ARAB CIVILIZATION

Table of Contents

Arab Civilization (Introduction)
Islam
Arabic Language
Arabic Writing and Calligraphy
Education
Chemistry
Music
Literature
Mathematics and Astronomy
Physics
Medicine
Architecture
The Arab world stretches some 5,000 miles—nearly twice the distance between New York and San Francisco—from the Atlantic coast of northern Africa in the west to the Arabian Sea in the east, and from the Mediterranean Sea in the north to Central Africa in the south. It covers an area of 5.25 million square miles, compared to the 3.6 million square miles of the United States.

With seventy-two percent of its territory in Africa and twenty-eight percent in Asia, the Arab world straddles two continents, a position that has made it one of the world's most strategic regions. Long coastlines give it access to vital waterways: the Atlantic Ocean, the Mediterranean Sea, the Arabian Gulf, the Arabian Sea, the Gulf of Aden, the Red Sea and the Indian Ocean.

While the Arab world is dominated by dry climatic conditions, the existence of mountain ranges permits seasonal rainfall. The Atlas range in northwest Africa (Morocco, Algeria and Tunisia) forms a barrier between the Sahara Desert and the coastal areas. Other important mountain systems are the Lebanon and Anti-Lebanon ranges and the Zagros Mountains to the east of Iraq.

Given the preponderance of arid conditions, reliable sources of water are immensely important—be they springs, from which oases are formed, or rivers. Foremost among the river valleys are the Nile and the Tigris-Euphrates.

The population of the Arab world—approximately 150 million—is a youthful one. Almost half of the population is under fifteen years of age. Given the current annual rate of increase, the population will be approximately 280 million by the year 2000.

The concept of average population density has little meaning when applied to the Arab world. Since significant human settlement is found only where water supplies are adequate, the overwhelming majority of Arabs lives in relatively high concentrations along coastal areas and major river valleys. The most striking example of this is Egypt, where more than ninety percent of the population lives on less than five percent of the land.

Agriculture is the primary economic activity in the Arab world. The most important food crops are wheat, barley, rice, maize and millet. These are largely consumed within the region, while cotton, sugarcane, sugar beets and sesame are exported as cash crops.

The distribution of petroleum and natural gas is highly localized, so that the Arab countries which possess these resources are relatively few. Other natural resources include iron, ore, lead, phosphate, cobalt and manganese.

The Arab world is the region where man first moved into a settled form of society, cultivating grain and raising livestock, establishing cities and promoting diverse skills and occupations. In such a setting, rich and complex cultures were nourished: ancient Egypt, Sumer, Assyria, Babylonia and Phoenicia were great civilizations, legends even in their own day, whose traces continue to be uncovered in archeological sites throughout the region.

It was in this same area that the three great monotheistic religions—Judaism, Christianity and Islam—were established, in time spreading to all corners of the world. The followers of those faiths lived in harmony throughout the centuries in the Arab world, since all considered themselves the children of one God.

The Prophet Muhammad appeared in the seventh century, A.D., carrying the message of Islam. His Arab followers soon spread the new faith in the West, across North Africa into Spain and France, and in the East, to the borders of China. But these Muslim believers were not merely conquerors. They rapidly established a new and dynamic civilization that for centuries was the only bright light in an otherwise culturally and intellectually stagnant world. Indeed, while Europe was experiencing its "Dark Ages," the Arab/Islamic empire was at its apogee. It was the same Islamic civilization, with its many contributions to science and the humanities, that paved the way for the rise of the West to its present prominence.
The Arab world today is a rich composite of many and diverse influences. Various ethnic, linguistic and religious groups inhabit the region. Yet, Islam and the Arabic language constitute its two predominant cultural features. The Arab people, spread over a vast area, enjoy common bonds of history and tradition. Members of twenty-two different countries, the Arabs consider themselves to be part of one nation.

The Arab people are further united through their membership and participation in the League of Arab States. One of the oldest regional organizations in the world, the Arab League was founded on March 22, 1945, even before the formal establishment of the United Nations. The primary objectives of the Arab League, as it is commonly called, are maximum integration among the Arab countries through coordination of their activities in the political sphere as well as in the fields of economics, social services, education, communications, development, technology and industrialization.

The headquarters of the Arab League is in Tunis, Tunisia, which also hosts some of the League's specialized agencies—some of which are based in other Arab capitals. The twenty-two member states of the League, in alphabetical order, are: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen Arab Republic and Yemen Peoples Democratic Republic.

The Arab world in the twentieth century is a region in transition—developing, modernizing and building the foundation for its own renaissance. Its great and ancient cities—Cairo, Damascus and Baghdad—with populations well into the millions, are rapidly expanding their municipal services, communications and other facilities. New construction is evident everywhere as high-rise buildings replace the covered bazaars of former times.

Those Arab countries with natural resources, especially petroleum, are devoting large funds to development programs in nearly every field while, at the same time, providing their less fortunate sister states with financial assistance to help them modernize. Scores of thousands of young Arabs are studying in old and new universities in their own countries or abroad, particularly in the United States where there are an estimated 60,000 Arab students. They are specializing in professions and disciplines which will enhance the progress of their homeland.

With all of this development and modernization, the Arab world is also determined to preserve its traditions and values, largely rooted in Islam. Its people are reaching out for progress but without the dislocation that so often accompanies rapid change.

While the great urban centers of the Arab world are reaping the benefits of the space age, including satellite communications with other parts of the world, many retain the flavor of the past in architecture, arts and traditions. In sum, the Arabs today are still drawing cultural sustenance from their great past, fueling their efforts to move on into the future.

This present collection is intended to offer the reader a glimpse of some of the major contributions made by the Arabs to world civilization. Its purpose is not merely to acknowledge a great cultural debt, but also to stimulate interest in a region and its people based on mutual respect and understanding.
Since the seventh century, A.D., the culture of the Arab world has been dominated by the last of the three great monotheistic religions to have emerged from that region: Islam. Islam, faith of the vast majority of Arabs, is more than just a religion; it is the focal point of Arab society for Muslims and non-Muslims alike permeating that culture at every level—political, social, economic, as well as private. To appreciate the enormous force of Islam in the Arab world, one must understand the basic tenets of the faith, how it emerged and grew.

Islam originated in the Arabian Peninsula, present-day Saudi Arabia in 622 A.D. According to Islamic tradition, God (Allah) conveyed to Muhammad, a tradesman, a series of revelations which were to form the basis of the new faith. Islam means submission—submission to the will of God; a Muslim, in turn, is one who has submitted to Allah and who acknowledges Muhammad as His prophet.

Muslims consider Muhammad to be the last in a series of prophets which included Abraham, Moses and Jesus, to whom God revealed His Divine Message. Islamic tradition, in fact, takes into account the doctrines of both Judaism and Christianity which preceded it; for example, Muslims believe, as do both Jews and Christians, in one God and in an afterlife. Islam also acknowledges Jews and Christians as “people of the Book” (ahl al-kitab), “the Book” meaning the Bible, and grants them privileged status from the early days of the Islamic empire into modern times. For this reason, religious minorities throughout the Arab world have survived and flourished during periods of severe cultural and religious repression elsewhere.

The body of revelation which Allah delivered to Muhammad through the Angel Gabriel is contained in the Qur’an, the holy book of Islam. The Qur’an, written in Arabic, the language of Allah’s divine transmission, provides the Muslim believer with all he or she needs to know to lead a good and pious life. In addition to its obvious religious significance, the revelation of the Qur'an represents the crowning literary achievement of the Arabic language. It has been both an immeasurable influence on the development of Arabic literature and an inspiration for all branches of literature and scholarship.

Islamic acts of devotion and worship are expressed in the Five Pillars of Islam. These involve, not only profession of faith, but also, recognition of God in all aspects of human conduct.
(1) Profession of Faith, or shahada in Arabic, requires the believer to profess the unity of God and the mission of Muhammad, this involves the repetition of the formula: “There is no God but Allah and Muhammad is the messenger of Allah.” This assertion forms part of every prayer and in a critical situation, one may repeat the first part in order to establish one’s identity as a Muslim.

(2) Prayer, sala, is required five times a day: at dawn, noon, midafternoon, sunset and dusk. It must be performed in a state of ritual purity and every word must be in Arabic. The worshipper has the choice of praying privately, in the open air or in a house; or with a group, outdoors, or in a mosque. Islam opposes the practice of withdrawing into ascetic life. For this reason, there is no priesthood, as is known in the West, only ‘ulema, learned men, who are well-versed in Islamic law and tradition. Throughout the Muslim world, services are held at noon on Fridays in mosques. Muhammad did not explicitly designate Friday as a day of rest, only a part of which is devoted to a special religious service. Merchants are free to open their shops before and after the service.

(3) The third Pillar of Islam, Almsgiving, zaka or zakat, embodies the principle of social responsibility. This precept teaches that what belongs to the believer also belongs to the community in the ultimate sense, and that only by donating a proportion of his wealth for public use does a person legitimize what he or she retains. The zaka, in addition to the other tenets of Islam, is a religious obligation and believers are expected to treat it seriously.

(4) The ancient Semitic institution of Fasting is the fourth Pillar of Islam, known as saum. To a Muslim, it means observing Ramadan, the month during which, it is written, God sent the Qur’an to the lowest heaven where Gabriel received it and revealed it in time to Muhammad. Fasting demands complete abstinence from food and drink from dawn to sunset every day during Ramadan.

(5) The last cherished Pillar of Islam is the Pilgrimage to Mecca, al-hajj, where God’s revelation was first disclosed to Muhammad. Believers worship publicly at the Holy Mosque, expressing the full equality among Muslims with a common objective—all performing the same actions, all seeking to gain the favor of God. All pilgrims, from various cultures and classes, wear identical white robes as they assemble around a single center, the Ka'aba, which inspires them with a strong sense of unity. Every Muslim is expected to make the pilgrimage at least once during his or her lifetime. Attached to the experience of the pilgrimage is added status: after the individual returns home, he or she is addressed as “al-Hajj” or “al-Hajjah” (the pilgrim), a title which carries great prestige.

While the Islamic community throughout the world is united by the two essential beliefs in (1) the Oneness of God and (2) the divine mission of His Prophet, there developed shortly after Muhammad’s death a debate within the Islamic community over who should succeed the Prophet as leader of the faithful. This debate split the community into Sunni and Shi’ite Muslims. It is important to remember, however, that on fundamental issues, Sunni and Shi’ite Muslims are in basic agreement since they both draw on the Qur’an and the Shari’ah, body of Islamic Law.
While most people know that Arabic is the written and spoken language of more than 150 million inhabitants of the Arab world, few realize that the Arabic script is also used by one-seventh of the world’s population.

Millions of people in Africa and Asia write their languages in the Arabic alphabet. Farsi—the language of Iran—and Urdu—the language of Pakistan and some parts of India—are written in the Arabic script. The Turkish language employed Arabic characters until the 1920’s. In addition, Arabic script is used today in Afghanistan, Indonesia, Malaysia, sections of China and even in the Muslim areas of the Philippines and the USSR.

The reason for the extensive use of Arabic dates back to the emergence of the Islamic faith in 622 A.D. The Qur’an, the Holy Book of Islam, was revealed to the Prophet Muhammad and subsequently, recorded in Arabic. Thus, for the Muslim Arab of that time, as well as today, his language and the language of God (Allah) are identical. Arabic remains the primary vehicle for prayer in Islam.

As the new believers, or Muslims, spread out from the Arabian Peninsula to create a vast empire—first with its capital in Damascus and, later, in Baghdad—Arabic became the administrative language of vast sections of the civilized world. It drew upon Byzantine and Persian terms and its own immense inner resources of vocabulary and grammatical flexibility. By the eleventh century, A.D., this language was the common medium of expression from Persia to the Pyrenees—the language of kings and commons, poets and princes, scholars and scientists. Arabic became the principal reservoir of human knowledge, including the repository for the accumulated wisdom of past ages, supplanting previous cultural languages, such as Greek and Latin.

Arabic belongs to the Semitic family of languages, of which Hebrew is also a member; thus, the term “Semite,” referring to anyone who speaks a Semitic tongue. Arabic script reads from right to left and its alphabet contains twenty-eight characters. While it is universally written, read and understood in its classical form, spoken Arabic has undergone regional or dialectical variations.

The Arabic language developed through the early centuries in what is today Saudi Arabia until, in the era immediately preceding the appearance of Islam, it acquired the form in which it is known today. Arab poets of the pre-Islamic, or Jahiliyyah period, had developed a language of amazing richness and flexibility, despite the fact that many were desert bedouins (nomads) with little or no formal education. For the most part, their poetry was transmitted and preserved orally. The Arabic language was then, as it is now, easily capable of creating new words and terminology in order to adapt to the demands of new scientific and artistic discoveries.

As the Empire spread, the Arabic language—and, indeed, culture—was enriched by contacts with other civilizations: Greeks, Persians, Copts, Romans, Indians and Chinese. During the ninth and tenth centuries, a great translation movement, centered in Baghdad, was in force, in which many ancient scientific and philosophical tracts were transposed from ancient languages, especially Greek into Arabic. Many were enhanced by the new wisdom suggested by Arab thinkers; other texts were simply preserved, only to re-emerge in Europe during the Renaissance.

Modern European languages, such as Spanish, Portuguese, French, Italian and English owe a great debt to Arabic. The English language itself contains many words borrowed from Arabic: algebra, alchemy, admiral, genius, ghoule, mare, sherbet, soda and many others.
<table>
<thead>
<tr>
<th>Arabic Term</th>
<th>English Translation</th>
</tr>
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<tbody>
<tr>
<td>'ANBAR * AMBER</td>
<td>Fossilized resin</td>
</tr>
<tr>
<td>BAWRAQ * BORAX</td>
<td></td>
</tr>
<tr>
<td>QAHWAH * COFFEE, CAFE</td>
<td>Coffee, originally wine</td>
</tr>
<tr>
<td>QANAH * CANE</td>
<td>Pipe, reed</td>
</tr>
<tr>
<td>CHARBALA * GARBLE</td>
<td>To sift</td>
</tr>
<tr>
<td>GHUL * GHOUL</td>
<td>Evil spirit, ogre</td>
</tr>
<tr>
<td>AL AZ-ZAHR * HAZARD</td>
<td>The die</td>
</tr>
<tr>
<td>AL-KUHL * ALCOHOL</td>
<td>Spirits of fermentation</td>
</tr>
<tr>
<td>QITAR * GUITAR</td>
<td></td>
</tr>
<tr>
<td>ZIRAFAH * GIRAFFE</td>
<td></td>
</tr>
<tr>
<td>NARANJ * ORANGE</td>
<td></td>
</tr>
<tr>
<td>RAHAT * RACKET</td>
<td>Palm of the hand</td>
</tr>
<tr>
<td>SAFARA * SAFARI</td>
<td>To travel</td>
</tr>
<tr>
<td>TUNBUR * TAMBOURINE</td>
<td>A drum</td>
</tr>
<tr>
<td>SANDAL * SANDAL</td>
<td>Arab skiff or type of sandal</td>
</tr>
<tr>
<td>NARANJ * ORANGE</td>
<td>Orange</td>
</tr>
<tr>
<td>AL'UD * LUTE</td>
<td>The lute</td>
</tr>
<tr>
<td>TASS, TASSAH * TASS</td>
<td>Wooden cup</td>
</tr>
<tr>
<td>TARIRF * TARIFF</td>
<td>Declaration</td>
</tr>
<tr>
<td>SUKKAR * SUGAR</td>
<td></td>
</tr>
<tr>
<td>MUFTI * MUFTI</td>
<td>Expert in Islamic law. The “civilian clothes” meaning is said to derive from the custom of British officials in India who bought fabrics of a quality used by the Muftis for civilian, off-duty clothes.</td>
</tr>
</tbody>
</table>
Arabic Writing and Calligraphy

Arabic calligraphy is characterized by flowing patterns and intricate geometrical designs. This fine writing—which the Alexandrian philosopher, Euclid, called a "spiritual technique", has poured forth from the pens of Arabs for the last thirteen centuries.

In a broad sense, calligraphy is merely handwriting, a tool for recording and communicating; but in the Arab world it is an art...an art with a remarkable history, a form with great masters and revered traditions. Beauty alone distinguishes calligraphy from ordinary handwriting; writing may express ideas, but to the Arab it must also express the broader dimension of aesthetics.

Historians disagree on both the birthplace and birthdate of Arabic writing, but the most widely accepted theory is that it developed from Nabataean, a west Aramaic dialect which served as the international language of the Middle East from about the fourth century, B.C., until the seventh century, A.D. As the new Islamic faith emerged and spread, the Arabic of the Arabian Peninsula replaced Aramaic as the lingua franca of the area.

As we have noted elsewhere, the Arabs had a highly developed oral tradition in poetry even before they had an alphabet. Poetry was composed and committed to memory and was passed on in this manner from generation to generation. Indeed, in the beginning, even the Qur'an, the Holy Book of Islam and the Arabic language's crowning literary achievement, was committed to memory by professional memorizers who attended the Prophet Muhammad. For fifteen years after his death, it existed only in oral form.

The Caliph 'Uthman, 644-656 A.D., fearing dangerous diversity in such a method, ordered that an official recension be undertaken. In the seventh century, only consonants and long vowels were written; the short vowels had to be inferred by the reader. But even more confusing was the fact that several consonants were written with the same symbol; only later was a system of dots above and below the letters devised in order to differentiate among them. Finally, in 933 A.D., the final version of the written Qur'an—the one which is considered authoritative even to this day—was completed.

Just as the Christian monks of Europe in the Middle Ages spent lifetimes writing and illuminating religious manuscripts, so, too, did the Arab forebears devote their lives to producing elegantly handwritten copies of the Qur'an. Because Islam's monotheism discouraged the representation of human or animal forms, the calligrapher found artistic expression in highly stylized intricate and flowing patterns. Over a period of centuries, calligraphy remained a supreme art form, replacing design, painting and sculpture. Calligraphy, filled not only by clothing, carpets, decorative items and literary works. The artist could draw from any number of styles—kufic, ihwâl, and being the best known, naksh—depending, often, on the purpose of that inscription.

From the Dome of the Mosque of the Rock in Jerusalem to the great mosques of Isfahan in Persia, calligraphy decorated, enhanced and even helped to visually unify the greatest Muslim structures. The art of Arabic calligraphy was employed in many European churches as well, such as in Saint Peter's in Rome. The representations of Christian saints that beautify the Capella Palatina in Palermo (Sicily) bear inscriptions in kufic, the early Arabic script. Today, the calligraphic tradition lives on throughout the Arab/Islamic world in religious, educational, governmental and commercial architecture.
La la ala ala lala ala
Ruq'ah

La la la la la la
Farsi

La la la la la
Naskh

La la la la la
Diwani

La la la la la
Royal Diwani

La la la la la
Rayhani

La la la la la
Thuluth

La la la la la
Kufi
The Arabic Alphabet (read from right to left)

A dot below the letter (as in ḥa) indicates it is aspirated. Capital letters indicate velarization.
The Prophet Muhammad said "it is the duty of every Muslim man and woman to seek education," and under his influence, the Arabs were encouraged to pursue knowledge for its own sake. Fulfilling the duty to pursue knowledge gave Muslims a head start in education. Among the early elementary educational institutions were the mosque schools which were founded by the Prophet himself; he sat in the mosque surrounded by a halqa (circle) of listeners, intent on his instructions. Muhammad also sent teachers to the various tribes to instruct their members in the Qur'an.

The formal pursuit of knowledge had existed in one form or another since the time of the Greeks. The Arabs translated and preserved not only the teachings of the Greeks but those of the Indians and the Persians as well. More importantly, they used these basic teachings as a starting point from which to launch a mass revolution in education beginning during the Abbasid dynasty (750-1258 A.D.).

During the Abbasid period, thousands of mosque schools were established throughout the Arab empire and the subjects of study were increased to include hadith (the science of tradition), fiqh (jurisprudence), philology, poetry, rhetoric and others. In tenth century Baghdad alone there were an estimated 3,000 mosques. Fourteenth century Alexandria had some 12,000 mosques, all of which played an important role in education.

In the mosque school, the teacher sat on a cushion and leaned against a column or wall as his students sat around him listening and taking notes. Only Muslims were allowed to attend the Qur'an or hadith sessions, but non-Muslims could attend all other subjects. There was no age limit, nor were there any restrictions on women attending classes.

Historians such as Ibn Khallikan reported that women also taught classes in which men took lessons. Few westerners recognize the extent to which Arab women contributed to the social, economic and political life of the empire. Arab women excelled in medicine, mysticism, poetry, teaching, and oratory and even took active roles in military conflicts. Current misconceptions are based on false stereotypes of Arab life and culture popularized by some journalists and "Orientalists."

In the mosque schools, rich and poor alike attended classes freely. Classes were held at specific times and announced in advance by the teacher. Students could attend several classes a day, sometimes traveling from one mosque to another. Teachers were respected by their students and there were formal, if unwritten, rules of behavior. Laughing, talking, joking or disrespectful behavior of any kind were not permitted.

Different teachers used various methods of instruction. Some preferred to teach from a text first and then to answer questions. Others allowed student assistants to read or elaborate upon the instructor's theories while the teachers themselves remained available to comment or answer questions. Still others taught without the benefit of texts.

In 1066 A.D., Nizam al-Mulk, a Seljuk vizier, founded the Nizamiyya Madrasa in Baghdad which became the forerunner of secondary/college level education in the Arab empire. Madrasas had existed long before Nizam al-Mulk, but his contribution was the popularization of this type of school. The madrasa gave rise to various universities in the Arab empire and became the prototype of several early European universities. Founded in 969 A.D., Al-Azhar University in Cairo preceded other universities in Europe by two centuries. Today it attracts students from all over the world.

The madrasa, which literally mean "places for learning," were the beginning of departmentalized schools where education was available to all. The physical construction of the madrasas provided student dormitories. Each madrasa, depending on its location, had a specific curriculum. The subjects taught were the religious sciences (e.g., the study of the Qur'an, hadith, jurisprudence and grammar) and the intellectual sciences (e.g., mathematics, astronomy, music and physics). As these schools began to attract distinguished teachers and specialists from all corners of the Arab empire, the number of disciplines increased. Teachers received substantial salaries and scholarships and pensions were available for students. Funds for operation of the madrasas came from both the government and private contributions. Since the government played an important role in promoting these institutions, the subject matter, choice of teachers and allocation of funds were closely supervised and regulated.

The development of the madrasa evolved from the various elementary and secondary schools which were prevalent in the Abbasid empire: the mosque school and other traditional institutions;
maktabat, or libraries, which originated in the pre-Islamic Arab world; tutoring houses, palace schools; halqa, discussion groups in the homes of Muslim scholars; and the library salons in the palaces of wealthy men and courtiers who were patrons of learning and scholarship. In addition, there were the majalis or meetings which were presided over by learned men at various social institutions and private homes. The majalis covered a wide range of topics and subjects. In the current revivals of traditional Islam, many of these “old” institutions and customs are being resuscitated.

Traveling to other cities to seek knowledge under the direction of different masters was a common practice in the early centuries of Islam. From Kurasan to Egypt, to West Africa and Spain, and from the northern provinces to those in the south, students and teachers journeyed to attend classes and discuss social, political, religious, philosophical and scientific matters. The custom was later popularized in Europe during the Renaissance.

Academies began to emerge in the eighth century, serving as centers for the translation of earlier works and for innovative research. Each academy provided rooms for classes, meetings and readings. The Bayt al-Hikma of the Caliph al-Ma’mum (813-833 A.D.) and the Dar al’ilm of Cairo founded by al-Hakim (996-1021 A.D.) are the most notable. Books were collected from all over the world to create monumental libraries that housed volumes on medicine, philosophy, mathematics, science, alchemy, logic, astronomy and many other subjects.

Along with the introduction of paper and textbooks in the eighth century came the antecedent of “teacher certification.” An instructor would give his permission (ijazah) to competent students to teach from one or all of his textbooks. Because of this practice, an individual could have an ijazah to teach a subject although he himself might be a student in another class. Consequently, the distinction between teacher and student was often minimized.

In the eleventh and twelfth centuries, as Arab influence spread to Spain, Sicily and the rest of Europe, Europeans became increasingly aware of Arab advancements in many fields, especially education and science. Books were translated from Arabic into Latin and, later, to vernacular languages. European schools which had long limited learning to the “seven liberal arts” began to expand their curricula.

For some five hundred years, Arab learning and scholarship played a major role in the development of education in the West. The Arabs brought with them well-developed techniques in translation and research and opened new vistas in areas of medicine, the physical sciences and mathematics. Application of empiricism in all fields of study was rapidly incorporated into the learning system of those who became familiar with Arab methodology.

Long before the popularization of the phrase “transfer of technology,” a term used to describe advanced expertise which developed nations offer to Third World countries, the Arabs shared their accumulated knowledge and institutions with the rest of the world.
Music

The identifying link of a people may be found not only in their language, but in their music as well. Throughout their long and illustrious history, the Arabs have been lovers of music in its various forms. Music is an integral part of daily life in the Arab world and sensibility to its sounds and tones is deeply rooted in the Arab personality.

Musical tradition in the Arab world is very old, dating back to the simple sing-song recitations of tribal bards in pre-Islamic days, usually accompanied by the rababa, a primitive two-string fiddle. As they spread out into the Middle East and North Africa in the seventh and eighth centuries A.D., the Arabs quickly added the rich and complicated scales and tones of Indian, Persian and Byzantine music and developed a unique form that has persisted to this day with only minor changes.

In that sense, Arabic music is a remarkably enduring art form which, after centuries of competing cultural influences, has retained an overall unity. Many of its sounds are alien to western ears, but the melodies have great emotive power for Arabs who can recognize the variations in musical styles, from the famous maqam of Iraq to the muwashahat, a form of singing developed in Arab Spain during the Middle Ages and still used today.

For several centuries, Arab rulers from Baghdad to Cordoba were famed for their patronage of music and musicians. Their courts boasted full orchestras for entertainment, while noted musicians competed for the ruler’s favor.

The music of the Arabs gradually influenced the West. Masters such as Bartok and Stravinsky composed works with detectable eastern or Arabic influences. The Western world inherited not only the structure and tabulation of Arab music but, also, many of its instruments.

The leading musical instrument in the Arab takhet (orchestra) is the 'oud. It has a half pear-shaped body with stripes on its shell and a right angle keyboard. It has twelve strings (six pairs) and is played with a plectrum, often the sharpened quill of an eagle. The word 'oud comes from the Arabic word meaning wood. This instrument has a long history. Pictures of oud-like instruments have been discovered on stone carvings in ancient Egypt and Mesopotamia. Persians and Indians played it in ancient days. It was the Arabs, however, who perfected the 'oud, gave it its name, and passed it on to the Western world.

The 'oud reached Europe during the Middle Ages to replace a plucked instrument, the gittern. In Italy, the 'oud became il luto, in Germany, laute, in France, le luth, and in England, the lute. As music became more complex, with the introduction of chord patterns in the thirteenth century, alterations in the technique of playing the 'oud as well as modifications in its construction were applied. These changes brought its sound close to that of the vihuela, a form of Spanish guitar. In the sixteenth and seventeenth centuries, the 'oud was very popular in Europe as a solo instrument and as a part of orchestra ensembles. By the middle of the eight-
ed its original name and shape until the fifteenth century. In Europe, it was the *psaltery*, in Russia, *gusli*, in the Ukraine, *bandura*. The Latin name was *canon*, the Italian, *canone*, the German, *kanon*, the Scandinavian, *kanala*, and the French, *micanone*.

As early as the twelfth century, a new Islamic instrument, very similar to the *qanoon*, was introduced to Europe through Byzantium. The *sanur*, as it originated, or the *ducimer*, as it was named by medieval Europe, is struck rather than plucked. In Greece it was known as the *sanuri* and in Rumania and Hungary it evolved as *cemalot*.

The *rabab*, or "rabe morisco"—one of the contributory ancestors of the violin—also spread from Spain to Europe under the name *rebec*. It is a violin-like instrument except that it is played vertically, most by street musicians.

The last Arab instrument to be adapted by the western world is the tambourine. A percussion instrument used to provide rhythm, the tambourine is made of wood and parchment with pairs of small brass cymbals attached around its circular frame. It is held up by its frame with the thumb of the left hand on one side and the rest of the fingers extended on the other side of the skin. Its effect can still be felt today in many parts of Europe, especially in Spain.

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Excerpt from a vocal improvisation in maqām rast. (8)
Chemistry, or alchemy, from the Arabic al-kimiya, was first studied among Arabs in the seventh century, A.D., by Khalid ibn Yazid ibn Muawiyya who was familiar with the writings of the ancient Greeks on that subject. Muawiyya was followed by Jabir ibn Hayyan (known to the West as Geber). Jabir was born in the year 721 A.D., and later became the pupil of the celebrated Islamic teacher, the Imam Jaffar. He spent most of his life in Kufa, Iraq. In spite of Jabir’s leanings toward mysticism and superstition, he more clearly recognized and proclaimed the importance of experimentation than any other early chemist. “The first essential in chemistry,” he declared, “is that you should perform practical work and conduct experiments, for he who performs not practical work nor makes experiments will never attain the least degree of mastery.” He made noteworthy advances in both the theory and practice of chemistry.

Jabir was acquainted with the usual chemical reactions such as crystallization, calcination, solution, sublimation, reduction and often described them. Among Jabir’s great contributions were his studies in the transmutation of metals. Regarding practical applications of chemistry, Jabir described processes for the preparation of steel and the refinement of other metals, for dying cloth and leather, for making varnishes to waterproof cloth and to protect iron, and for the preparation of hair dyes. He devised a recipe for making an illuminating ink for manuscripts from “golden” marcasite to replace the much more expensive ones made from gold itself, and suggested the use of manganese dioxide in glass-making.

Jabir is credited with the discovery of red oxide, bichloride of mercury, hydrochloric acid, nitrate of silver, nitric acid, and sal ammoniac, and ammonium chloride. The preparation of nitric acid was perhaps his most useful discovery. But to the alchemists and chemists of the Middle Ages, the descriptions and illustrations of furnaces in Jabir’s books were probably of even greater value.

After the death of Jabir, history records a few alchemists in the interval, but it is only with the chemist and physician, Muhammad ibn Zakariya al-Razi (known to the West as Rhazes) that Jabir’s great example was successfully followed. Razi was learned in almost every branch of science and philosophy, alchemy, mathematics, logic, ethics, metaphysics and music. By profession a physician, his medical writings were more famous than his works in alchemy. His interest in alchemy seems to have begun in his youth and he is reported to have said that “no man deserves the name of ‘philosopher’ unless he be a master of theoretical and applied chemistry.” He authored more than one hundred medical books, thirty-three treatises on natural science (exclusive of alchemy), eleven on mathematics and astronomy and more than forty-five on philosophy, logic and theology. On alchemy, he wrote *Compendium of Twelve Treatises and Book Secrets*.

Razi is a figure of exceptional importance in the history of chemistry since in his works we find for the first time a systematic classification of carefully observed and verified facts regarding chemical substances, reactions and apparatuses described in a language almost entirely free from mysticism and ambiguity. Razi also gives a list of the apparatuses used in chemistry. These consist of two classes: (1) instruments used for melting metals, and (2) those used for the manipulation of substances generally. He completes the subject by describing how to make composite pieces of apparatuses and, in general, provides the same kind of information as is to be found in laboratory manuals today.

Another famous scientist who followed Razi is Abu Ali al-Hussain ibn Sina, the Avicenna of Europe, who has been described as the “Aristotle of the Arabs.” During his lifetime, he accomplished an amazing mass of literary, medical, philosophical and scientific works. In his *Book of Remedy*, he wrote about minerals, formation of rocks and stones and properties of minerals and metals.

From the fourth to the twelfth centuries, A.D, the original chemical research and writing in Europe was virtually non-existent. Instead, Arabic texts came to be translated into Latin, these treatises functioning as standard textbooks for students in Europe. The translation of technical matters presented special difficulties, so that scholars often had to content themselves with literal renderings. It was safer not to translate words the meaning of which was imperfectly understood. Thus, in the translation from Arabic to Latin, such words were often simply transliterated, e.g. alembic, camphor, borax, elixir, t alc and saffron.

![Equipments used by early Arab chemists: a distillation vessel and ovens.](image)
Any discussion of Arabic literature must begin with the language itself. While the leading literary figures within the Islamic Empire represented a diversity of ethnic and cultural backgrounds, the non-Arabs among them adopted the language of the Qur'an as their universal medium of expression. Arabs have long considered their language a perfect instrument of precision, clarity and eloquence, as evidenced by the Qur'an itself and by subsequent literary masterpieces. Since the Qur'an was adopted as the fixed standard, a surprisingly vast and rich literature has accumulated over a period of fourteen hundred years.

The earliest form of Arabic literature known is the heroic poetry of the noble tribes of pre-Islamic Arabia. It was there that the standard Arabic verse form, the qasidah, evolved. The qasidah, a long poem, often recounted incidents from the poet's own life or that of his tribe—sometimes dramatically and, sometimes, with a distinctively epic flavor. Pre-Islamic poetry was transmitted and preserved orally until the latter part of the seventh century A.D., when the Arab scholars undertook a large effort to collect and record verses and shorter compositions that had survived in the memories of professional reciters.

During the Umayyad period (661-750 A.D.), the Arab way of life began to shift from a nomadic mode of existence to a more settled and sophisticated urban style. In accordance with Greek and Persian practices of the time, poetry was often accompanied by music, performed by women. In time, the poetic form was simplified: the complex and highly refined meters of the traditional Arabian poetry were replaced by shorter, freer meters which were adaptable to music. Poetry and music became inseparable, giving rise to the ghazal traditions, most strikingly illustrated in the famous Kitab al-Aghani, or “Book of Songs.”

Arab literature flourished under the Abbasids, who rose to power in Baghdad in the mid-eighth century. The “golden age” of Islamic culture and commerce reached its zenith in the reigns of Harun al-Rashid and his son, al-Ma'mun. Arabic prose began to take its rightful place along with poetry; secular literature was at home alongside religious tracts. Abbasid authors of this era not only contributed to the splendor of their age but also left an indelible mark on the European Renaissance.

The outstanding genius of Arab prose at that time was Abu 'Uthman 'Umar bin Bahr al-Jahiz (776-869), the grandson of a black slave who, having received a wide education in Basra, Iraq, became one of the period’s leading intellectuals. Al-Jahiz is best known for his Kitab al-Hayawan, “Book of Animals,” an anthology of animal anecdotes, representing a curious blend of fact and fiction. His Kitab al-Bukhala, “Book of Miser’s,” a witty and insightful study of human psychology, is more revealing of Arab character and society than any other book of the time.

The essays of al-Jahiz form a part of the large category of adab, polite literature or belles-lettres. In the second half of the tenth century, a new literary genre appeared. This was known as maqamat “assemblies”—amusing anecdotes narrated by a vagabond who made his living by his wits. The maqamat were invented by Badi’ al-Zaman al-Hamadhani (d. 1008); only fifty-two of his original four hundred maqamat have survived. Al-Hariri (d. 1122) elaborated upon this genre and stereotyped it, using the same format and inventing his own narrator and roguish hero. The popularity of the maqamat was only eclipsed by the rise of modern Arabic.

For many people, Abu al-Tayyib Ahmad al-Mutanabbi, may have been the greatest of all Arab poets. Born in Kufa, Iraq, and educated in Syria, al-Mutanabbi appeared in the early part of the tenth century. His themes recalled the traditional Arab
ing—the book has Arab, Greek, Persian and Indian origins. It was finally compiled and unified by Arab authors in the tenth century, giving it an entirely Arab character, placing its two main centers in Baghdad and Cairo. At times, with the salty humor of true folk tales and always with an astounding inventiveness, the book enjoyed great popularity throughout the Middle East where it was known chiefly through oral transmission by professional storytellers. Its popularity with the European public, however, was infinitely greater. The first translation by the Frenchman Galland, in 1704, was soon followed by English versions. Their success was spectacular, and new editions followed one another in the most enviable manner of modern best-sellers.

The astounding popularity that *The Thousand and One Nights* enjoyed in Europe from the start can be traced to the "oriental" yearnings that had been growing among western writers, artists and readers ever since the days of the Crusades. The public found in these tales an element of romance and adventure that was missing from European literature. To be sure, *The Thousand and One Nights* was partly responsible for the composition of European novels as famous as *Robinson Crusoe* and *Gulliver’s Travels*. Arabism, or "Orientalism," as it was usually called, provided western writers with a wealth of new themes. We find such themes in Samuel Johnson’s *Rasselas*, in Byron, in the satires of Voltaire and of the French reformers, in Beckford’s *Vathek*, and in Germany, in Goethe’s famous *Westöstlicher Diwan*, in Ruckert and in Platen-Hallermund.
MATHEMATICS AND ASTRONOMY

There is no doubt that mathematics and astronomy owe a great debt to the Arabs. As George Sarton, the great Harvard historian of science, wrote in his monumental Introduction to the History of Science:

From the second half of the eighth to the end of the eleventh century, Arabic was the scientific, the progressive language of mankind... When the West was sufficiently mature to feel the need of deeper knowledge, it turned its attention, first of all, not to the Greek sources, but to the Arabic ones.

In the twelfth century, Europe became aware of the scientific achievements of the Arabs and embarked upon serious translations of their rich legacy. A special college for translators was founded in Toledo, Spain, and it was there, and in other centers, that some of the great Christian scholars translated most of the Arabic works on mathematics and astronomy. In most European universities Arab treatises formed the basis of mathematical studies.

The history of Arab mathematics began with Muhammad ibn Musa al-Khawarazmi who, in the ninth century, journeyed east to India to learn the sciences of that time. He introduced Hindu numerals, including the concept of zero into the Arab world. This number system was later transmitted to the West. Prior to the use of “Arab” numerals, as we know them today, the West relied upon the somewhat clumsy system of Roman numerals. Whereas in the decimal system, the number 1948 can be written in four figures, eleven figures were needed using the Roman system: MDCCCXLVIII. It is obvious that even for the solution of the simplest arithmetical problem, Roman numerals called for an enormous expenditure of time and labor. The Arab numerals, on the other hand, rendered even complicated mathematical tasks relatively simple.

The scientific advances of the West would have been impossible had scientists continued to depend upon the Roman numerals and been deprived of the simplicity and flexibility of the decimal system and its main glory, the zero. Though the Arab numerals were originally a Hindu invention, it was the Arabs who turned them into a workable system; the earliest Arab zero on record dates from the year 873, whereas the earliest Hindu zero is dated 876. For the subsequent four hundred years, Europe laughed at a method that depended upon the use of zero, “a meaningless nothing.”

Had the Arabs given us nothing but the decimal system, their contribution to progress would have been considerable. In actual fact, they gave us infinitely more. While religion is often thought to be an impediment to scientific progress, we can see, in a study of Arab mathematics, how religious beliefs actually inspired scientific discovery.

Because of the Qur'an’s very concrete prescriptions regarding the division of an estate among children of a deceased person, it was incumbent upon the Arabs to find the means for very precise delineation of lands. For example, let us say a father left an irregularly shaped piece of land—seventeen acres large—to his six sons, each one of whom had to receive precisely one-sixth of his legacy. The mathematics that the Arabs had inherited from the Greeks made such a division extremely complicated, if not impossible. It was the search for a more accurate, more comprehensive, and more flexible method that led Khawarazmi to the invention of algebra. According to Professor Sarton, Khawarazmi "influenced mathematical thought to a greater extent than any other medieval
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Without question, the greatest name in physics during the Arab/Islamic Empire was Ibn al-Haytham, born in the city of Basra, Iraq, in 965 A.D. By the time he died in 1030, he had made major contributions to optics, astronomy and mathematics, some of which would not be improved upon for six centuries.

Ibn al-Haytham’s main field of interest and the one to which he made his greatest contributions, was the branch of physics we call optics. Striking parallels exist between his work and that of the seventeenth century English physicist, Isaac Newton, one of the greatest scientists of all time.

One of Newton’s major accomplishments was his famous Law of Universal Gravitation. The most significant aspect of this theory is that it considers gravitation to be universal; that is, the same laws apply in the heavens and throughout the universe as apply on earth. This contradicts the idea held from the time of Aristotle (384-322 B.C.) that there is a difference between the laws governing events on earth and those pertaining to celestial bodies. Newton realized that the force that causes an apple to fall from a tree is the same force that holds the moon and all the planets in their orbits and, indeed, is the same as that which governs the motion of the stars themselves.

If this idea were considered new in the seventeenth century, it was certainly new in the eleventh. Yet some of Ibn al-Haytham’s experiments showed that he, too, believed that extraterrestrial phenomena obeyed the same laws as do earthly ones.

Ibn al-Haytham evolved his theories of optics through the study of light rays, and his investigations revealed a number of important properties: that light travels in a straight line; that every point of a luminous object radiates light in every direction; and that light weakens as it travels from its source. He studied these characteristics of light from a variety of light sources, i.e. self-emitting (the sun, fires and various lamps), and reflecting (the moon and reflecting bodies on earth).

This seemingly trivial experiment is in fact an early example of what is known as the “scientific method.” Ibn al-Haytham designed an experiment to test a hypothesis, namely, that light travels in a straight line. His experiment was arranged to avoid the possibility of the experimenter’s bias affecting the conclusions. Today, it seems obvious that light travels in straight lines, yet there was a time when intelligent men thought it obvious that the sun travels around the earth. The most advanced and sophisticated theory in modern physics, the Theory of Relativity, is derived from a refutation of ideas that are based on our everyday experience. Performing experiments to test and verify theories is at the heart of all modern scientific methods.

Ibn al-Haytham’s experiments have even greater significance. By using the sun, the moon, lamps, fires and a variety of other light sources in his experiments, he was saying that light is light, regardless of its source. In this sense, he anticipated the universal laws of seventeenth century scientists.

We have described only the simplest of Ibn al-Haytham’s experiments on the properties of light rays, but there are many others that were considerably more sophisticated. Ibn al-Haytham foresaw the works of later scientists not only in his use of experimentation but in the use of instrumentation: devices to help make measurements, the key to all modern science. He designed and constructed a variety of instruments, pipes, sheets, cylinders, rulers and plane, concave and convex mirrors in order to conduct his tests.

In addition to his studies of reflection, he also studied refraction, a phenomenon in which light rays bend when travelling from one medium to another, such as from air to water. The effect causes an object to appear to be in a location other than where it actually is, making him the first scientist to test a property of refraction that seems so obvious today. He demonstrated that a ray of light arriving perpendicular to the air-water boundary was not bent at all and showed that this was true for light passing through not just two, but several media. Clear parallels exist between his work and that of Isaac Newton six centuries later: both men studied the effects of light passing through glass, and both realized that the accepted ideas of their day were wrong.

It is difficult to appreciate the degree of intellect required by both these men to overcome the
to optics and other physical sciences by applying their knowledge of mathematics to the results of experiments. Ibn al-Haytham’s descriptions of his experiments are replete with mathematical explanations in the form of geometric drawings, and he must have prepared engineering drawings or sketches to assist with the manufacture of his instrumentation.

About one-fourth of Ibn al-Haytham’s more than 200 books and treatises survive, the best known of these being his *Kitab al-Manazir*, or *Book of Optics* (literally, *Book of Perspectives*). The breadth of the other subjects discussed in his book shows the wide range of his interests. They include optical illusions, the structure of the eye, binocular vision, perspective, atmospheric refraction, comets, mirages and the *camera obscura*. He is known to have studied physiology, anatomy and meteorology. Ibn al-Haytham also made notable contributions to astronomy. For example, he pointed out problems with the model of planetary orbits proposed by Ptolemy in the first century, A.D., a model that was not superseded until the time of Copernicus in the sixteenth century.

It is not too much to claim that Ibn al-Haytham was not only the founder of the science of optics, but a pioneer in the modern scientific method and a man whose work stood unchallenged for six centuries before others were able to carry forward ideas that sprang from his fertile mind.

A hydraulic water pump
The development and, indeed, the very creation of European medicine is unthinkable without the Arabs' contribution. For its basis was the legacy of the ancient Greeks, and that legacy was unknown to Europe until the moment when it became available in Arabic translations and with the commentaries of Arab scholars. The first contribution of the Arabs to western medicine is, thus, the transmission of Greek knowledge. Between 800 and 900 A.D., they had discovered, translated, commented upon, and assimilated the entire Greek heritage in practically all branches of science. Of medical works they translated not only those of such giants as Hippocrates and Galen, but also of Dioscorides, Paul of Aegina, Oribasius and Rufus of Ephesus. Further, the Arabs are credited with many original contributions of hospitals and clinics, the practice of internship, the licensing of physicians and regulations concerning malpractice.

The most important medical school affecting the development of Arab medicine was Jundishapur, situated in what is now western Iran. Jundishapur came under Arab rule in 738 A.D. and a medical school, managed by Syrian Christians, began to foster the spread of medicine among Arabs and other Muslims.

The first bimaristan (hospital and medical institution) in the Arab domain was established in Baghdad during the reign of the Caliph al-Mansur (754-775 A.D.). Incorporating the traditions and standards of Jundishapur and laying the foundations for the wider Arab adventure in medicine, hospitals continued to be built throughout the Abbasid empire (749-1258 A.D.), an era referred to as the "golden age" of Arab Muslim rule. In the medical schools associated with the hospitals, a well-developed curriculum was taught, in line with the notion that an "educated" man was not one with a singular area of expertise. Music, mathematics, astronomy, geometry and other courses were among the electives available. Students learned medical theory and practiced in small classes where they received clinical instruction and observed surgery.

From Spain to western Indian, bimaristan were among the most important educational institutions in the Arab world. Physicians of many races, nationalities and religions taught and practiced in them, making daily rounds, taking notes, writing prescriptions. Men and women recuperated in separate wards and many hospitals had gardens in which herbs were grown for use in treatments. Doctors even traveled to remote villages and accompanied soldiers into the field so that the injured could be cared for immediately. Hospitals were established for the blind, lepers and even the mentally ill.
Pasteur’s bacteriological discoveries, the fact remains that Ibn Khatib and Ibn Khatima were the first to give clinical accounts of contagion.

In the book Kitab al-Maliki (Liber Regius in its Latin version), the tenth century al-Majusi propounded views that show a rudimentary conception of the capillary system, several hundred years in advance of western science. In the same century, the geographer and historian al-Masudi, speaks of the process of evolution from mineral to plant, plant to animal, and animal to man in his Kitab-al-Tanbih. Modern scholars have recognized him as a precursor of Darwinism, and the German expert Dieterici called his book about Masudi, Darwinism in the Tenth and Nineteenth Century (Leipzig, 1878). Ibn al-Nafis (d. 1289), discovered not only the fundamental principles of pulmonary circulation but, by criticizing Ibn Sina’s theory concerning the possible passages of venous blood between the ventricles, established himself as a forerunner of William Harvey.

Gradually, in western Europe, chiefly in Spain and Sicily, both strongly subject to Arab influences, scholars were absorbing the knowledge opened up to them by the Arabs. Among the western pioneers of Arab medicine were Roger Bacon, Michael Scott, Gerard of Cremonal, Adelard of Bath and Gerbert, the future Pope Sylvester II. They approached that knowledge “with a great and growing enthusiasm combined with a blind trust in its authority.” Medieval Europe regarded Arab medicine with wondrous awe, and Cordova, an Arab center, was looked upon with admiration by educated Europeans. As a result, until the end of the sixteenth century, the medical curricula of European universities demanded a knowledge of Avicenna’s Canun (Arabian Medicine, by Donald Campbell, London, 1926). When the leading European medical schools were established in Paris (1110 A.D.), Bologna (1113), Montpellier (1181), Padua (1222) and Naples (1224), their curricula were dominated entirely by Arab medicine. It is interesting to note that these universities have remained among the leading medical schools to the present day.
Architecture

Every culture builds in its own way, borrowing from the past, developing a distinctive style, then passing on to a new age those special achievements which are proven most worthy. The foundation of all great buildings in Islam was Faith. The earliest major work of Islamic architecture was undertaken during the lifetime of the Prophet Muhammad: the rebuilding of the sanctuary of the Ka'aba at Mecca. Since, Islamic architecture has created a unique design concept, style and form which have survived to this day. The principal architectural types of Islamic buildings are the mosque, with its minaret, the madrassa (school), the tomb (mausoleum), the khan (rest house), the fort, and the palace.

At first, the Arabs adopted Greek methods of design and architectural forms to suit their own purposes. The Byzantine rotunda dome, for example, was used in the seventh century Mosque of 'Umar, or Dome of the Rock, in Jerusalem (685), the earliest existing monument of Islamic architecture. This mosque, built on the site from which the Prophet Muhammad ascended to heaven, is the work of craftsmen from all corners of the Arab-Islamic Empire.

The method of constructing domes—a recurrent feature of Islamic mosques—is another architectural theme that was passed on to the West. The Arabs introduced a transitional structural support, known as corner stalactites or muqarnas, between the dome and the cube which shaped the plan of a mosque. This technique was successfully applied in the Capella Palatina in Palermo, Sicily (1132).

The minaret, a Muslim innovation, was inspired by earlier forms. The earliest known minaret at Kairouan, Tunisia (670), is a vast, battlemented tower. The most striking was constructed in Samarra, a Muslim capital of Iraq. It recalled the lofty, spiraling structure, called ziggurat, which the Arabs found in the ancient cities of Babylonia. The minaret, in turn, was adopted by western architects. The Giralda of Seville, which had been built originally as a minaret and completed as a bell-tower, was duplicated in Evesham, England. The influence of the minaret may also be seen in innumerable towers of rural medieval English churches and in the campaniles or belltowers of Renaissance Florence (Palazzo Vecchio) and Venice (Piazza San Marco).

The horseshoe arch was an early Islamic form. It became a predominant feature of the Great Mosque of Damascus (707), in Alcazar of Seville and in Santa Maria la Blanca in Toledo. The Muslims also developed the pointed arch which appeared throughout the Arab world especially in the Ahmad Ibn Tulun Mosque in Cairo, more than two centuries
India the art of crucible steel forging. Islamic craftsmen developed the process considerably. The result was a high order of arms and armor named after the cities in which they originated, as well as architectural Islamic metalwork, decoration and inlays. Techniques of setting gold and silver segments into brass and bronze vessels were developed in Persia, Syria and Egypt, and influenced western craftsmanship for many years.