

“Setting the Stage”

The history of Islamic cartography is interesting in showing historical practice that helped shape the medieval conception of the Mediterranean and the global view. Filled with intellectual diversity, this tradition took from the Greek, Persian, Indian, and Byzantine influences in order to come up with maps that served both practical functions and were beautiful in form. Islamic maps had a close relationship with cosmological ideas, depicting concretely a worldview that integrates physical and metaphysical reality. The amount of artwork in minute detail involved in the preparation of them, as in the case of illuminated manuscripts in the West, testifies to their importance as a cultural artifact.

These Arabic cartographic works held real influence which went much beyond the medieval period. Al-Idrisi (#219) and people like him played an important role in linking Islamic and European cartography; in essence, they laid the foundation for later exploration and understanding. Islamic cartography is very critical and forms a major part of the history of mapmaking. Notably, it incorporates science, art, and cosmology, hence vastly improving the medieval understanding of the world and creating a long-standing influence in the field of mapping.

As Ahmet T. Karamustafa writes, the cartographic heritage of pre-modern Islamic civilization is extremely varied. Different traditions of theoretical and empirical cartography coexisted for over a millennium, from about 700 to 1850, with varying degrees of interaction in a cultural sphere that extended from the Mediterranean and Atlantic shores of Africa to the Pacific, from the steppes of Siberia to the islands of South Asia. The heterogeneity of pre-modern Islamic mapping was not due solely to the unusual geographical extent and temporal span of this cultural sphere. Rather, it was primarily a natural outcome of the fact that Islamic civilization developed on the multifaceted and discontinuous cultural foundations of the Middle East. The very core of this foundation, the Semitic-Iranian tradition, was itself marked by radical ruptures that separated the age of cuneiform from that of Aramaic and Middle Persian. Muslims further complicated the picture, not only by deliberately rejecting their own classical Semitic-Iranian heritage but, more dramatically, by appropriating and naturalizing in an enormously creative act the "foreign" classical tradition of Greek science and philosophy. The enclosed monographs attempt to trace the major outlines of the conceptual as well as the practical mapping traditions of the multi-rooted cultural complex that resulted from this merger of cultures.

Independent map artifacts, excluding astronomical instruments, are the exceptions in the cartographic record of pre-modern Islamic civilization. Almost all the extant Islamic maps are integral parts of larger manuscript contexts. This prominence of the textual environment generates problems of interpretation for the student of Islamic cartographic representation. The contents of medieval manuscripts are not usually numbered by pages but rather by folios (or leaves) each of which has two sides. In Western manuscripts, written in languages reading from left to right, the two sides of a folio are designated either **r** (recto) or **v** (verso). In manuscripts written in languages reading from right to left, such as Arabic, Hebrew, and Persian, the sides of a folio are referred to in the sequence read as 'a' and 'b'.

Also it should be mentioned that the Muslim calendar is a lunar one of 354 days beginning from the day of the Emigration (*Hijrah*) of the Prophet Muhammad from Mecca to Medina, which occurred on the 16th of July 622 of the Christian calendar. Consequently, Muslim dates do not correspond directly to those of the Christian era

(AD/CE) commonly used today in Europe and the U.S. For convenience, most dates in these monographs will be those of the Christian calendar, or both. General references to a century rather than a specific year refer to centuries of the Christian era. For example, ninth century refers to the years 800-899 AD/CE (which in the Muslim calendar would be 184-287). The designations AD/CE will be used only when there is need to distinguish a date from an earlier B.C. date. The Muslim calendar is designated by *H*.

In the exuberant cultural flowering of Islamic society in the ninth century CE, most of the Greek scientific writings became available to Islamic scholars in their own tongue, but not in Latin treatises. Whereas up to that time Greek ideas filtered down to the Latin West through the Roman and early Christian authors, the Islamic world received their Greek inheritance directly. The way in which the thought of earlier cultures reached medieval scholars is fundamental to understanding the manner in which ideas developed and the contrast between products of Islamic scholars and those of Christians of the same period. The lack of access to Latin materials, for example, suggests the reason why the European T-O maps (*see* #205) played no role in Islamic cartography.

Writing in about 150 CE, Ptolemy composed in Greek not only the astronomical treatise the *Almagest*, but also a monumental *Geography*. Both were translated into Arabic in the early ninth century CE and stimulated an interest in geography and map-making. While the *Almagest* included a list of geographical coordinates for some places on the earth, his *Geography* provided coordinates for roughly 8,000 localities. In the *Almagest*, the ratio of the number of hours in the longest to those in the shortest day was used to establish latitude.

In the *Geography* latitudes were determined from measurement of the height of the sun or pole star. Calculating longitude was trickier, but Ptolemy understood that the interval in longitude between two places could be found by establishing the local time of a lunar eclipse at both places. Unfortunately, not enough reliable data existed, and his figures, by his own admission, were necessarily approximate, based on travelers' estimates.

In the course of the *Geography*, Ptolemy discussed the requirements for making a map of the inhabited world (*see* #119). He, like all other scholars of his day, believed the earth to be spherical in form, with land-masses occupying about one-quarter of its surface and the rest covered by ocean. Anyone wishing to map the inhabited world is confronted by a problem: the surface of even one-quarter of a sphere cannot be represented on a flat map without distortion. Several methods of representing part of the surface of a sphere on a flat surface (called *projections*) were proposed by Greek scholars. Ptolemy singles out for criticism the one proposed by his near contemporary Marinus of Tyre, who in about 100 CE had suggested a rectangular grid (or *graticule*) of meridians and parallels on which latitudes and longitudes could be plotted. Ptolemy rejected Marinus' approach, except for use in regional maps, and proposed two mathematical projections of his own. Unfortunately, neither Marinus' nor Ptolemy's maps have been preserved, and it is uncertain whether Ptolemy ever actually made the maps which his *Geography* describes. The frequently reproduced 'world maps of Ptolemy were constructed by European scholars in the early Renaissance following Ptolemy's text (*see* #119). It is curious that the Islamic world, which possessed the text of the *Geography* at an early date, made almost no direct use of it in map-making.

On a technical level, the submergence of maps in Islamic texts means that their study is subject to all the difficulties associated with studying the latter. A substantial

portion of the textual legacy of pre-modern Islamic civilization is still preserved only in manuscript form in a great many public and private collections scattered throughout the world. Many of these collections are only partially and inadequately cataloged. The number of individual works that are transcribed or, much less often, critically edited and published is disappointingly low. The researcher who compares these manuscript codices faces serious problems such as difficulty of access as well as intractable questions of authorship and copying. The student of Islamic maps faces additional problems. Often it is difficult to surmise where to search for maps, since they are found in many kinds of texts. Once located, maps present their own problems of dating, provenance, and draftsmanship, though never divorced from similar difficulties associated with the texts in which they are found.

Throughout the length and breadth of the Islamic world, we are concerned with a *manuscript* culture. Printing was not highly regarded, in spite of the arrival of block-printing techniques derived from China and even a short-lived attempt to print paper money at Tabriz in 693/1294. Such techniques were not adopted for traditional Islamic cartography until the 18th century. The printing press, which so revolutionized the production and dissemination of knowledge in Europe, had a delayed and muted impact within Islamic culture.

There are accounts of large maps made especially for the delight and gratification of various Muslim rulers. They were constructed of various materials and displayed at court to enhance the glory of the reign. The survival rate of such maps would have been low, but it is curious that not a single fragment has survived. Instead, as stated above, much of the corpus of Islamic maps, especially for the pre-Ottoman period, comes down to us as illustrations to geographical works and historical annals. The maps we examine today, despite some evidence for independent artisans working outside court circles, were incorporated into imperially commissioned texts or intended for other individuals holding high office. As a result, map production in traditional Islamic cultures, as we are able to reconstruct it from the available evidence, is closely linked to the highly formalized art of illustrated manuscript texts.

The classical geography of Ptolemy was lost to the west and would remain so for many centuries. Yet the survival of his texts in eastern centers such as Alexandria, Antioch and Damascus meant that the first beneficiary of the Greek geographical system was Islam. By 750 A.D./CE Islamic power had spread from its Arabian heartland west as far as Spain and east as far as India, and covered the larger part of the Ptolemaic world. Arab traders sailed to East Africa and to India and China, learning to master the monsoon winds that prevailed in the Indian Ocean. As remarkable as this maritime trade was the Islamic penetration of Africa,



developing caravan routes across the Sahara, up the White and Blue Nile into Sudan and Ethiopia, and via the East coast trading ports. The twin demands of Islamic religious practice, the pilgrimage to Mecca and the observance of the sacred direction of prayer - the *Qibla* - fostered a strong sense of precise geography in Islamic culture. When Arab scholars sought to construct a systematic geography of the known world, the Greek model was their principal guide. Even more than the Romans, the Islamic dominion over large regions of Asia, Africa and Europe provided both a context for travel and the data for a world map. The former is exemplified in the exotic figure of Ibn Battutah, who in the 14th century traveled from his birthplace in Tangier throughout North Africa and the Middle East, to Central Asia beyond the Caspian Sea, to Mombasa and Zanzibar on the East African coast, and eastwards to India, Sumatra and China. He cannot be called an explorer, for he traveled existing caravan and sea routes, mainly with fellow-Muslims, but for that very reason his travels hold up a mirror to the Islamic world of his day, and to the half-known, exotic lands that lay on its fringes, lands which become central in the fabulous tales of Sinbad.

Contrary to the impression that one receives from traditional histories of cartography, the richest heritage of pre-Renaissance maps has come down through history from the medieval Islamic world rather than ancient Greece or medieval Europe. Muslim carto-geographical scholars from the 10th century CE onward drew on Greek, Babylonian, Coptic, Syriac, Sassanian, Indian, Chinese, and Turkic knowledge to produce a new genre of detailed maps of the known world. According to historian Karen Pinto there exist an estimated 2,000+ cartographic images of the world and various regions, scattered throughout collections of medieval and early modern Arabic, Persian, and Turkish manuscripts. The sheer number of these extant maps tells us that, at least from the 13th century onward, whence copies of these map-manuscripts begin to proliferate, that the world was an often a graphically depicted place. It loomed large in the medieval Muslim imagination. It was pondered, discussed, and copied with minor and major variations again and again, with what seems to be a peculiar idiosyncrasy to modern eyes. The cartographers did not strive for mimesis (i.e., the representation or imitation of the real world). They did not usually show irregular coastlines, for example, even though some of the geographers within whose work these maps are encased openly acknowledge that the landmasses and their coastlines are uneven. They presented instead a deliberately schematic layout of the world and the regions that comprised the Islamic empire.

Until recently these maps lay virtually untouched, often deliberately ignored on the grounds that they are not mimetically accurate representations of the world. This perspective overlooks the great value of these images as representations of the way medieval Muslims perceived their world. These schematic, geometric, and often symmetrical images of the world are iconographic representations, "carto-ideographs", of how medieval Muslim cartographic artists and their patrons perceived their world and chose to represent and disseminate this perception. The abundance of extant copies produced in locales across the Islamic world for eight centuries testifies to the enduring importance of these maps. Because all images are socially constructed, these iconic carto-ideographs contain valuable information about the milieus in which they were produced. They are a rich source of historical data that can be used as alternate gateways into the past.

The Muslim maps avoided religious iconography since Islam forbids the representation of a human being. Thus the art of using decorative elements was adopted

by the Muslim cartographers. Though not overtly religious, these elements had symbolic meanings. For example, Muslim cartographers would include geometric designs or calligraphic writings in and around the maps as manifestations of abstract Islamic artistic traditions. Even though Muslim maps did not include religious figures, they did include several place names and descriptions of a religious nature.

On the surface it seems that these often elaborately illuminated a-mimetic cartographic works, employing pigments made from precious metals and stones, must have been produced for the elite literati of medieval Islamic society, such as the commissioners/patrons, collectors, copyists, and high-status readers of the geographic texts within which these maps are found. This conclusion ignores the easy-to-replicate nature of these schematic images, which would have enabled students visiting the libraries of sultans, amirs, and other members of the ruling elite to transport basic versions of these carto-ideographs back to the people of their villages and far-flung areas of the Islamic world.

The majority of the medieval Islamic maps occur in the context of geographical treatises devoted to an explication of the world in general and the lands of the Muslim world in particular and should be analyzed and studied within the context of the associated text. Not all of these geographical manuscripts contain maps, however. Only those referred to generally as part of the al-Balkhi/al-Istakhri (#211 and #214.1) tradition, also referred to as the *Classical School of Geographers*, include maps. For this reason the cartographically illustrated manuscripts of this genre are also referred to as the *Atlas of Islam*. These first of a kind of geographical atlases generally carry the title *Kitab al-masalik wa al-mamalik* [Book of routes and provinces] a.k.a. the KMMS, although they are sometimes named *Surat al-ard* [Picture of the earth] or *Suwar al-aqalim* [Pictures of the climes or climates]. They emerge out of an early tradition of creating lists of pilgrim and post stages that were compiled for administrative purposes. Beginning with a brief description of the world and theories about it - such as the inhabited versus the uninhabited parts, the reasons why people are darker in the south than in the north, and so on - these geographies methodically discuss details about the Muslim world and its cities, people, roads, topography, and the like. Sometimes the descriptions are interspersed with tales of personal adventures, discussions with local inhabitants, and debates with sailors as to the exact shape of the earth and the number of seas. They have a rigid format that seldom varies, with a territorial sequence as follows: first the whole world; then the Arabian Peninsula, the Persian Gulf, the *Maghrib* [North Africa and Andalusia], Egypt, Syria, the Mediterranean, and upper and lower Iraq; and concluding with twelve maps devoted to the Iranian provinces, beginning with Khuzistan and ending in Khurasan, including maps of Sindh and Transoxiana. The maps, which usually number twenty-one, one world map and twenty regional maps, follow the same format as the text.

The earliest extant KMMS manuscript is by Ibn Hawqal (#213) and is housed at the Topkapı Saray Museum Library (Ahmet 3346) For the sake of brevity, the Islamic map historian Karen Pinto refers to this carto-geographic tradition as the KMMS series, an acronym based upon the universal title of the most popular Arabic and Persian carto-geographic manuscript in the series, namely al-Istakhri's work known by the universal title of *Kitab al-Masalik wa al-Mamalik* [Book of Roads and Kingdoms]. This mapping tradition dates back to the 10th century, although the earliest extant manuscript containing maps is from the 11th century. It is firmly dated to 479/1086 by its colophon. The striking mimesis of the maps in this manuscript stands in stark contrast to the later

KMMS map copies, which over the centuries abandon any pretense of mimesis entirely. Moving through the KMMS set, we travel through a series of more and more stylized maps that shift further into the realm of objects d'art and away from direct empirical inquiry. By the 19th century the KMMS maps become so stylized that, were it not for the earlier examples, it would be hard to recognize them as maps of the world.

For more detail on this manuscript tradition see Karen Pinto's 'Cartography', in *Encyclopaedia of Islam and the Muslim World*, Richard C. Martin, Said Amir Arjomand, Marcia Hermansen, Abdulkader Tayob, Rochelle Davis and John Obert Voll (eds.) New York: Macmillan Reference, 2003), 128–31 and *Passion and Conflict, Medieval Islamic views of the West* by Karen C. Pinto).

Other variations of this KMMS tradition include world maps found in copies of Zakariya' ibn Muhammad al-Qazwini d. 1283 CE (#222), whose work *'Aja'ib al-makhlūqat wa ghara'ib al-mawjūdāt* [The Wonders of Creatures and the Marvels of Creation] focuses on the wonders of the world—real and imaginary. Although al-Qazwini's original manuscript is not illustrated, copies from the late 13th century onward—during the lifetime of the author—incorporate illustrations of flora and fauna, as well as world maps based on what can be referred to as the al-Biruni model (#214.3). The large number of extant *'Aja'ib* manuscripts indicate that, at least from the 13th and 14th centuries onward, the world maps had a significant audience. The al-Biruni variation looks at the world from above and shows the old world spread-eagled on a circle surrounded by the *Encircling Ocean* (a combination of the Atlantic and Pacific Oceans). It is found in copies of *Kitab al-taḥṣīm li-awā'il sina'at al-tanjīm* [Book of Instruction on the Principles of the Art of Astrology] from the mid-13th century onward. Eventually, world maps based on the al-Biruni model appear in general geographical encyclopedias, such as Yaqut's 13th century *Kitab mu'jam al-buldan* [Compendium of Lands].

A great deal of mystery surrounds the origins and the architects of this Islamic Atlas tradition. This is primarily because not a single manuscript survives in the hand of the original authors. The earliest extant manuscript of this tradition dates from the late 11th century CE, almost a century after the death of the last reported author. As a result, it is not clear who initiated the tradition of accompanying geographical texts with maps. Scholars of the 18th, 19th, and 20th centuries held that al-Balkhi (d. 322 H/934 CE #214.2) initiated the series and that his work and maps were expanded on by al-Istakhri (fl. mid-

10th century, #211), Ibn Hawqal (fl. second half of 10th century, #213), and al-Muqaddasi (d. c. 390 H/1000 CE). The earliest extant example is from a manuscript by Ibn Hawqal housed at the Topkapi Palace Museum's library in Istanbul. It is firmly dated to 479 H/1086 CE by its colophon. Over time the maps of this medieval Islamic atlas become more and more stylized.



World map from a KMMS Ottoman cluster manuscript. Circa late 15th, early 16th century.

Diameter 19.3 cm.

Topkapi Saray Museum, Istanbul.

Ahmet 3349, fol. 3a.

Persian cartography, at first wholly under Arab influence, seems to have ceased altogether, at least in the production of land maps, with the decline of Arab power. Only one Persian map is known, and even that is not the original work, but merely an English translation. The original is now lost, and it is not easy to trace its genesis. It seems most likely that the map was made somewhere in northern India or in a Persian border province by a Mohammedan who used the Persian language, and possibly Arabic as well, and portrayed chiefly India and its northern parts. All the other countries receive schematic treatment: *Abyssinia* [Africa] in the west, China in the east, Bokhara and Kashgar in the north, and beyond them the mythical *Gog* and *Magog*. Europe is mentioned incidentally as *Farang*. Nautical cartography in southwest Asia, however, developed independently as a practical science, as it did in Europe, but no examples are known to survive.

As the heir of both Arab and Byzantine cultures, the Turkish Empire had a rich cartographic tradition behind it. The first known product of Turkish cartography, dating from the time when the Turks were still in Central Asia, is an unusual and original circular world map included by Mahmud al-Kashgari in his Turkish dictionary of 1074 (#218). During their subsequent migrations in face of Mongolian expansion the Turks acquired the nomadic cast of mind and lost all interest in science. Only when they had settled down in Asia Minor did they return to literature and science, now following Greek models. Mohammed II, who conquered Constantinople, surrounded himself with a retinue of scholars and artists charged to protect the works of art and antiquities of Byzantium; among these Byzantine doctors, philosophers, astrologers and mathematicians was Georgios Amirutzes. Mohammed II's interest centered on Ptolemy's *Geographia*, and as the manuscript of it found in his library contained no world maps, Georgios had to make one in Greek and Arabic, which Mohammed II ordered to be woven into a large carpet. He subsequently commissioned Georgios and his son to translate the text of the *Geographia* into Arabic. When he heard that there were good Latin translations available in Italy (Jacopo d'Angiolo, 1406), he acquired one for himself, apparently a copy made by Francesco di Lapacino of Florence about 1450. Francesco Berlinghieri, aware of Mohammed II's esteem for the works of Ptolemy, later presented him with his newly-printed version of the *Geographia* (1482) with an autograph dedication. The manuscripts of Ptolemy's *Geographia* mentioned above are preserved to this day in the Seraglio Library at Istanbul, but Georgios' world map has never been traced.

During the Middle Ages the Greek tradition of disinterested research was stifled in Western Europe by a theological dictatorship which bade fair, for a time, to destroy all hope of a genuine intellectual revival. Further, socio-economically and politically the Latin West had gradually drifted apart from the Greek and Muslim East, thereby widening the already present cultural cleavage. Meanwhile the Muslims were slowly unearthing the treasures of Greek and Persian wisdom, and in so doing they became fired with enthusiasm to study them. Aided by their own native genius, by the keenest inter-regional competition - for Muslim culture radiated from a number of centers distributed all the way from Samarkand to Seville - and the stimulus of the classical models, they succeeded in advancing the cause of every known science before being overtaken by a tyrannical obscurantism. For example, the Muslims of the Eastern Caliphate had become familiar with Claudius Ptolemy's *Almagest* and *Geographia* (#119) through Syriac translations and through versions of the original Greek text. A manuscript of the *Kitab al-Majisti*, or *Almagest* (meaning 'the greatest'), was translated

into Arabic in the days of Harun ar-Rashid by that caliph's vizier, Yahya, and other translations appeared during the middle part of the ninth century. Study of the *Almagest* stimulated Arab scholars and incited them to write such original treatises of their own as Al-Farghani's *On the Elements of Astronomy*, Al-Battani's *On the Movements of the Stars*, or *Astronomy*, and Ibn Yunus' *Hakimi Tables*. Furthermore, Ptolemy's *Geographia* was certainly known to the Muslims in Syriac translations and probably also in copies of the original Greek text. With the *Geographia* as a model, a number of Arabic treatises, usually entitled *Kitab surat al-ard*, [Book of the Description of the Earth], were composed at an early period of Islam and served as basis on which later geographical writers built more complex systems. One of the most significant was the *Kitab surat al-ard* of Al-Khwarizmi, composed about the time of Al-Ma'mun (813 H/833 CE). From another book of the same sort and title Al-Battani derived the geographical details included in his *Astronomy*. The latter was translated into Latin during the 12th century; the former was known in Europe only through second-hand sources.

Another important influence in the development of cartography in medieval Islam was the patronage of the caliph al-Ma'mun, who ruled in Baghdad. He commissioned several scholars to re-measure the distance on the surface of the earth that corresponded to one degree of celestial meridian. In this way he refined the definition of the mile (*mil*) used by Arabs in comparison with the Greek unit of measure, the *stadion*, and also the calculation of the circumference of the earth. Another achievement of scholars working for al-Ma'mun was the production of a large map of the world, unfortunately no longer preserved. What form the map of al-Ma'mun took has prompted much speculation. Was it rectangular as Marinus proposed, or circular, or did it follow one of Ptolemy's non-rectilinear projections?

In the late 10th century, a Muslim geographer named Suhrab accompanied a book of geographical coordinates with instructions for making a rectangular world map having horizontal and vertical scales for use in plotting the coordinates. The result of this procedure would have been (in modern terms) an equi-rectangular or cylindrical equidistant projection, essentially one that was proposed by Marinus of Tyre nine centuries earlier. Here again, no medieval examples of such a map exist today, though the carefully executed graphic scale on the rectangular map in the 11th century map in the *Book of Curiosities* suggests that such maps may have been in circulation.

Most Arab cartographers also used Ptolemy's instructions in the construction of their own maps. With this basis the Muslims combined the accumulated knowledge gained through exploration and travel. Muslim trade between the seventh and ninth centuries reached China by sea and by land; southward it tapped the more distant coasts of Africa, including Zanzibar; northward it penetrated Russia; and westward Islamic navigators saw the unknown and dreaded waters of the Atlantic. Their own enlarged knowledge of the explored-world helped to broaden their cartographic outlook, and contemporaries soon acknowledged the pre-eminence of their civilization. Islamic astronomers continued the observations that had been discontinued in Greece; they measured an arc of the meridian by observations made in Baghdad and Damascus; they constructed improved astronomical instruments and set up observatories. As a general rule, however, they were very stylized cartographers; they were apt to use the compass and ruler far too often so that land contours became stereotyped and rather arbitrary, as can be seen in maps by al-Istakhri, al-Kashgari, and Ibn Said (#211, #214 and #221).

Over the years, these enlightened Muslims injected new life and a storehouse of knowledge into the relatively backward science of Western Europe, and, for centuries,

Islamic culture actually dominated the Iberian Peninsula and Sicily. However, in the 11th century the Norman conquerors were beginning their advance westward and southward, overrunning the littoral of Western Europe, reaching the Mediterranean and establishing themselves in Southern Italy between 1066 and 1071. These new rulers preserved much of what was best of this Islamic tradition and culture, and Muslim scholars played a brilliant part in the intellectual life of the court.

Many of the surviving copies contain either incomplete colophons or no colophons at all. Additionally, the texts are sometimes so mixed up in the surviving manuscripts that it is often difficult to disentangle them. The numerous incomplete and anonymous manuscripts, often abridged, along with the versions translated into Persian, further cloud the matter. Since the extant examples stretch in time from the 11th century to the 19th century and range from the heart of the Middle East to its peripheries, they can provide us with a broad range of historical insights across time and space.

There were several distinctive approaches to terrestrial mapping in the Islamic culture, one being that of the 'Balkhi school', so-called after its first proponent Abu Zayd al-Balkhi (d. 934 CE, #214.2), who was born in the city of Balkh in north-eastern Iran but spent most of his working life in Baghdad. The four geographers in this group, all working in the 10th century, wrote descriptions of the peoples, products, and customs of areas of the world then under Muslim domination; there was little-to-no interest in the non-Muslim world. No copies remain of al-Balkhi's treatise, but those of his three followers are preserved and each is accompanied by one world map and twenty-three regional maps, all closely related and characterized by a distinctive linear and abstract style.



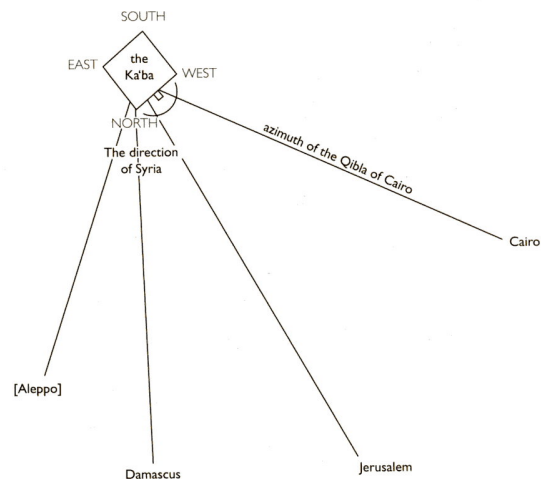
Early Mamluk KMMS world map. 684/1285 · Shades of blue, green, red, and brown gouache along with red and black ink on paper. Diameter 35.8 cm.

Topkapr SarayMuseum, Istanbul. Ahmet 3348, fols. 2b- 3a.

A second cartographic style can be seen in the anonymous *Book of Curiosities*. Compiled in Egypt between 1020 and 1050 (and copied about 150 years later), it contains a series of maps, both world and regional, many of which are without parallel. This recently discovered manuscript is a spectacular addition to our knowledge of medieval Islamic cosmography, geography, and map-making. The *Book of Curiosities* shows little influence from the 'Balkhi school', though it does appear that the author made use of other 10th century maps.

In the early 11th century, the versatile and highly creative scholar al-Biruni (#214.3) produced a rather crude sketch map of land and water distribution that seems to have had a surprising amount of influence on later maps (see #221). The Nile is depicted as a broad channel dividing Africa in two, and it has been suggested that this map is the origin of the depiction of southern Africa as a forked peninsula that occurs in some later maps. It is notable that Africa does not extend eastward towards China, in contrast to most world maps of this period where the African continent filled the southern hemisphere. That idea had been inherited from the astronomer and geographer Ptolemy but apparently was rejected by al-Biruni, for here Africa is so reduced that the Indian Ocean fills most of the southern hemisphere.

The Islamic world also produced a unique style of map in diagrams for use in determining *Qibla*, the correct orientation toward Mecca. In the construction of mosques a niche facing Mecca must be placed accurately in the wall, so that those praying can orient themselves properly. The treatise on the determination of *Qibla*, written in 1196 by the Egyptian legal scholar al-Dimyati, includes an example of a *Qibla* diagram, indicating the directions to be faced from four different localities (Aleppo, Damascus, Jerusalem, and Cairo) as well as pilgrimage routes, marked by squiggly lines. Similar diagrams often appear on astrolabes and other instruments known as *Qibla*-compasses.



A *Qibla* diagram of from a treatise by the Egyptian scholar al-Dimyari, showing the directions to be faced toward Mecca front four different localities (Aleppo, Damascus, Jerusalem and Cairo). MS. Marsh 592, fol. 88b.

Like Christians, Muslims showed Mecca and Jerusalem, their sacred cities in special places, especially considering some maps were specifically designed to locate the Qibla. There were some other religious representations, including the depiction of seas, in which a Quranic verse suggests that the throne of God rests. Some Islamic maps imbued the seas with religious significance, reflecting both cosmographic and sacred understandings within the Islamic mapping tradition.

From the late 12th century onward, other types of maps other than the KMMS tradition abound, such as *hajj* [pilgrimage] certificates and travelogues containing map-like pictures of the holy sites. These can be read as an indication of the growing demand for visual images of sacred spaces. Eventually, the scope of these pilgrimage scrolls expands to become an illustrated *hajj* manuscript series called *Futuh al-haramayn* [The Conquests of the Holy Sites], which first appears in the early 16th century and proliferates thereafter. Like the copies of Ibn al-Wardi's *Kharidat al-ʿAjaʿib*, the number of pocket-book sized copies of this manuscript are too numerous to count (#214.1). In tandem with these *hajj* manuals, a tradition begins of including in mosques a glazed tile containing a schematic map-like representation of the *Kaʿbah* with directional markings similar to *Qiblah* maps adjacent to the *mihrab* [prayer niche].

From the 13th century onward, world maps appear in historical treatises. Some manuscripts of the famous Islamic historian al-Tabari's *Tarikh* [History] include a "clime-type" map of the world as part of the frontispiece. Copies of another well-known historian's work, Ibn Khaldun's (1332–1406) *Muqaddimah* [Prologue], also opens with an al-Idrisi-type world map. An unusual variant of a KMMS-type world map even surfaces in a 16th century Ottoman history scroll containing Seyyid Luqman's *Zubdat al-tawarih* [Cream of Histories] produced during the reign of Suleyman I (r. 1520–1566).

By far the most popular tradition from the late 15th century onward was a unique pocket-book encyclopedia tradition by Ibn al-Wardi, d. 1457 (#214.1) called *Kharidat al-ʿAjaʿib wa faridat al-gharaʿib* [The Unbored Pearl of Wonders and the Precious Gem of Marvels], which typically includes one world map per copy (of either the KMMS or al-Biruni variety), along with other cartographic images, such as a *Qiblah* map and an inset map of Qazwini and other cities.

Unfortunately, this rich indigenous mapping tradition has been overlooked thanks to the modern predilection to evaluate maps according to their representational accuracy. Thus the best-known examples of Islamic maps are those that are the most mimetic. Famous for precisely this reason is the work of the 12th century North African cartographer, Sharif al-Din al-Idrisi, d. 1165 (#219), whom the Norman king Roger II (1097–1154) commissioned to produce an illustrated geography of the world: *Nuzhat al-mushtaq fi ikhtiraq al-afaq* [The Book of Pleasant Journeys into Faraway Lands]. The maps that accompany the copies of al-Idrisi's manuscript have been heralded time and again for their mimetic accuracy and are rightly acclaimed as well ahead of their time. Not only are the al-Idrisi maps ranked among the most mimetic world maps of the later Middle Ages, they also include detailed regional maps that show an astounding depth of understanding of the topography of the greater Mediterranean region.

One of the lingering issues with al-Idrisi's work is that there are no extant examples of his work from his time period of the 12th century. Nor are there any original autograph manuscripts. The earliest extant al-Idrisi manuscripts are from the 14th century. The other issue with al-Idrisi's work is that it is unique and therefore not representative of the bulk of the medieval Islamic mapping tradition. The great

cartographer of the Islamic world was al-Idrisi who worked under the patronage of the Norman king of Sicily, Roger II, during the years 1140-1155, where he constructed the most detailed and accurate world map of the era. Comprising seventy sectional maps, this work was accompanied by full textual descriptions of the countries, cities and peoples of each region. Al-Idrisi's world map bears a strong resemblance to that of Claudius Ptolemy (#119); the most significant differences were that the Islamic scholar did not believe that the Indian Ocean was land-locked, and he clearly had definite knowledge of China's eastern coast. However he perpetuates a typical error of Islamic maps - the enormous eastward extension of Africa's east coast, and this was derived directly from Ptolemy. This is a puzzling feature, for Arab seafarers trading to Mombasa, Zanzibar and south as far as Sofala (near the mouth of the Zambesi) could surely have contradicted it. The effect is that the Indian Ocean is shown as an elongated sea with many large islands, resembling the Mediterranean. The huge peninsula of India escaped the mapmaker, as it had escaped Ptolemy. These errors are useful reminders of two things: first, whatever the scientific achievements of Islamic scientists in the fields of mathematics and astronomy, mapmaking and compass charting were technical and empirical skills that lay still in the future; and second, that the scholars who made the maps were not the same men who sailed to Malindi, Mombasa, Calicut or Ceylon. According to Ms Pinto, Al-Idrisi's work cannot be held up as representative of the Islamic mapping tradition, nor can the maps that are attributed to him be used as a source of insight into the worldviews of medieval Muslim cartographers and their milieus. At best, al-Idrisi's work can be used to illumine the worldview of the milieu surrounding Roger II in Norman Sicily, possibly with some insight into the North African—specifically Tunisian—ambit. But even here we have issues, since the four extant manuscripts are productions of a century or so later. We cannot, therefore, ascribe with surety the worldview expressed in these copies as being representative of the Norman-Muslim world of the 12th century. As outstanding as al-Idrisi's work is for inserting mimesis into late medieval Islamic mapping repertoire, it needs to be addressed with these cautions in mind.

Similarly, the 16th century Ottoman naval admiral Piri Reis, c. 1470–1554 (#322) is famous for the earliest extant map of the New World. Piri Reis and his surprisingly accurate early 16th century map of South America (1523) has been the subject of many a controversial study. In keeping with the emphasis placed on Western products in the field of the history of cartography—especially maps from the Renaissance onward—scholarship on Piri Reis's map has focused on its connections with early modern European cartography.

The same could be said of the acquisition of the *Book of Curiosities* manuscript by Oxford, which has received considerable attention in the opening decade of the 21st century. This manuscript contains a medley of hybrid maps, some unique and others that reflect the influence of the KMMS tradition. The square world map is unusual and merits further in-depth analysis. The Bodleian's *Book of Curiosities* is, like the maps of the al-Idrisi manuscripts, plagued by dating issues. Although the text of the manuscript has been dated to the 10th century by Evelyn Edson and Emilie Savage-Smith, the maps reflect a late 12th or early 13th century Islamic miniature style. While unique manuscripts such as the *Book of Curiosities* are intriguing additions to our repertoire of the Islamic cartographic tradition, we must bear in mind that they are not representative of the popular mapping tradition that was widespread in the medieval Islamic world.

Just as in Latin Europe, the Biblical '*Four Rivers of Paradise*' played a role in Islamic cosmology, probably deriving from apocalyptic literature such as the *Book of the Secrets of Enoch*. The rivers were said to issue from a heavenly lotus tree. Some said that the Nile and the Euphrates were two exterior rivers, while the other two were hidden *Rivers of Paradise*. Others identified the *Four Rivers of Paradise* with the earthly rivers of the Nile, the Euphrates, the Pyramus or Ceyhan river, which arises in eastern Turkey and flows into the Mediterranean, and the Saros or Syr Darya River, which arises near Tashkent in present-day Uzbekistan and flows into the Aral Sea. Yet others suggested these four rivers of the world were only counterparts to the paradisaical rivers of honey, milk, wine, and water. In contrast to Western conventions, however, the *Rivers of Paradise* are never represented on Islamic maps nor do they seem to have had any influence on the cartographic tradition.

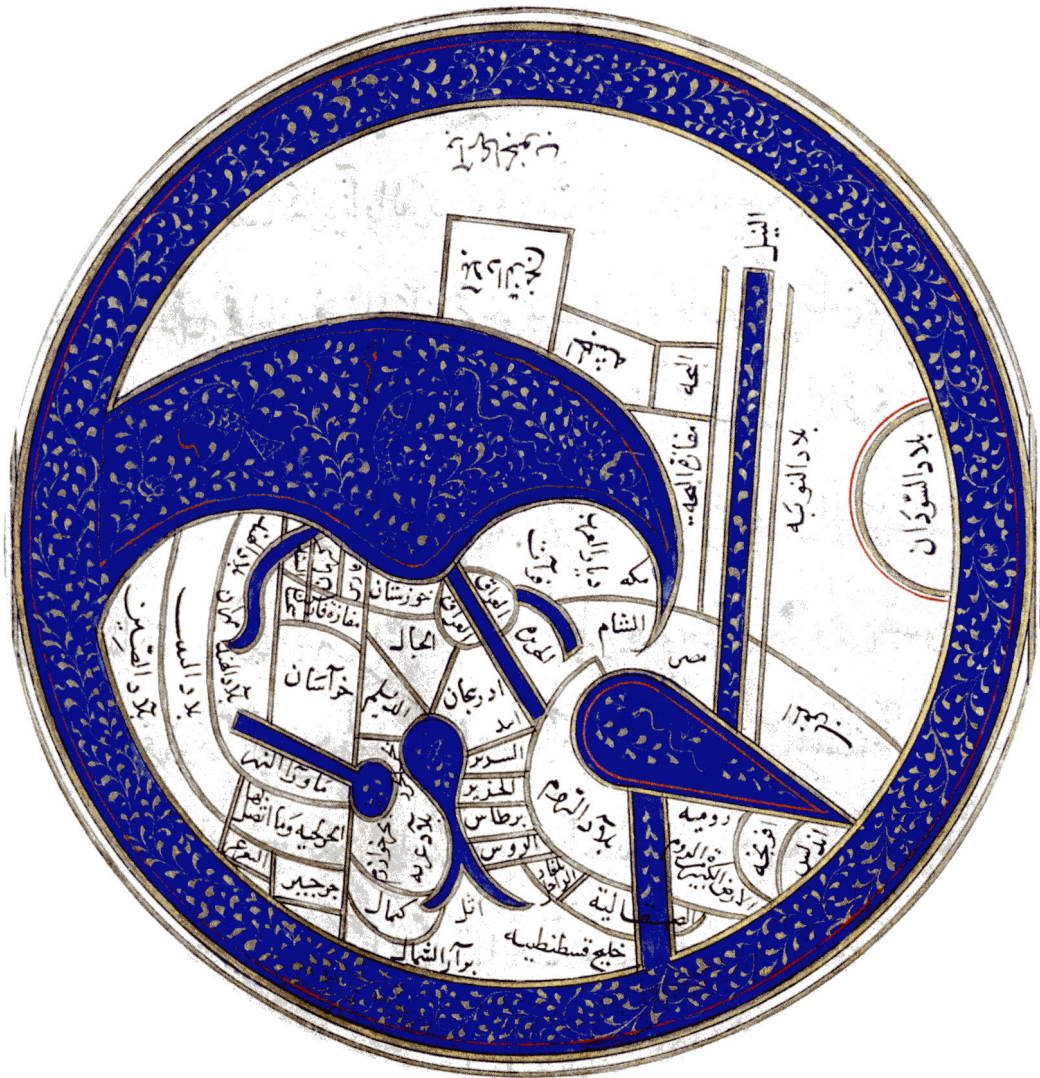
In addition to the Biblical Gog and Magog who dwelt in the far northeast, geographers loved to describe strange and monstrous races of people living at the edges of the inhabitable world. These curious creatures are never illustrated on any Islamic maps preserved today, in contrast to their frequent appearance on Western ones. Many of the strange peoples are similar to those described in Western writings (men with heads in the middle of their chest, for example), but one group, the *Waq-waq*, are unique to Islamic accounts. The explanation for their name was given by an anonymous 12th century Andalusian geographer as follows:

The island of Waq-waq is so called because of its great, tall trees there, with the many leaves like those of the fig-tree, except larger ... In March, this tree sprouts fruit like those of the palm-tree but with the feet of young girls projecting fi'om the base. On the second day of the month, two shins appear, and on the third day, two legs and two thighs. This continues, revealing a little more each day, until by the last day of April the whole torso has emerged. During May, the head appears, and the whole figure is complete, suspended by the hair. Their form and shape are most beautiful and desirable. At the beginning of June, they begin to drop from the trees and by the middle of the month not one remains. At the moment of falling, they utter two cries 'Wagl-waq!' "" But once on the ground, they are found to be all flesh and no bones. Although they are more beautiful than words can describe, they have no life or soul. They are buried in the earth, for, were they to be left lying, no one would be able to approach them on account of the stench.

Just as the figures of Gog and Magog are also not found on Islamic maps, though the barrier built by Alexander the Great to contain them is frequently depicted, so the labels '*Land of the Waq-waq*' or '*Island of the Waq-waq*' are found on medieval Islamic maps, but no drawings of the *Waq-waq* themselves. Illustrators of books on marvels, however, took all such strange creatures inhabiting inaccessible places as favorite subjects.

In conclusion, the cultural and scientific achievements of pre-modern Islamic cartography demonstrate the rich synthesis of various intellectual traditions from the Mediterranean, Persian, Indian, and Byzantine worlds. Islamic scholars not only preserved the ancient knowledge of Ptolemy and other classical sources but also expanded on it with their own innovations in the fields of geography, astronomy, and cosmology. The religious symbolism, artistic expression, and cosmological views that reflected the spiritual and intellectual landscape of the Islamic world were intertwined. Through institutions like the House of Wisdom and the works of figures such as al-

Biruni and al-Idrisi, Islamic cartography left a profound and lasting impact on the medieval understanding of the world, influencing both Islamic and European geographical scholarship for centuries to come.



Close-up view of Aqqoyunlu KMMS map of the world from the mother manuscript that spawned the Ottoman cluster. The lavish lapis lazuli and gold pigments are commensurate with an expensive production intended for presentation to Sultan Mehmed II as the opening medallions confirm. Circa mid to late 15th century. Diameter 26.4 cm.

Topkapi Saray Museum, Istanbul. Ahmet 2830, fol. 4a



The last KMMS world map in the Ottoman cluster series. Delicate outlines painted in gold on egg-white polished European paper. Probable date for the map of circa 1520. The coloring does not conform to the typically strict color-coding of other Ottoman cluster maps. The use of gold ink suggests that this final version of the Ottoman cluster was completed for a high-ranking dignitary—possibly the then Ottoman sultan Selim I (Mehmed's grandson) who defeated the Mamluks in 1517. Diameter 19.2 cm. ©The British Library Board, London. Or. 5305, fol. 3a.



The Waq-waq tree added by a later owner to the copy of the anonymous Book of Curiosities compiled about 1020–50. MS. Arab. c. 90, fol. 27a_

Below is the Waq-waq tree from an Arabic miscellany compiled for the Mongol ruler of Baghdad, Sultan Ahmad who ruled 1382–1410. MS Bodl. Or. 133, fol. 41b.



What follows here is a selection of monographs mostly from a set of Islamic 'carto-ideographs'. The set comprises the cartographically illustrated *Kitāb al-Masālik wa-al Mamālik* (KMMS), what is also called the *Ottoman Cluster* [al-Istakhri's *Book of Roads and Kingdoms*]

The classical KMMS map of the world is made up of a double-edged circle in a square or rectangular frame. Placed within this circle is the image of a pre-Columbian world, punctuated by seas and rivers. At the top of the map a large crescent shape sweeps in to shelter a double-headed, bulging form in the lower left-hand corner with a tiny triangle marooned in the lower right-hand sector of the image. These are white or paper-colored. Two outspread blue arms emerge from a blue encircling band and additional blue shapes punctuate the white mass, including two small twin keyhole shapes towards the bottom of the map.

Within this aesthetically packaged ideograph are all the features standard to the classical medieval Islamic vision of the world. The *Encircling Ocean* [*Baḥr al-Muḥīṭ*] that rings the world along with four other seas, seven rivers and the three major land masses of Africa, Asia and Europe (listed here in order of their size on the map). The key to comprehending the medieval Muslim conception of the world is to assimilate the basic shapes of the land-masses and the seas, and, crucially, the map's southerly inversion.

The crescent-shaped land mass is the continent of Africa. Once we make this association we recognize that the double-headed, bulging form in the lower left-hand corner corresponds to the continent of Asia. The bulge connecting Africa to Asia is the Arabian Peninsula, and the tiny triangle marooned in the lower right-hand sector of the image is none other than Europe. Behind lie the seas outlining the land-masses and, in doing so, make them possible.

Did medieval European maps influence the Islamic ones or vice versa? Or, were they mutually exclusive? Scholars fall on both sides of the divide and the question of Islamic-Christian cartographic connections remains elusive due to the lack of extant examples. The author of the Arabic notations on a rare ninth-century copy of Isidore's geographical treatise of *Etymologiae* (#205), and, in particular, on its T-O map with the aim of revealing that the notations were made by a distinguished Arab geographer of princely stock from caliphal Andalus and not just an unknown anonymous Mozarab - Iberian Christians including Christianized Iberian Jews who lived under Muslim rule in the southern sections of the Iberian peninsula from the early eighth century until the mid-15th century including those who escaped to the Christian kingdoms of Aragon, Asturias, and Castile. The majority of the Islamic annotations on a late eighth/early ninth-century Visigothic Latin Isidorean manuscript of Isidore's *Etymologiae*, MS. Vit. 014/003, housed at Madrid's Biblioteca Nacional de España (BNE) were made by Abū 'Ubayd 'Abdallāh al-Bakrī (d. 487 H/1094 CE), an Andalusī geographer of princely background, whose mid-11th century Islamicate geography *Kitāb almasālik waal-mamālik* [Book of Routes and Realms] influenced many a later medieval Islamic geographical scholars. The most famous was Yāqūt al-Ḥamawī (d. 626 H/1229 CE), an inveterate medieval Islamic-world traveling scholar of Byzantine stock who relied heavily on al-Bakrī's geography for his seven volume magnum opus, a geographical dictionary on countries and places called *Mu'jam al-Buldān* [Dictionary/Collection of Countries, completed 1224-1228] that is considered one of the most comprehensive medieval Arabic geographical dictionaries ever written because it provides mini-encyclopedic entries on thousands of sites in the Islamic realm of the Middle Ages. If al-Bakrī used Isidore's *Etymologiae* for his conclusion, then it could be asserted that Yāqūt and other medieval Islamic geographers who relied on al-Bakrī's may have been influenced a little by Isidore. Significant scholarly connections between medieval European and Islamic cartogeographical traditions centuries apparently occurred earlier than previously presumed. In doing so it adds to the story of trans-cultural connectivity across the greater Mediterranean.

Since all images are socially constructed, these iconic Islamic carto-ideographs contain valuable information about the milieus in which they were produced. They are a rich source of historical data that can be used as alternate gateways into the past. Karen Pinto writing in *The Oxford Encyclopedia of Philosophy, Science, and Technology in Islam* edited by Ibrahim Kalin, in *Maps and Mapmaking* - addressed the Islamic contribution to medieval cartography. Pinto's 2016 book entitled *Medieval Islamic Maps: An Exploration* is the latest and most comprehensive analysis of the subject.