Arabic Translation Movement in Baghdad and Early Abbasid Society* (London: Routledge, 1998), 137.

Contemporary accounts make it clear that a breakthrough or discovery in one field, such as cartography, would send the Arab scholars back to their Classical-era source material, where they would check and recheck their own findings.

Along the way, the original translations were corrected or improved, often based on new experimental data, to the point where the revised Arabic versions that emerged represented substantial improvements—or even outright replacements—on established older works. Under the Caliph Mamun (786–833), an innovative program of astronomical observations and practical experiments was laid out to test out many of the assertions contained in Classical astronomy. These and related efforts led to significant revisions in the existing celestial models. Hundreds of years later, the Renaissance humanists found to their chagrin that their demands to work exclusively from the original Greek texts, rather than with those of the Arabs, left them vulnerable to significant errors, observational shortcomings, and other serious flaws that had long since been rectified by the Muslims.

The curious history of Western mapping of the Caspian Sea provides a case in point. By the fourteenth century, European cartographers had fully adopted earlier Muslim models and accurately portrayed the Caspian as running primarily north-south. Less than two centuries later, with the vogue for Greek “originals” in full swing during the Renaissance, Europe’s mapmakers reverted to the older Classical understanding of this large but remote body of water as running east-west. The correct north-south orientation was only reestablished another two hundred years later—eight centuries after the Muslim cartographers had accurately depicted the Caspian.⁴¹ Likewise, the refusal to properly value medieval Arabic science led educated Europeans to underestimate the earth’s circumference by as much as 20 percent, an error not addressed until the sixteenth century. Christopher Columbus mistakenly used this shorter distance in planning his exploration of the New World, with near-fatal consequences for his entire mission.⁴²

In those cases where Europeans initially acknowledged the primacy of Arab achievement, such as advanced mathematics, it was not unusual for later developments to see a deliberate revision of historical views which slowly but steadily erased Muslim contributions. The French humanists of the sixteenth century, for example, refashioned the history of algebra to eliminate all accounts of the seminal work of the ninth-century mathematician and astronomer Muhammad ibn Musa al-Khwarizmi.⁴³ Not only had translations of al-Khwarizmi’s works first introduced Europe to the art of algebra, but the term “algorithm” comes from Latin corruption of the scholar’s own name and our very word “algebra” is derived from the title of one of his most influential books. In the hands of the humanists, however, algebra became first a Greek art and ultimately a European and even French one, part of the expanding Renaissance project to delete any traces of Islamic scholarly influence and to establish the idea of science as a wholly Western endeavor. Such revisionism can also be found in the historiography of Western medicine.⁴⁴

Simply erasing the achievements of the Islamic scholars from the collective memory is not, of course, a path open to serious students of the history of science. After all, the Muslims led the world in science from the eighth century into the Renaissance. In addition to the algebra of al-Khwarizmi (ca. 780–ca. 850), who also helped introduce the “Arabic” number system we use to this day, we must account for the foundational chemistry of Gaber (ca. 715–ca. 815); the medical teachings and psychological insights of Avicenna (980–1037); the geography of al-Idrisi; the rational philosophy of Averroës (1126–1198); the engineering wonders of Abu al-Jazari (1136–1206); the mathematical astronomy of Nasir al-Din Tusi (1201–1274) and Ibn al-Shatir (ca. 1305–ca. 1375); and many others. Elsewhere, I have called this challenge to the predominant Western discourse the “problematic of Islamic science”: Given even this abbreviated list of great Muslim thinkers and their undeniable attainments, how can it be asserted that Modern Science is the exclusive and necessary product of the Western experience?⁴⁵

41. Fuat Sezgin, *The Mathematical Geography and Cartography in Islam and Their Continuation on the Occident*, vol. 1 (Frankfurt-am-Main: Institute for the History of Arabic-Islamic Science, 2005), 541–542.

42. Pier Giovanni Donini, *Arab Travelers and Geographers* (London: Immel, 1991), 37.

43. Giovanna Cifoletti, “The Creation of the History of Algebra in the Sixteenth Century,” in Catherine Goldstein, Jeremy Gray, and Jim Ritter, eds., *L’Europe mathématique: Histoires, mythes, identités*, 123–142 (Paris: Foundations de la maison des sciences de l’homme, 1996). See also Jens Høyrup, “The Formation of a Myth: Greek Mathematics – Our Mathematics,” in *L’Europe mathématique: Histoires, mythes, identités*, 103–19.

44. Chiara Crisciani, “History, Novelty, and Progress in Scholastic Medicine,” *Osiris* 2nd ser., 6: 118–139; Cifoletti, 125.

45. Lyons, *Islam Through Western Eyes*, 74–76.

Rather than such outright denial, the prevailing discourse has instead sought to limit the scope and influence of the Arab scholars by segregating their achievements within a hermetic and narrowly defined Golden Age, beyond which the tradition ceases to offer any value or interest to either science itself or to its historical course.⁴⁶ This preserves the overriding Western claim on the origins and development of Modern Science while allowing for intellectual curiosity to be directed toward the *studia Arabum*; at its core, however, it fails to take on Islamic science on anything like its own terms. In other words, historical analysis essentially bypasses serious exploration and is instead reduced to the consideration of procedural questions: *When did Islamic science die off? And why did it fail to lead to Modern Science?*

George Saliba, a leading scholar of the history—and historiography—of Arab science has dubbed this

approach the “classical narrative.” Central elements include the failure to consider pre-Islamic scientific traditions on which to ground an indigenous science; the associated need to rely exclusively on borrowings from more advanced cultures; the Muslims as caretakers of Greek learning, with few true innovations or advancement; the short-lived Golden Age in the face of theological reaction; and the independent rise of a European tradition, known as the Renaissance, that marked a return to a steady, autonomous trajectory toward the glories of Modern Science.⁴⁷ I would add the unexamined assumption that the Muslim experience, like its Western counterpart, was marked inevitably by conflict between faith and reason.⁴⁸ The power of this narrative goes a long way toward explaining the seeming resistance of Western scholarship to rigorous study of the Muslims’ claim on scientific originality.

“...the refusal to properly value medieval Arabic science led educated Europeans to underestimate the earth’s circumference by as much as 20%...”



46. For prominent examples of this approach, see Marshall G. S. Hodgson, *The Venture of Islam*, 3 vols. (Chicago: Chicago University Press, 1974); Bernard Lewis, ed., *Islam and the Arab World* (New York: Knopf, 1976) and *What Went Wrong? Western Impact and Middle Eastern Response* (New York: Oxford University Press, 2002); Ira M. Lapidus, *A History of Islamic Societies* (New York: Cambridge University Press, 2002), and Huff.

47. Saliba, *Islamic Science and the Making of the European Renaissance*, 1-3. To this, I would add the notion that relations between the realms of science and religion are inevitably in conflict, that is, the Muslim experience must mirror that of Western Christendom.

48. This particular pitfall might have been at least partly avoided from the outset had the Latin translation movement chosen not to ignore all Arabic texts that appeared to touch on religious questions rather than strictly scientific or philosophical ones. Translations of the works of Averroes on Aristotelean philosophy and many other matters were highly influential throughout medieval Europe. However, one of his most important works, *On the Harmony of Religion and Philosophy*, never appeared in any Western language until the modern day, by which point it was too late to shape the prevailing discourse of “faith versus reason” and its application to the world of Islam.

Core Curriculum

In addition to institutional trappings of the university and the spirit of true inquiry needed to animate such an enterprise, Muslim scholarship was also responsible for much of what would become the core curriculum throughout medieval Europe. This arrived at the University of Paris and other leading institutions around 1230, largely in the form of brief synopses and larger, more detailed commentaries on the scientific and philosophical works of Aristotle, particularly the work of Avicenna and Averroes. Only these texts, newly translated from the Arabic into Latin, came with an important twist: they did not so much present Aristotelean thought as they offered Europe a fully naturalized “Arab” Aristotle.

Generations of Muslim scholars—all committed monotheists, like their new Christian readers—had already spent centuries seeking to harmonize pagan Greek philosophy with the tenets of their faith; and, unlike Aristotle and his school, they were deeply interested in connecting metaphysics to their own understanding of the one true God. According to Yaqub ibn Ishaq Al-Kindi (ca. 800–870 CE), the first of the great Arab philosophers, he and his colleagues set out to advance Classical wisdom and adapt it to the needs and requirements of Muslim culture: “It is fitting then to remain faithful to the principle which we have followed in all our works, which is first to record in complete quotations all that the Ancients have said on the subject, secondly to complete what the Ancients have not fully expressed, and this according to the usage of our Arabic language, the customs of our age, and our own ability.”⁴⁹ The result was a comprehensive and coherent worldview whose very existence posed a challenge to one thousand years of church teachings on such questions as the origins of man, his place in the universe, and his final destiny.⁵⁰

By now, the Catholic Church had managed to extend its authority over the universities that had first coalesced around what had once been informal groupings of students, tutors, and teaching masters in cities such as Bologna, Padua, and Oxford. Church leaders took particular interest in the University of Paris, the most influential and prestigious center of advanced study, and as early as 1210 they sought to clamp down on the reading of this Arab-influenced natural philosophy—a

subject that immediately proved irresistible to teachers and students alike. The issuance over many years of repeated bans on specific ideas and texts, each carefully enumerated by church bureaucrats, however, demonstrates just how hard it was to put the *jinn* of Arab learning back in the bottle. By 1255, the enforcement effort remained largely in name only, and all major works of natural philosophy then available in Latin became part of the official arts curriculum.

This atmosphere of growing intellectual freedom saw university enrollment swell dramatically. This was especially the case in the Faculty of Arts, which grew much faster than those of theology, law, and medicine. Modern estimates put the number of students who matriculated at European universities between 1350 and 1500 at around 750,000, many of whom went on to careers as government clerks, lawyers, doctors, and secular officials and bureaucrats.⁵¹ Armed with a new ethos shaped by Arab teachings in natural philosophy, these graduates represented a powerful social cohort capable of resisting the old, established ways of both church and state.⁵² Tensions between the demands of the established church theologians and those of the rising class of natural philosophers spilled over into matters of university governance, student life, faculty appointments, as well as the curriculum. At one point, the Paris authorities tried to ban private tutoring in anything but logic and grammar, another acknowledgment by the church that it had failed completely to stem the promulgation of illicit material.

Yet, it was out of this very tension that the outlines emerged of a grand compromise that would make way for both the new learning at Europe’s universities and traditional Catholic teachings. Central to the effort to reconcile these two, seemingly disparate camps, was the figure of Thomas Aquinas, the Dominican friar, theologian and future saint, who arrived in Paris in early 1269 with the specific mission to end the infighting that had brought university life to a standstill. Before joining the Dominican order, Thomas studied at Frederick II’s University of Naples, where he first encountered natural philosophy in an environment shaped by the works of Arab and Jewish thinkers. These included Avicenna and Averroes, as well as the Jewish scholar Maimonides, who

49. Al-Kindi, *Metaphysics*, quoted in Richard Walzer, “Arabic Transmission of Greek Thought to Medieval Europe,” *Bulletin of the John Rylands Library* 29 (1956–54), 174.

50. Fernand van Steenberghen, *Aristotle in the West: The Origins of Latin Aristotelianism*, trans. Leonard Johnston (Louvain: E. Nauwelaerts, 1955), 32–39.

51. Grant, *Foundations of Modern Science*, 37.

52. Roger French and Andrew Cunningham, *Before Science: The Invention of the Friar’s Natural Philosophy* (Aldershot, Eng.: Scolar Press, 1996), 63.

wrote his philosophical treatises in Arabic. A number of Thomas' writings from the 1250s show just how much he respected these leading Arab thinkers, even when he disagreed strongly with their arguments. Avicenna was at the time the primary authority for Western philosophers, and many of his ideas can be found explicitly in Thomas' works, including two proofs of God's existence and the distinction between divine and human knowledge.⁵³

Armed with both a subtle mind and a poison pen, Thomas realized that an accommodation with Europe's new generation of philosophers, backed by the authoritative voice of the *studia arabum*, was necessary in order to end the increasing turmoil in the universities and to preserve the long-term viability and influence of the church and its teachings. One of the most hotly contested issues of the day concerned the Eternity of the World. Traditional Muslim, Christian, and Jewish understanding held that God had made the universe at a time of His choosing, and then controlled every event in it, in accordance with the opening line from Genesis: "In the beginning God created the heavens and the earth."

Christians, following the lead of the Jews and followed in turn by the Muslims, generally took this to mean the universe had a distinct starting point and was created *ex nihilo*, "from nothing." Against this, Averroes laid out the Aristotelian view that both time and matter were eternal, and that the Creator had simply set the entire process in motion. This view was now championed in its most radical form by Averroes' Western followers in Paris, who then extended the argument to encompass attacks on other fundamental church teachings.

To the grave disappointment of theological hardliners, Thomas did not attempt to challenge the Arab-influenced philosophers head-on over the Eternity of the World; nor did he support proposed philosophical arguments in defense of the established church position, that the universe was created "in time." Instead, in an impressive move of intellectual ju-jitsu, Thomas side-stepped the powerful and closely reasoned arguments of these so-called "Latin Averrorists" and immediately withdrew behind an impenetrable wall of religious faith. In his unfinished masterwork, the *Summa theologiae*, Thomas acknowledged that a battle over creation

fought on strictly philosophical grounds was a losing cause—and a dangerous one at that. Rather, good Christians had to simply accept as an article of faith that God had made the world "in time" and not strive to demonstrate it philosophically.

"That the world had a beginning ... is an object of faith, but not of demonstration or science," Thomas concluded, in a passage that would one day help establish a truce between the rival approaches of reason and faith and pave the way for the West's eventual assimilation of the *studia arabum*. "And we do well to keep this in mind; otherwise, if we presumptuously undertake to demonstrate what is of faith, we may introduce arguments that are not strictly conclusive; and this would furnish infidels with an occasion for scoffing, as they would think that we assent to truths of faith on such grounds."⁵⁴

By the time of his death, in March 1274, there was certainly no indication that Thomas's goal of harmonizing science and religion—an effort guided by the spirit of Averroes and other Muslim thinkers, tempered with Christian tradition—would survive the ensuing controversies let alone become the official teaching of the Catholic Church. Many of his fellow theologians were aghast, and the more astute realized that Thomas had opened the way to almost unbridled philosophical speculation. Decades of Persecution of the Averroists and other symptoms of internal turmoil—one of their leading lights was killed under mysterious circumstances—plagued the universities and the church itself for years.

All the same, Thomas Aquinas' views gradually prevailed at the highest levels of the Church, and his enduring stature was ensured with his canonization in 1323. There was, it turned out, room in the Christian imagination for separate realms of reason and faith, something Adelard of Bath had himself proposed more than one hundred and seventy-five years earlier. Man, the pioneering scholar-adventurer declared in Adelard's essay *Questions on Natural Science*, should take refuge in God only when his intellect proves incapable of understanding the world around him. "I will detract nothing from God, for whatever is, is from Him. ... We must listen to the very limits of human knowledge and only when this utterly breaks down should we refer things to God."⁵⁵

53. Marcia L. Colish, "Avicenna's Theory of Efficient Causation and Its Influence on Thomas Aquinas," in *Studies in Scholasticism* (Burlington, VT: Ashgate, 2006), 2–3.

54. Thomas Aquinas, *Summa Theologiae*, quoted in Cyril Vollert, Lottie H. Kendzierski, and Paul M. Byrne trans. and eds., *On the Eternity of the World* (Milwaukee: Marquette University Press, 1964), 66.

55. Adelard of Bath, *Questions on Natural Science*, quoted in Cochrane, 45.

Some Lessons for Modern Times

The history of education, and intellectual history in general is worthy of renewed attention in these times of rapid globalization of higher education led by some of the world's most powerful and influential institutions. Today, more and more American and European universities are opening satellite campuses around the world to provide foreign students with Western-style curricula and degrees in line with those offered on the home campus. The Arab world has been the locus of a number of high-profile projects in recent years.

This rapid expansion of recent years marks a third phase in the global spread of Western-style education. In its earliest iteration, during the period of high colonialism, access to Western universities was largely bestowed on select children of local elites by the ruling European powers. These students, almost universally men, were expected to return home equipped with technocratic expertise, inculcated with cosmopolitan values, and fully prepared to guide their nations under the tutelage of administrators from the Mother Country. The end of the colonial era and the steady rise of a middle class across large parts of the developing world set in motion a second phase, which continues unabated to this day: the direct enrollment of foreign students, men and women alike, on Western campuses of all sizes, from the mega-universities to community colleges. As before, some are sponsored by their governments or other institutions or receive financial aid, but most travel and enroll at their own expense.

The latest report from the State Department and its partner, the Institute of International Education, put the number of foreign students studying in the United States in 2015 at 974,000, an increase of 10 percent over last year, the highest growth rate in the last 35 years. China accounts for the largest cohort, representing more than 31 percent of enrollment, with India second with 13.6 percent. Student populations from Brazil, Saudi Arabia, Vietnam, Mexico, and Iran all grew in double digits in comparison with 2014. Accordingly, the financial stakes for all are significant. Almost two-thirds of all students are paying their own way while the entire foreign student body as a whole contributes an estimated \$30 billion to the US economy in the form of tuition, room and board, books, travel, and related costs.⁵⁶

The enormous global appeal of a Western college education, as reflected in the above figures, has now propelled a third major expansion of the universities' reach through a new 'export' model. As a result, students in select foreign countries increasingly have access to the same program and degrees without the potentially large social, psychological, and emotional costs of leaving their homes and families behind. This is a particularly attractive to parents and students from more traditional cultures, such as the Muslim Gulf States, where some of the values and attitudes prevalent on Western campuses, including the widespread use of alcohol and unsupervised relations between unmarried men and women, clash openly with accepted standards.

Foreign proponents of the satellite campus model often cite these social protections, especially for women, rather than any reduction in tuition or travel costs, as among the export model's strongest attributes. Backers also see opportunities for technology transfer to address potentially critical shortages of know-how vital to the economies of the twenty-first century. For their part, administrators at the home institutions and their supporters commonly argue that the strengthening of liberal democratic values, including the spirit of open academic inquiry and free speech, through the spread of Western-style education helps bring stability and build trust and understanding across international borders. Others cite the benefits of cultural exchange as students, faculty, and staff from different traditions interact in pursuit of a shared educational endeavor. David J. Skorton, until 2015 the president of Cornell and an early backer of the satellite campuses in foreign lands, has referred to the US system of higher education as "the most important diplomatic asset we have."⁵⁷

In the case of the Muslim world, however, the laudable goal of building bridges between East and West through student-to-student contacts is not as simple or direct as it may sound, for the construction of lasting bridges requires that all sides recognize the deep cultural and intellectual context at work. It is not, then, enough to build bridges grounded only in the understanding of the moment. While the notion of universities from the United States or Europe setting up campuses in the Arab

56. Institute for International Education, "Open Doors 2015," available at <http://www.iie.org/Research-and-Publications/Open-Doors>. Last accessed November 23, 2015.

57. Tamar Lewin, "U.S. Universities Rush to Set Up Outposts Abroad," *The New York Times*, February 10, 2008.

world is a relatively new one, the exchange of knowledge across the cultural and linguistic lines that demarcate East and West is anything but a novel development. And, as the foregoing discussion has shown, what are generally seen by many as two very different and even inherently hostile worlds, those of Islam and the West, actually share a common cultural, intellectual, and, in many ways, religious heritage that goes far deeper than current differences would suggest.

In other words, we need to pose the following questions for further reflection: If we are truly in need of bridges between East and West, then what exactly is the chasm we are trying to cross? How was such a chasm created? And of what does it consist?

Here, a critical reading of traditional history of science proves a useful, if perhaps unexpected, starting point from which to analyze such questions, and to assess the Western discourse of Islam as a whole. As I have argued elsewhere, the predominant narrative of Islam and science—or the lack of science—underpins the entire discourse and feeds directly into the common and accepted apprehension of other aspects of Muslim life and culture, as viewed from the West.⁵⁸ And not just the West, for these same attitudes and biases have spread worldwide and often overwhelm Arab and Muslim students and scholars as well, particularly those largely influenced by Western training and scholarship. I have in mind here some of the so-called hot button issues of our times: questions of Islam and women; Islam and violence; and Islam and democracy, or modernity in general.

Discursive approaches to these and other contested aspects of Muslim life share an embedded structure with the question of Islam and science; at their core

all rest on the established notion that Muslims are innately hostile to reason and, thus, incapable of rational behavior, actions, policies, or goals. Since the fourteenth century, this same narrative has essentially informed the worldviews of successive Western elites, from the early humanists through the Enlightenment to the colonial era, when it was routinely invoked to justify the West's domination and administration of Eastern lands.

Today, this narrative remains as powerful as ever. In his study of Muslim intellectual life, the sociologist Toby Huff faithfully recapitulates the discourse in its modern form with the assertion that orthodox Islamic thought ultimately cut short the spirit of free inquiry and made impossible the development of universities and other autonomous institutions that inevitably led to modern science.⁵⁹ Science, Huff adds in a clear echo of his intellectual forbears, was seen by Muslims as ungodly. By contrast, says Huff, Western scholars were free to pursue rational thought for centuries: “This [Western] flight of the imagination, if you will, was both sponsored by and motivated by the idea that the natural world is a rational and ordered universe and that man is a rational creature who able to understand and accurately describe that universe.”⁶⁰ As is immediately evident, the role of Islam in this seminal transition in human thought—once celebrated by Adelard of Bath and his fellow pioneers of the *studia arabum*—has by now been deleted.

In more polemical hands, such as those of Orientalist scholar and former US policy advisor Bernard Lewis, the operation of the anti-Islam discourse takes on greater immediacy and urgency in matters of contemporary public policy, such as the war on terrorism and the broader relationship between Islam and the West. The juxtaposition of Western rationality and Islam's irrationality is invoked regularly to support a host of broader claims against Islam: that it is uniquely ill-suited to concepts of democracy, the rule of law, creative thought, or modernity in general. All aspects of Islamic culture, then, are reduced to a series of atavistic attitudes that must be radically reformed or violently repressed before they threaten the West's values and undermine its security.

58. Lyons, *Islam Through Western Eyes*.

59. Huff's work is particularly valuable for my purposes, because it reflects the Orientalist canon and invokes accepted Western interpretations for its underlying sources. For in-depth critiques of Huff, see Roshdi Rashed, *The Development of Arabic Mathematics: Between Arithmetic and Algebra*, trans. A. F. W. Armstrong (Dordrecht: Kluwer, 1994), 332–348; George Saliba, *Rethinking the Roots of Modern Science: Arabic Scientific Manuscripts in European Libraries* (Washington, D.C.: Center for Contemporary Arabic Studies, Georgetown University); and Muzaffar Iqbal, *Islam and Science* (Burlington, Vt.: Ashgate, 2002), 143.

60. Huff, 1.

In this reading, the terrorist attacks of 2001 were a direct result of Islam's steadfast refusal to accept what Lewis calls the "underlying philosophy and socio-political context" of Western scientific advances. "The relationship between Christendom and Islam in the sciences was now reversed," he writes in *What Went Wrong? Western Impact and Middle Eastern Response*, published in early 2002. "Those who had been disciples now became teachers; those who had been masters became pupils, often reluctant and resentful pupils."⁶¹ Lewis, one of the intellectual architects of the war on terrorism, similarly argues that issues of Islam and women, Islam and democracy, and Islam and violence can all be explained by a prevalent and enduring backwardness on the part of Muslims and their entire civilization.

The abiding failure of the War on Terrorism, now in its fourteenth year with no end in sight and little or nothing to show for the enormous loss of life and treasure it has entailed, underscores the fundamental failure of the Western discourse of Islam. One thousand years since its initial formation as part of mobilization for the First Crusade, this same discursive formation continues, essentially unchanged and unexamined, to exercise its corrosive influence across a range of academic disciplines and important contemporary issues dividing East and West. This, in turn, has left fears of an inevitable "clash of civilizations" careening dangerously toward self-fulfilling prophecy. Clearly, Western thinking about the world of Islam has hit a dangerous dead end.

One possible way out involves a dramatic rethinking of the Western idea of Islam, effectively suspending or even reversing the existing discourse, if only as a thought experiment. In setting aside the central pillars of this discourse, including the notion that Islam is inherently and irredeemably anti-science, and thus anti-modern, as flawed representations of the nondiscursive reality of the Muslims, it becomes possible to imagine new and different relationships between East and West. This is all the more the case when the deep ties and interrelationships between the worlds of Islam and the West are reinstated to their proper place, in science, philosophy, and even theology. After all, Max Weber, the father of modern sociology, argued one hundred years ago that Islam and Christianity are both *western* religions.

A serious reconsideration of our failed discourse would ultimately yield a new, "secret" history of Islam and Muslims. This is, of course, an enormous enterprise and one that faces enormous challenges and significant obstacles. Better, then, to break the problem into smaller and more manageable units. A revisionist history of Western science, including the origins of the university system and the values, opportunities, and experiences that it has come to offer the world, would make a good beginning.



61. Lewis, *What Went Wrong?*, 81.

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About Jonathan Lyons

Jonathan Lyons has spent much of his professional and personal life exploring the shifting boundaries between East and West, first on both sides of the Cold War divide and, for the past two decades, on the cusp between the Islamic and Western worlds.

He served as a foreign correspondent for the Reuters news agency, with posts in Moscow, during the collapse of the Soviet Union; in Turkey, during the rise of the first elected Islamist government; and in Tehran during the contentious presidency of Mohammad Khatami. He also worked as a senior editor in Reuters Washington bureau, and covered radical Islamic movements across Southeast Asia.

Leaving behind the life of a foreign correspondent and editor, he completed doctorate in sociology at Monash University, Melbourne, Australia. He also holds a BA with Honors in Russian and History from Wesleyan University and was a Fellow at Columbia University's Harriman Institute of Soviet Studies. In addition, he studied at the Pushkin Institute of Russian language in Moscow.

His books include *Answering Only to God: Faith and Freedom in 21st-Century Iran* (2003), co-authored with Geneive Abdo, and *The House of Wisdom: How the Arabs Transformed Western Civilization* (2009), a narrative account of the West's extensive borrowing from the medieval Arab and Muslim world.

His most recent book, *Islam Through Western Eyes: From the Crusades to the War on Terrorism* (2013), attempts to explain the fact that Western images of Islam have remained to this day almost unchanged since they were first crafted from wartime propaganda at the time of the First Crusade, one thousand years ago.

Dr. Lyons has taught at Monash University, George Mason University, and the Center for Muslim-Christian Understanding at Georgetown University.

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