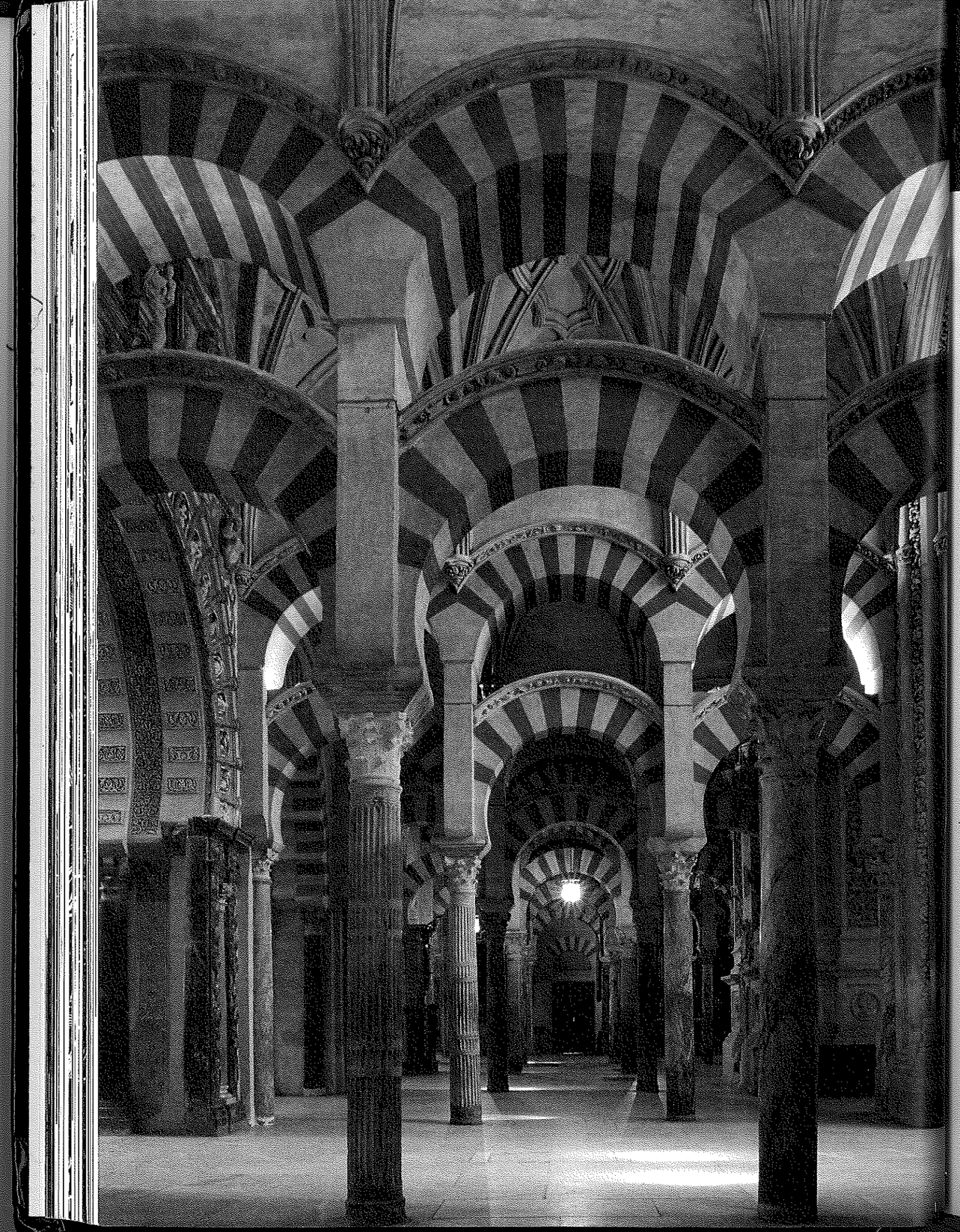


This mosque in Cordoba, Spain, displays distinctive Muslim architecture and design.

CHAPTER 10

Contributions of Muslims to World Civilization

10.1 Introduction

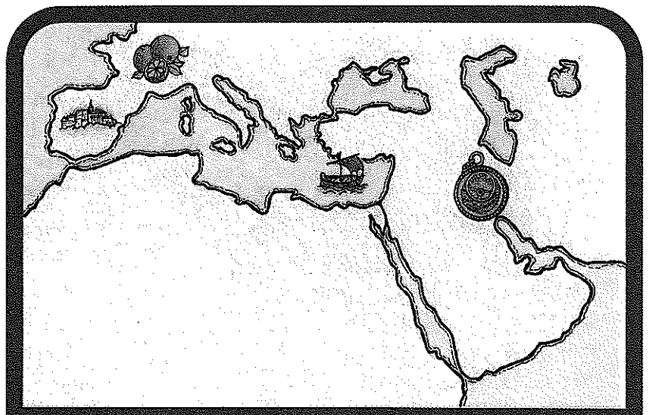
In Chapter 9, you learned about Islam, the Muslim faith. In this chapter, you will study many contributions made by Muslims to world civilization.

By 750 C.E., Muslims ruled Spain, North Africa, the Middle East, and much of central Asia. Over the next 500 years, many cultural influences blended in this vast region. Arabs, Persians, Turks, and others all helped to build Islamic civilization.

The Islamic world was rich, diverse, and creative. Rulers encouraged scholarship and art. Great cities flourished as centers of culture. Muslims learned from the ancient Greeks, the Chinese, and the Hindus of India. They preserved old learning and made many striking advances of their own. Scholars traveled and exchanged ideas across the Islamic world, from Spain to Baghdad (in present-day Iraq). By spreading knowledge and ideas, they had a deep impact on other cultures.

You can still see signs of this influence today. For instance, Muslims introduced many foods to other parts of the world. Among them were sugar (*al-sukkar* in Arabic), rice (*al-ruzz*), and oranges (*naranj*). *Mattress* and *sofa* are both from Arabic. *Pajamas* and *tambourine* are derived from Persian words. The Arabic numerals (1, 2, 3, …) we use today were brought to Europe by Muslims.

In this chapter, you will explore Muslim contributions to world civilization. You'll study Muslim achievements in **city building** and **architecture, scholarship** and **learning, science** and **technology, geography** and **navigation, mathematics, medicine, literature** and **bookmaking, art** and **music,** and even **recreation**. Let's begin by looking more closely at the flowering of Islamic culture following the Arab conquests of the 7th and 8th centuries.



Use this illustrated map as a graphic organizer to help you discover and remember Muslim contributions to world civilization.

10.2 The Flowering of Islamic Civilization

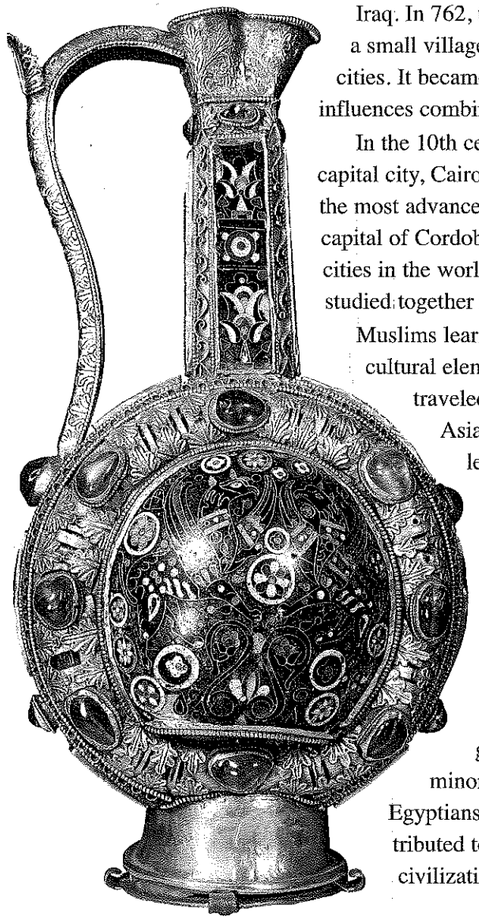
Abbasid member of a Muslim ruling family descended from Abbas, an uncle of Muhammad

Fatimid dynasty a Muslim ruling family in Egypt and North Africa that was descended from Fatimah, Muhammad's daughter

As you have learned, Islam began in Arabia. By the middle of the 8th century, Arab conquests had created a vast Muslim empire. Spain, North Africa, and much of western and central Asia came under Muslim rule. Over the next 500 years, Islamic civilization flowered throughout this huge area.

As a political unit, however, the empire did not last. By 750, a family called the **Abbasids** had wrested power from the Umayyad dynasty. An Umayyad named Abd al-Rahman fled to Spain. There he established a rival caliphate, or government, that made Cordoba one of the leading cities in the world. In the 9th and 10th centuries, Muslim dynasties rose up in Egypt, North Africa, and elsewhere.

Despite this loss of political unity, Islamic civilization flourished. Muslim rulers built great cities where scholars and artists made advances in many fields.



Harun al-Rashid, the fifth caliph of the Abbasids, created a lavish court at Baghdad. He presented this jeweled water jug to Charlemagne, emperor of the Holy Roman Empire.

One of the most important cities was Baghdad, in present-day Iraq. In 762, the Abbasids made Baghdad their capital. From a small village, Baghdad grew into one of the world's largest cities. It became a major center of learning where Persian influences combined with the Arabic heritage of Islam.

In the 10th century, the **Fatimid dynasty** in Egypt built a capital city, Cairo, that rivaled Baghdad. Its university became the most advanced in the Muslim world. In Spain, the Muslim capital of Cordoba became one of the largest and wealthiest cities in the world. Jews, Christians, and Muslims worked and studied together in this thriving cultural center.

Muslims learned from other cultures, and they helped spread cultural elements to other places. Ideas as well as goods traveled along the Muslim trade routes that connected Asia, Europe, and Africa. For example, Muslims learned paper making from the Chinese, and they passed this knowledge on to Europeans. Furthermore, Muslims produced new scientific, medical, and philosophical texts based on earlier Greek works. Many of these texts were translated into Latin in the 12th century and became available to western Europeans for the first time.

As you read this chapter, keep in mind the great diversity of the Islamic world. Only a minority of Muslims were from Arabia. Persians, Egyptians, North Africans, Turks, and others all contributed to the great cultural blending we call Islamic civilization.

10.3 City Building and Architecture

Many large cities developed in Muslim lands. The growth of cities encouraged new kinds of architecture. Thousands of workers labored to build palaces, schools, orphanages, hospitals, mosques, and other buildings.

The City of Baghdad One of the most glorious Muslim cities was the Abbasid capital of Baghdad. After the Abbasids rose to power, Caliph al-Mansur decided to move his capital east from Damascus to a site that was more central to his far-flung empire. The site he chose was Baghdad, a village between the Tigris and Euphrates Rivers. This location was a crossroads of trade routes connecting distant parts of the empire.

It took 100,000 architects, workers, and craftspeople four years to build the new capital. Because of its shape, people called the capital complex the "round city." At its center were the caliph's palace and the grand mosque. Around them were offices and the houses of court officials and army officers. A double wall with four heavily guarded gates surrounded the inner city.

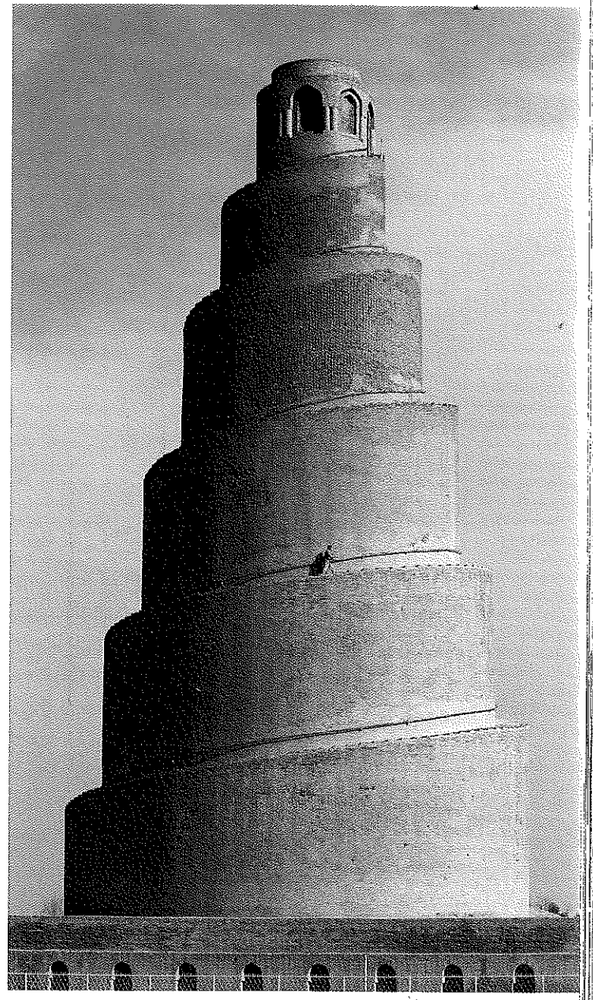
Shops, markets, and residences grew up outside the wall. Soon Baghdad was one of the world's largest cities. Bridges, palaces, and gardens all added to its splendor. One Arab historian of the 11th century called Baghdad "a city with no equal in the world."

The Mosque Muslims created distinctive forms of architecture. A particularly important type of building was the mosque, the Muslim house of worship.

Mosques usually had a minaret (tower) with a small balcony where the muezzin chanted the call to prayer. In the walled courtyard stood a fountain for washing before prayers.

Inside the mosque was the prayer room. Worshipers sat on mats and carpets on the floor. The imam, or prayer leader, gave his sermon from a raised pulpit called the *minbar*. Next to the minbar was the *mihrab,* the niche that indicated the direction of Makkah.

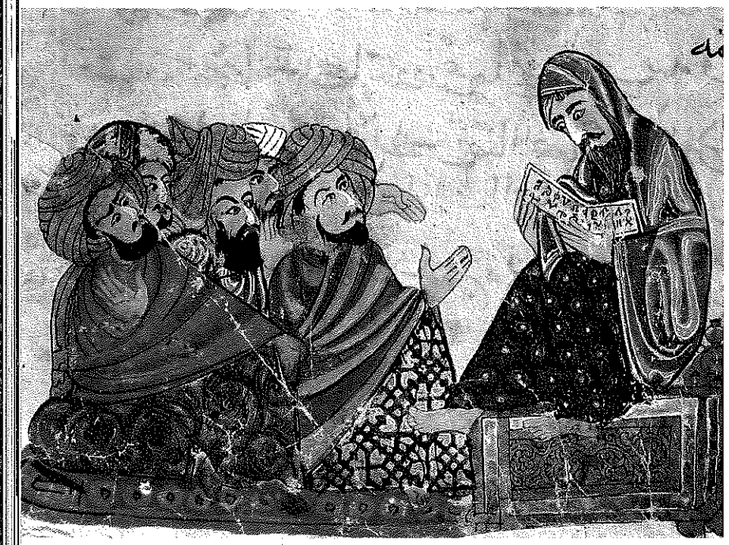
Many design styles and materials went into the building of mosques, reflecting the great diversity of Muslim lands. Like the cathedrals of Europe, mosques expressed the religious faith and the artistic heritage of their builders.



The minaret of the Great Mosque of Samarra has a spiral design. Muezzins follow spiral steps around the outside of the tower to the balcony at the top.

10.4 Scholarship and Learning

Scholarship and learning were highly valued in Islamic culture. Muhammad himself declared, "The ink of scholars is more precious than the blood of martyrs."



Students in Muslim schools discussed and debated philosophical ideas with their teachers.

Acceptance of the Arabic language helped promote learning. Beginning in the 8th century, Arabic became the language of scholarship and science throughout Muslim lands. A shared language and love of learning allowed scholars in Europe, North Africa, and the Middle East to exchange ideas and build on one another's work.

Muslim rulers built schools, colleges, libraries, and other centers of learning. In Baghdad, Caliph al-Ma'mun founded the House of Wisdom in 830. Scholars from many lands came together there to do research and to translate texts from Greece, Persia, India, and China.

Other cities also became great centers of learning. In Cairo, the Hall of Wisdom opened in the 10th century. Scholars and ordinary people could visit its library to read books. The huge library in Cordoba, Spain, held as many as 400,000 volumes. Buyers traveled far and wide to purchase books for its shelves.

Among the texts studied by Muslim scholars were the works of ancient Greek thinkers, such as the philosophers Plato and Aristotle. Following the example of the Greeks, Muslim philosophers used reason and logic to try to prove important truths.

Like Christian thinkers in Europe, Muslims sometimes wondered how to make reason and logical proof agree with their religious faith. Al-Kindi, an Arab philosopher of the 9th century, tried to resolve this issue. Humans, he said, had two sources of knowledge: reason, and revelation by God. People could use reason to better understand the teachings of faith. Some truths, however, could be known only through God's word. For example, no one could prove that there would be a resurrection, or rising from the dead, on the day of judgment.

immortal able to live forever

Ibn Sina, a Persian, became Islam's most famous philosopher. Called Avicenna in Europe, Ibn Sina wrote in the early 11th century. He believed that all knowledge came from God and that truth could be known through both revelation and reason. For example, he presented a logical proof (argument) that the soul was **immortal**. His writings were widely translated and influenced many thinkers in medieval Europe.

10.5 Science and Technology

Muslims showed an endless curiosity about the world God had made. In fact, the Qur'an instructed them to learn more:

Have they not looked at the camel—how it was created?
And at the sky—how it was raised up?

As a result of their interest in the natural world, Muslims made many advances in science and technology. Let's look at a few of their accomplishments.

Zoology A number of Muslim scholars became interested in **zoology,** the scientific study of animals. Some wrote books describing the structure of animals' bodies. Others explained how to make medicines from animals. In the 800s, a scholar named al-Jahiz even presented theories about the **evolution** of animals. Muslims also established zoological gardens, or zoos, where exotic animals were displayed.

Astronomy Muslim scholars made great advances in **astronomy,** the study of objects in the universe. Astronomy had many practical uses for Muslims. For example, compasses and **astrolabes** could be used to locate the direction of Makkah. These instruments allowed worshipers far from the holy city to pray facing the right direction. Astronomers also figured out exact times for prayer and the length of the month of Ramadan.

Beyond such practical matters, Muslim astronomers simply wanted to learn about the universe. Some of them realized that Earth rotated, or turned, like a spinning top. Many questioned the accepted idea that Earth was the center of the universe, with the sun and stars traveling around it. As later work showed, in reality Earth travels around the sun.

zoology the scientific study of animals
evolution the process by which different kinds of animals and other living things develop
astronomy the science of the stars, planets, and other objects in the universe
astrolabe an instrument used to observe and measure the position of the sun and other heavenly bodies

Irrigation and Underground Wells Muslims made technological advances that helped them make the most of scarce water resources. Much of the land under Muslim rule was hot and dry. Muslims restored old irrigation systems and designed new ones. They built dams and aqueducts to provide water for households, mills, and fields. They improved existing systems of canals and underground wells. Some wells reached down 50 feet into the ground. Muslims also used water wheels to bring water up from canals and reservoirs.

The town of Hama, Syria, has 17 wooden waterwheels from medieval Muslim times. These waterwheels scooped water from the Orontes River into aqueducts, bringing it to homes and farms.

This copper astrolabe is from the ninth century.

10.6 Geography and Navigation

Another subject of study for Muslim scholars was geography. Muslim geographers examined plants and animals in different regions. They also divided the world into climate zones. Most educated people in medieval times believed that the Earth was round, but they disagreed about the Earth's size. Muslim scientists calculated the Earth's **circumference** within nine miles of its correct value.

Some Muslims studied geography simply out of curiosity. But geography had practical uses, too. For example, Muslims created extremely accurate maps. A scholar in Muslim Spain produced a world atlas with dozens of maps of lands in Europe, Africa, and Asia. A work called *The Book of Roads and Provinces* provided maps and descriptions of the main Muslim trade routes. *The Book of Countries* listed useful facts about the lands under Muslim rule. From this book, travelers could get information such as a region's physical features and water resources.

Travelers were another source of knowledge. Some travelers wrote guidebooks to help pilgrims make the journey to Makkah. Others explored and described foreign lands, like China and Scandinavia. One traveler wrote a 30-volume encyclopedia about all the places he had seen.

To aid in their travels, Muslims used navigational instruments. Muslim scientists adapted and perfected the compass and the astrolabe. Muslims probably learned about the compass from the Chinese. Compasses allowed people to identify the direction in which they were traveling. The astrolabe was probably invented by the Greeks. With this instrument, sailors at sea could use the position of objects in the sky to pinpoint their location.

circumference the distance around a circle or sphere

10.7 Mathematics

Muslims greatly advanced the study of mathematics. They based their work in part on ideas from India and classical Greece. For example, scholars in Baghdad's House of Wisdom translated the works of the Greek mathematician Euclid. They also translated important texts from India. Then they adapted what they learned and added their own contributions.

One of these scholars was the astronomer and mathematician al-Khwarizmi, who worked in the House of Wisdom in the 9th century. Al-Khwarizmi is best known as "the father of algebra." In fact, the word **algebra** comes from the title of one of his books.

Algebra is used to solve problems involving unknown numbers. An example is the equation "$7x + 4 = 25$." Using algebra, we can figure out that in this equation, x represents 3.

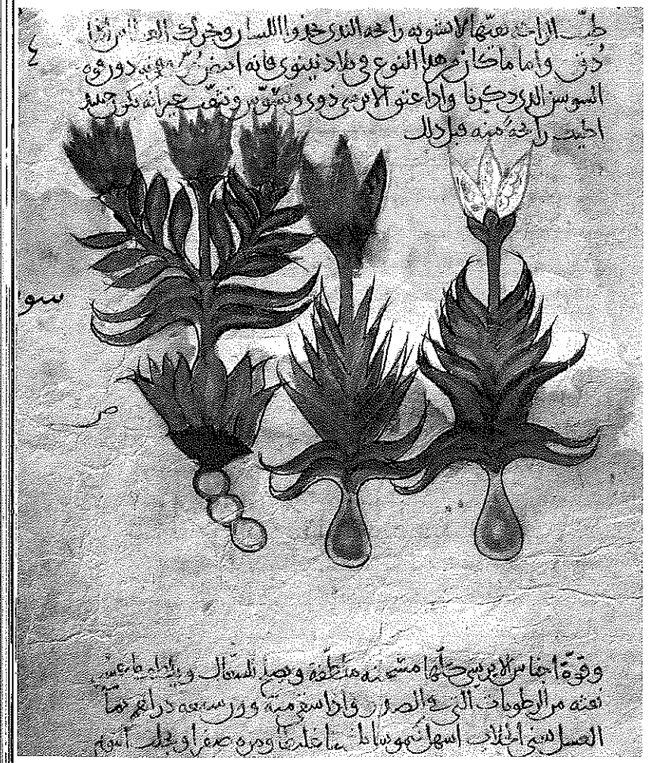
Al-Khwarizmi's famous book on algebra was translated into Latin in the 12th century. It became the most important mathematics text in European universities.

The translation of another of Al-Khwarizmi's books helped to popularize Arabic numerals in Europe. Actually, Muslims learned this way of writing numbers, along with fractions and decimals, from Indian scholars. Arabic numerals were a big help to business and trade. Compared to earlier systems, they made it easier for people to do calculations and check their work. We still use Arabic numerals today.

Muslims also spread the Indian concept of zero. In fact, the word *zero* comes from an Arabic word meaning "something empty." Ancient peoples used written symbols for numbers long before anyone thought of using a symbol for zero. Yet zero is very important in calculations. (Try subtracting 2 from 2. Without using zero, how would you express the answer?) Zero also made it easier to write large numbers. For example, zero allows people to distinguish between 123 and 1,230.

algebra a branch of mathematics that solves problems involving unknown numbers

The geometric designs in Muslim art and architecture are based on knowledge about advanced mathematical principles.



Muslim doctors treated patients with herbal remedies as well as drugs, diet, and exercise. This illustration of a lily plant is from an Arabic herbal encyclopedia of the 10th century.

10.8 Medicine

Muslims made some of their most important contributions in the field of medicine. They learned a great deal from the work of ancient Greeks, Mesopotamians, and Egyptians. Then, as in other fields of study, they improved upon this earlier knowledge.

Muslim doctors established the world's first hospitals. By the 10th century, Baghdad had at least five hospitals. Most cities and towns also had one or two. Many hospitals served as teaching centers for doctors in training. Anyone who needed treatment could get it, because the government paid all medical expenses. There were even hospital caravans that brought medical care to people in remote villages.

Muslim hospitals had separate wards for men and women, surgical patients, and people with diseases that others could catch. Doctors treated ailments through drugs, diet, and exercise. They gave patients remedies made from herbs, plants, animals, and minerals. **Pharmacists** made hundreds of medications. Some drugs dulled patients' pain. Antiseptics (medications that fight infection) were used to clean wounds. Ointments helped the wounds to heal.

For some problems, surgeons performed delicate operations as a last resort. Drugs such as opium and hemlock put patients to sleep before operations. Muslim surgeons amputated (cut off) limbs, took out tumors, and removed cataracts (cloudy spots) from the eye. After surgery, doctors used animal gut to stitch up wounds.

Muslim doctors made many discoveries and helped spread medical knowledge. For example, al-Razi, a Persian doctor, realized that infections were caused by bacteria. He also studied smallpox and measles. His work helped other doctors diagnose and treat these deadly diseases.

The Persian philosopher Ibn Sina (Avicenna), whom you met earlier in this chapter, was also a great doctor. In fact, he has been called "the prince of physicians." His most important medical work, *The Canon of Medicine,* explored the treatment of diseases. It is one of the classics in the history of medicine.

Europeans later translated Ibn Sina's book and many other Muslim works into Latin. Medical schools then used these texts to teach their students. In this way, Muslim doctors had a major impact on European medicine.

pharmacist a person who prepares medications for use in healing

10.9 Bookmaking and Literature

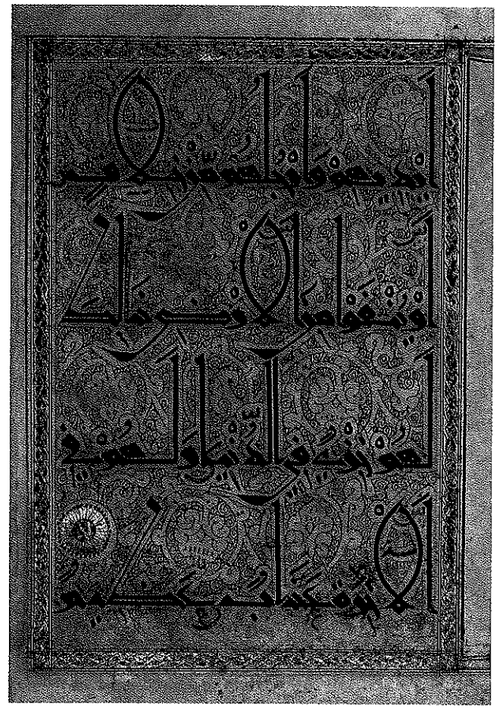
In the 8th century, Muslims learned the art of making paper from the Chinese. Soon they were creating bound books. Bookmaking, in turn, encouraged the growth of Muslim literature.

Craftspeople turned bookmaking into an art form. Bookmakers gathered sheets of paper into leather bindings. They illuminated the bindings and pages with designs in gold as well as with miniature paintings.

Books become a big business in the Muslim world. In Baghdad, more than 100 bookshops lined Papersellers' Street. In addition to copies of the Qur'an, many volumes of poetry and prose were sold.

Arabs had a rich heritage of storytelling and poetry. Arab poetry often honored love, praised rulers, or celebrated wit. Persians introduced epic poems, or long poems that tell a story. Prose eventually replaced poetry for recording history, events, and traditions. Writers also composed stories in prose.

One famous collection of stories was called *A Thousand and One Nights.* Also known as *Arabian Nights,* this book gathered stories that originally came from many places, including India and Persia as well as the Middle East. In the book, a wife tells her husband a new tale each night. The stories take place in Muslim cities and in places like China, Egypt, and India. A European translator later added tales that were not part of the medieval Arabic collection. Among these added tales are those about Aladdin's magic lamp, Ali Baba, and Sinbad the Sailor, which remain well known today.



Bookmaking was an art in the Muslim world. Copies of the Qur'an were written with elaborate letters and decorated in gold.

Muslim literature was enriched by Sufism, or Islamic **mysticism**. This type of religious practice involves intense personal experiences of God rather than routine performance of rituals. Sufis longed to draw close to God in their everyday lives. One way to express their love and devotion was through poetry filled with vivid images and beautiful language. Rabi'a, a poet of the 8th century, shared her feelings in this verse:

But your door is open to those who call upon you.
My Lord, each lover is now alone with his beloved.
And I am alone with Thee.

A 13th-century Sufi poet, Rumi, had an enormous influence on Islamic mysticism. Rumi wrote a long religious poem in Persian that filled six volumes. Pilgrims still travel to his tomb in Konya, Turkey.

mysticism a form of religious belief and practice involving sudden insight and intense experiences of God

10.10 Art and Music

Muslims created many forms of art and music. In this section, you'll look at four types of artistic expression in the medieval Islamic world.

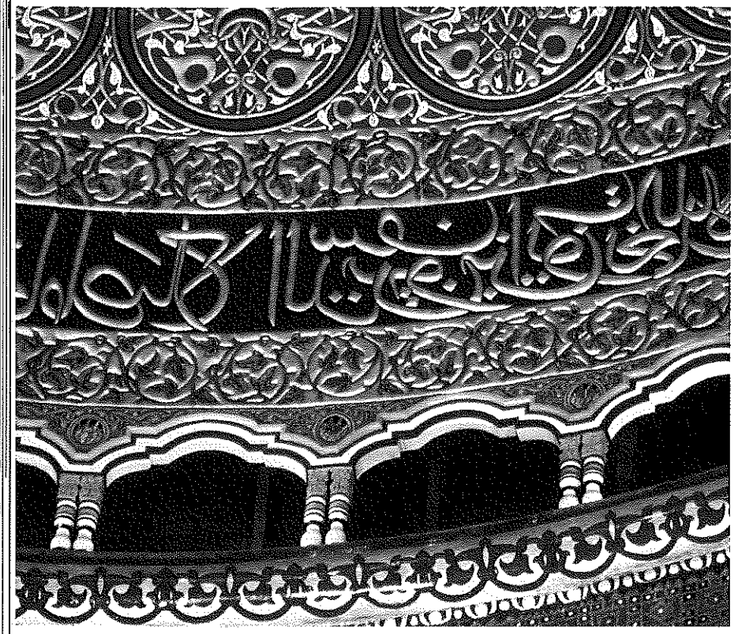
Geometric and Floral Design Muslims earned fame for their decorative art. Early in the history of Islam, Muslims rejected the use of images of humans or animals in their visual art, especially religious art. Only God, they said, can create something that is alive. Instead, artists turned to shapes and patterns found in nature and geometry to create marvelous designs and decorations.

calligraphy the art of beautiful handwriting

Art sometimes was religious, as in the beautiful illuminated manuscripts of the Qur'an. But artists and craftspeople also applied their talents to everyday items like plates, candlesticks, glassware, and clothing. They decorated the walls of mosques and palaces with intricate designs.

A type of design called *arabesque* took its beauty from the natural world. Artists crafted stems, leaves, flowers, and tendrils (long, thread-like parts of plants) into elegant patterns that were repeated over and over. They carved, painted, and wove arabesque designs into objects both large and small. Metal boxes, ceramic bowls, tiles, carpets, and even entire walls displayed intricate arabesque designs.

Artists also used geometric shapes in their designs. Circles, triangles, squares, and hexagons had special meaning to Muslims. Artists used simple tools—rulers and compasses—to create abstract designs from these shapes. This basic design was then repeated and combined to create a complex pattern.



Arabic calligraphy is featured in the decoration on the inside of this architectural dome.

Calligraphy For Muslims, the highest form of decorative art was **calligraphy,** the art of beautiful handwriting. When Muslims began copying the Qur'an, they felt that only calligraphy was worthy to record the words of God. For this reason, they honored calligraphers above other artists.

Calligraphers used sharpened reeds or bamboo dipped in ink to write on parchment and paper. Some forms of calligraphy had letters with angles. Most featured round letters and cursive writing, in which the script flows and letters within words are connected.

In addition to copying the Qur'an, artists used calligraphy to decorate everyday items. They put elegantly written lines of poetry on pottery, tiles, and swords. Bands of calligraphy trimmed the bottoms of pieces of cloth. Calligraphy even adorned coins, which often featured verses from the Qur'an.

Verses of the Qur'an were also used to decorate mosques. Sometimes the holy verses were engraved along the tops of the outside walls or circled the inside dome of the mosque.

Textiles Manufactured cloths, or textiles, had long been important to the Arab people as practical items and as trade goods. Muslims in medieval times brought great artistry to the making of textiles. Weavers wove wool, linen, silk, and cotton into cloth, which then might be dyed with vivid colors. Valuable cloths sometimes featured long bands of inscriptions or designs showing important events. Fabrics were also embroidered, sometimes with gold thread.

Clothes showed rank and served as status symbols in the Muslim world. The caliph and his court wore robes made of the most valuable materials. Fine textiles served as awnings and carpets in the royal palace during festivals or when distinguished guests visited.

The lute, or oud, is a popular instrument in Muslim music.

Music in Muslim Spain There were several centers of music in the Islamic world, including Baghdad and Damascus. Persian musical styles were very influential in the cities of the east. But in Cordoba, Spain, a unique style developed that blended elements of Arab and native Spanish cultures.

A key figure in this cultural innovation was Ziryab, a talented musician and singer from Baghdad. Ziryab settled in Cordoba in 822. There he established Europe's first **conservatory,** or music school. Musicians from Asia and Africa came to Cordoba to learn from the great Ziryab. Many were then hired as entertainers at royal courts in other parts of the world.

conservatory an advanced school of music

Singing was an essential part of Muslim Spain's musical culture. Musicians and poets worked together to create songs about love, nature, and the glory of the empire. Vocalists performed the songs accompanied by such instruments as drums, flutes, and lutes. Although this music is lost today, it undoubtedly influenced later musical forms in Europe and North Africa.

10.11 Recreation

Fun was also part of Islamic culture. Two favorite pastimes that Muslims helped popularize were polo and chess.

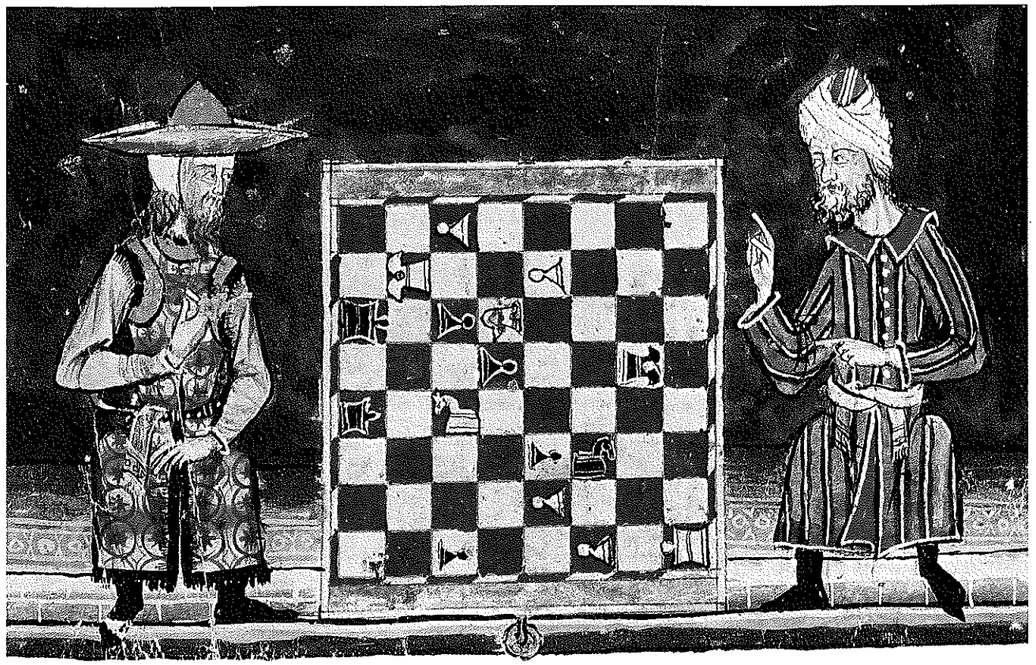
Polo Muslims first learned about the game of polo from the Persians. Polo is a sport in which teams on horseback use mallets (wooden sticks) to strike a ball through a goal. Muslims looked at horses as status symbols, and polo quickly became popular among the wealthy. Even Abbasid rulers began to raise champion Arabian horses to play polo. (Polo is often called the "sport of kings.")

Muslims adapted and refined the game of polo. Today the game is enjoyed all over the world.

Chess The game of chess was probably invented in India. Persians introduced the game to the Muslim world in the mid 600s. It quickly became popular at all levels of society. Caliphs invited chess champions, including women and slaves, to their palaces to play in matches. Players enjoyed the intellectual challenge that chess presented.

Chess is a battle of wits in which players move pieces on a board according to complex rules. Each player commands a small army of pieces, one of which is the king. The goal is to checkmate the opponent's king. *Checkmate* means that the king cannot move without being captured.

As with polo, Muslims adapted and improved the game of chess. They spread it across Muslim lands and introduced it to Europe. Chess remains one of the world's most popular games.



This illustration of two men playing chess is from a 13th-century book of games. The exaggerated size and position of the chessboard indicates the popularity of the game at the time.

Muslims greatly influenced the course of history as they traveled from place to place, trading cultural influences as well as goods.

10.12 Chapter Summary

In this chapter, you learned about many of the contributions Muslims have made to world civilization. In a dazzling variety of fields, Islamic culture has left a lasting mark on the world.

In the 7th and 8th centuries, Arab conquests created a vast Muslim empire. Although the empire did not last as a political unit, Islamic civilization thrived.

Muslim rulers built great cities and centers of learning and scholarship. Muslim scholars learned from other cultures and helped to spread knowledge to other parts of the world.

Muslims made a number of advances in city building, architecture, technology, and the sciences. Muslim mathematicians built on the work of Indians and Greeks. Doctors, too, improved on ancient knowledge. Many of these advances had a major influence on Europe.

Having learned paper making from the Chinese, Muslims created beautiful books. Writers composed works of both poetry and prose. The religious poetry of Sufis celebrated the love of God.

Muslim artists and craftspeople created distinctive forms of decorative art. In Spain, a unique style of music developed that combined Arabic and Spanish influences. Two of medieval Muslims' favorite pastimes, polo and chess, are still enjoyed around the world.

As you have seen, Europeans owed a great debt to Islamic civilization. But by the 11th century, much of Christian Europe saw Islam as an enemy. In the next chapter, you will learn about the series of wars between Christians and Muslims, the Crusades.