3.2 The Heritage of The ‘Abbasids

Cambridge Resources:

www.britannica.com/topic/Abbasid-dynasty
www.khanacademy.org/humanities/world-history/medieval-times/cross-cultural-diffusion-of-knowledge/a/the-golden-age-of-islam
https://courses.lumenlearning.com/suny-hccc-worldcivilization/
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The golden age of Islam

The Abbasid caliphs established the city of Baghdad in 762 CE. It became a center of learning and the hub of what is known as the Golden Age of Islam.

Overview

- After the death of Muhammad, Arab leaders were called **caliphs**.
- Caliphs built and established Baghdad as the hub of the **Abbasid Caliphate**.
- Baghdad was centrally located between Europe and Asia and was an important area for trade and exchanges of ideas.
- Scholars living in Baghdad translated Greek texts and made scientific discoveries—which is why this era, from the seventh to thirteenth centuries CE, is named the Golden Age of Islam.

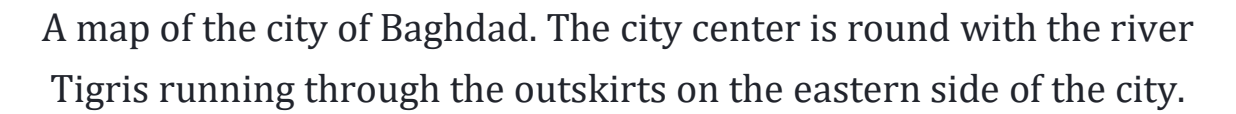
A love of knowledge was evident in **Baghdad**, established in 762 CE as the capital city of the Abbasid Caliphate in modern-day Iraq. Scholars, philosophers, doctors, and other thinkers all gathered in this center of trade and cultural development.. Academics—many of them fluent in Greek and Arabic—exchanged ideas and translated Greek texts into Arabic.

Chief Muslim leaders after Muhammad's death were referred to as Caliphs.The era of the Abbasid Caliphs' construction and rule of Baghdad is known as the **Golden Age of Islam**. It was an era when scholarship thrived.

Abbasid Caliphate

After the death of Muhammad and a relatively brief period of rule by the Rashidun Caliphs, the **Umayyad Dynasty** gained the reins of power. Based in Damascus, Syria, the Umayyad Caliphate faced internal pressures and resistance, partly because they displayed an obvious preference for Arab Muslims, excluding non-Arab Muslims like Persians. Taking advantage of this weakness, Sunni Arab Abu al-Abbas mounted a revolution in 750 CE. With support from his followers, he destroyed the Umayyad troops in a massive battle and formed the **Abbasid Dynasty** in its place.

Baghdad



A map of the city of Baghdad. Image credit: Wikimedia

The leaders of the Abbasid Dynasty built **Baghdad**, the capital of modern-day Iraq. Baghdad would come to replace and overshadow Damascus as the capital city of the empire. It was located near both the Tigris and Euphrates rivers, making it an ideal spot for food production that could sustain a large population.

The Abbasids built Baghdad from scratch while maintaining the network of roads and trade routes the Persians had established before the Umayyad Dynasty took over. Baghdad was strategically located between Asia and Europe, which made it a prime spot on overland trade routes between the two continents. Some of the goods being traded through Baghdad were ivory, soap, honey, and diamonds. People in Baghdad made and exported silk, glass, tiles, and paper. The

central location and lively trade culture of the city made a lively exchange of ideas possible as well.

A map of the extent of the Abbasid Dynasty from 750 to 1258. Extent of Abbasid dynasty is shown in red and covers most of the modern-day Middle East and North Africa.

A map of the extent of the Abbasid Dynasty from 750 to 1258. Image credit: Wikimedia

Baghdad attracted many people, including scholars, to live within its borders. To get a sense of what living in the newly constructed city was like, here's an excerpt from the writings of Arab historian and biographer, Yakut al-Hamawi, describing Baghdad in the tenth century:

The city of Baghdad formed two vast semi-circles on the right and left banks of the Tigris, twelve miles in diameter. The numerous suburbs, covered with parks, gardens, villas, and beautiful promenades, and plentifully supplied with rich bazaars, and finely built mosques and baths, stretched for a considerable distance on both sides of the river. In the days of its prosperity the population of Baghdad and its suburbs amounted to over two [million]! The palace of the Caliph stood in the midst of a vast park several hours in circumference, which beside a menagerie and aviary comprised an enclosure for wild animals reserved for the chase. The palace grounds were laid out with gardens and adorned with exquisite taste with plants, flowers, and trees, reservoirs and fountains, surrounded by sculpted figures. On this side of the river stood the palaces of the great nobles. Immense streets, none less than forty cubits wide, traversed the city from one end to the other, dividing it into blocks or quarters, each under the control of an overseer or supervisor, who looked after the cleanliness, sanitation and the comfort of the inhabitants.

Tenth-century historian Yakut al-Hamawi, from *Lost History* 60-61

Pursuit of knowledge

Abbasid Caliphs Harun al-Rashid and his son, al-Ma'mun, who followed him, established a **House of Wisdom** in Baghdad—a dedicated space for scholarship. The House of Wisdom increased in use and prestige under al-Ma'mun's rule, from 813 to 833. He made a special effort to recruit famous scholars to come to the House of Wisdom. Muslims, Christians, and Jews all collaborated and worked peacefully there.

Scholars at an Abbasid library. Image credit: Wikimedia

The translation movement

Caliphs like al-Rashid and al-Ma'mun directly encouraged a **translation movement,** a formal translation of scholarly works from Greek into Arabic. The Abbasid rulers wanted to make Greek texts, such as Aristotle's works, available to the Arab world. Their goal was to translate as many of these famous works as possible in order to have a comprehensive library of knowledge and to preserve the philosophies and scholarship of Greece. The Abbasids aimed to have philosophy, science, and medicine texts translated. In addition to Arab Muslim scholars, Syrian Christians translated Syriac texts into Arabic as well.

Why were the Abbasids so interested in a massive translation undertaking? In addition to their desire to have a comprehensive library of knowledge and the *Qur'an*'s emphasis on learning as a holy activity, they also had a practical thirst for medical knowledge. The dynasty was facing a demand for skilled doctors—so having as much knowledge as possible for them to access was a must.

One way the Abbasid dynasty was able to spread written knowledge so quickly was their improvements on printing technology they had obtained from the Chinese; some historians believe this technology was taken after the Battle of Talas between the Abbasid Caliphate and the Tang Dynasty in 751. The Chinese had guarded paper making as a secret, but when the Tang lost the battle, the Abbasids captured knowledgeable paper makers as prisoners of war, forcing them to reproduce their craft.

In China, papermaking was a practice reserved for elites, but the Arabs learned how to produce texts on a larger scale, establishing paper mills which made books more accessible. In turn, Europeans eventually learned these papermaking and producing skills from Arabs.

Bust of Aristotle.

Bust of Aristotle. Image credit: Wikimedia

Abbasid advances

During the Golden Age of Islam, Arab and Persian scholars—as well as scholars from other countries—were able to build on the information they translated from the Greeks and others during the Abbasid Dynasty and forge new advances in their fields. Ibn al-Haythm

invented the first camera and was able to form an explanation of how the eye sees. Doctor and philosopher Avicenna wrote the *Canon of Medicine*, which helped physicians diagnose dangerous diseases such as cancer. And Al-Khwarizmi, a Persian mathematician, invented algebra, a word which itself has Arabic roots.

Portrait of Al-Khwarizmi.

Portrait of Al-Khwarizmi. Image credit: Wikimedia

ʿ**Abbasid caliphate**, second of the two great dynasties of the Muslim empire of the caliphate. It overthrew the Umayyad caliphate in 750 CE and reigned as the Abbasid caliphate until it was destroyed by the Mongol invasion in 1258.

The name is derived from that of the uncle of the Prophet Muhammad, al-ʿAbbās (died c. 653) of the Hashemite clan of the Quraysh tribe in Mecca. From about 718, members of his family worked to gain control of the empire from the Umayyads and, by skillful propaganda, won much support, especially from Shiʿi Arabs and Persians in Khorāsān. Open revolt in 747, under the leadership of Abū Muslim, led to the defeat of Marwān II, the last Umayyad caliph, at the Battle of the Great Zab River (750) in Mesopotamia and to the proclamation of the first Abbasid caliph, Abū al-ʿAbbās al-Saffāḥ.

Islamic world: The third fitnah

…particularly ambitious Hāshimite family, the ʿAbbāsids. The ʿAbbāsids, who were kin but not descendants of Muhammad, claimed also to have...

Under the Abbasids the caliphate entered a new phase. Instead of focusing, as the Umayyads had done, on the West—on North Africa, the Mediterranean, and southern Europe—the caliphate now turned eastward. The capital was moved to the new city of Baghdad, and events in Persia and Transoxania were closely watched. For the first time, the caliphate was not coterminous with Islam. In Egypt, North Africa, Spain, and elsewhere, local dynasties claimed caliphal status. With the rise of the Abbasids, the base for influence in the empire became international, emphasizing membership in the community of believers rather than Arab nationality. Since much support for the Abbasids came from Persian converts, it was natural for the Abbasids to take over much of the Persian (Sasanian) tradition of government. Support by pious Muslims likewise led the Abbasids to acknowledge publicly the embryonic Islamic law and to profess to base their rule on the religion of Islam.

Between 750 and 833 the Abbasids raised the prestige and power of the empire, promoting commerce, industry, arts, and science, particularly during the reigns of al-Manṣūr, Hārūn al-Rashīd, and al-Maʾmūn. Their temporal power, however, began to decline when al-Muʿtaṣim introduced non-Muslim Berber, Slav, and especially Turkish mercenary forces into his personal army. Although these troops were converted to Islam, the base of imperial unity through religion was gone, and some of the new army officers quickly learned to control the caliphate through assassination of any caliph who would not accede to their demands.

The power of the army officers had already weakened through internal rivalries when the Iranian Būyids entered Baghdad in 945, demanding of al-Mustakfī (944–946) that they be recognized as the

sole rulers of the territory they controlled. This event initiated a century-long period in which much of the empire was ruled by local dynasties. In 1055 the Abbasids were overpowered by the Seljuqs, who took what temporal power may have been left to the caliph but respected his position as the titular leader, restoring the authority of the caliphate, especially during the reigns of al-Mustarshid (1118–35), al-Muqtafī, and al-Nāṣir. Soon after, in 1258, the dynasty fell during a Mongol siege of Baghdad.

Rise Of The Abbasid Empire (C. 750 CE)

The Umayyad dynasty was overthrown by another family of Meccan origin, the Abbasids, in 750 CE. The Abbasids distinguished themselves from the Umayyads by attacking their moral character and administration. In particular, they appealed to non-Arab Muslims, known as mawali, who remained outside the kinship-based society of the Arabs and were perceived as a lower class within the Umayyad empire. The Abbasid dynasty descended from Muhammad's youngest uncle, Abbas ibn Abd al-Muttalib (566–653 CE), from whom the dynasty takes its name. Muhammad ibn 'Ali, a great-grandson of Abbas, began to campaign for the return of power to the family of Muhammad, the Hashimites, in Persia during the reign of Umar II, an Umayyad caliph who ruled from 717–720 CE.

Coin of the Abbasids, Baghdad, Iraq, 765 CE.

Power In Baghdad

The Abbasids moved the empire’s capital from Damascus, in modern-day Syria, to Baghdad, in modern-day Iraq, in 762 CE. The Abbasids had depended heavily on the support of Persians in their overthrow of the Umayyads, and the geographic power shift appeased the Persian mawali support base. Abu al-‘Abbas’s successor, Al-Mansur, welcomed non-Arab Muslims to his court. While this helped integrate Arab and Persian cultures, it alienated the Arabs who had supported the Abbasids in

their battles against the Umayyads. The Abbasids established the new position of vizier to delegate central authority, and delegated even greater authority to local emirs. As the viziers exerted greater influence, many Abbasid caliphs were relegated to a more ceremonial role as Persian bureaucracy slowly replaced the old Arab aristocracy.

The Abbasids, who ruled from Baghdad, had an unbroken line of caliphs for over three centuries, consolidating Islamic rule and cultivating great intellectual and cultural developments in the Middle East in the Golden Age of Islam. By 940 CE, however, the power of the caliphate under the Abbasids began waning as non-Arabs gained influence and the various subordinate sultans and emirs became increasingly independent.

Map of the Abbasid Caliphate at its greatest extent, c. 850 CE. The Abbasid dynasty ruled as caliphs from their capital in Baghdad, in modern Iraq, after taking over authority of the Muslim empire from the Umayyads in 750 CE.

Decline Of The Abbasid Empire

The Abbasid leadership worked to overcome the political challenges of a large empire with limited communication in the last half of the 8th century (750–800 CE). While the Byzantine Empire was fighting Abbasid rule in Syria and Anatolia, the caliphate’s military operations were focused on internal unrest. Local governors had begun to exert greater autonomy, using their increasing power to make their positions hereditary. Simultaneously, former supporters of the Abbasids had broken away to create a separate kingdom around Khorosan in northern Persia.

Several factions left the empire to exercise independent authority. In 793 CE, the Shi'a (also called Shi'ite) dynasty of Idrisids gained authored over Fez in Morocco. The Berber Kharijites set up an independent state in North Africa in 801 CE. A family of governors under the Abbasids became increasingly independent until they founded the Aghlabid Emirate in the 830s. Within 50 years, the Idrisids in the Maghreb, the Aghlabids of Ifriqiya, and the Tulunids and Ikshidids of Misr became independent in Africa.

By the 860s governors in Egypt set up their own Tulunid Emirate, so named for its founder Ahmad ibn Tulun, starting a dynastic rule separate from the caliph. In the eastern territories, local governors decreased their ties to the central Abbasid rule. The Saffarids of Herat and the Samanids of Bukhara seceded in the 870s to cultivate a more Persian culture and rule. The Tulinid dynasty managed Palestine, the Hijaz, and parts of Egypt. By 900 CE, the Abbasids controlled only central Mesopotamia, and the Byzantine Empire began to reconquer western Anatolia.

The Fatimid Caliphate (909–1171 CE)

Several factions challenged the Abbasids' claims to the caliphate. Most Shi'a Muslims had supported the Abbasid war against the Umayyads because the Abbasids claimed legitimacy with their familial connection to Muhammad, an important issue for Shi'a. However, once in power, the Abbasids embraced Sunni Islam and disavowed any support for Shi'a beliefs.

The Shi'a Ubayd Allah al-Mahdi Billah of the Fatimid dynasty, who claimed descent from Muhammad's daughter, declared himself Caliph in 909 CE and created a separate line of caliphs in North Africa. The Fatimid caliphs initially controlled Morocco, Algeria, Tunisia, and Libya, and they expanded for the next 150 years, taking Egypt and Palestine. The Abbasid dynasty finally challenged Fatimid rule, limiting them to Egypt. By the 920s, a Shi'a sect that only recognized the first five Imams and could trace its roots to Muhammad's daughter Fatima, took control of Idrisi and then Aghlabid domains. This group advanced to Egypt in 969 CE, establishing their capital near Fustat in Cairo, which they built as a bastion of Shi'a learning and politics. By 1000 CE, they had become the chief political and ideological challenge to Abbasid Sunni Islam. At this point, the Abbasid dynasty had fragmented into several governorships that were mostly autonomous, although they official recognized caliphal authority from Baghdad. The caliph himself was under "protection" of the Buyid Emirs, who possessed all of Iraq and western Iran, and were quietly Shi'a in their sympathies.

The Fatimid Caliphate at its height, c. 969 CE. The Fatimid dynasty broke from the Abbasids in 909 CE and created separate lines of caliphs in Morocco, Algeria, Tunisia, Libya, Egypt, and Palestine until 1171 CE.

Outside Iraq, all the autonomous provinces slowly became states with hereditary rulers, armies, and revenues. They operated under only nominal caliph authority, with emirs ruling their own provinces from their own capitals. Mahmud of Ghazni took the title of “sultan,” instead of “emir,” signifying the Ghaznavid Empire’s independence from caliphal authority, despite Mahmud’s ostentatious displays of Sunni orthodoxy and ritual submission to the caliph. In the 11th century, the loss of respect for the caliphs continued, as some Islamic rulers no longer mentioned the caliph’s name in the Friday khutba, or struck it off their coinage. The political power of the Abbasids largely ended with the rise of the Buyids and the Seljuq Turks in 1258 CE. Though lacking in political power, the dynasty continued to claim authority in religious matters until after the Ottoman conquest of Egypt in 1517.

The Abbasid Caliphate

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In the Middle East, during these centuries, the ‘Abbasids, after their victory over the Umayyads, had transformed the Umayyads’ Arab empire into a multinational Muslim empire. They moved the capital of the empire from Syria to Iraq, where they built a new capital, Baghdad, from which, during the next five centuries, they would influence many of the main events of Islamic history. In the early period of ‘Abbasid rule, al-Mansur, the second caliph of the dynasty, continued the reorganization of the administration of the empire along the lines that had been laid down by his Umayyad predecessor, ‘Abd al-Malik. Much of the ‘Abbasid administration, for example, was left in the hands of well-educated Persian civil servants, many of whom came from families that had traditionally served the Sassanid kings. The important office of wazir or vizier, chief counselor, may well have developed from Sassanid models. The vizier was much more than an advisor; indeed, when the caliph was weak, a capable vizier became the most powerful man in the empire. The creation of the office of the vizier was only one of the innovations the ‘Abbasids brought to statecraft. Another was the development of the Umayyad postal system into an efficient intelligence service; postmasters in outlying provinces were the eyes and ears of the government and regular reports were filed with the central government on everything from the state of the harvest to the doings of dissident sects. Under the ‘Abbasids too a whole literature was created for the use and training of the clerical classes that had come into being. Since all government business was by now transacted in Arabic, manuals of correct usage were written for the instruction of non-Arabic speakers who had found government employment. There was also a vast literature on the correct deportment of princes, as well as anthologies of witty sayings and anecdotes with which to enliven one’s epistolary style.

In some ways, the ‘Abbasids were more fortunate than the Umayyads. When, for example, al-Mansur died in 775 after a reign of twenty years, his son, al-Mahdi, inherited a full treasury and an empire that was more devoted to trade than war.

The developments in trade, indeed, are among the achievements of the ‘Abbasids that are too often overlooked. Because Islamic rule unified much of the Eastern world, thus abolishing many boundaries, trade was freer, safer, and more extensive than it had been since the time of Alexander the Great. Muslim traders, consequently, established trading posts as far away as India, the Philippines, Malaya, the East Indies, and China.

From the eighth to the eleventh centuries this trade was largely concerned with finding and importing basic necessities- grain, metals, and wood. To obtain them, of course, the Muslims had to export too, often using the imports from one region as exports to another: pearls from the Gulf, livestock from the Arabian Peninsula (particularly Arabian horses and camels), and – one of the chief products – cloth. The Muslims also traded medicines, an offshoot of ‘Abbasid advances in medical science, as well as paper and sugar.

This expansion of commercial activity led to other developments too. One was a system of banking and exchange so sophisticated that a letter of credit issued in Baghdad could be honored in Samarkand in Central Asia or Kairouan in North Africa. The demands of trade also generated the development of crafts. From Baghdad’s large urban population, for example, came craftsmen of every conceivable sort: metalworkers, leatherworkers, bookbinders, papermakers, jewelers, weavers, druggists, bakers, and many more. As they grew in importance to the economy these craftsmen eventually organized themselves into mutual-benefit societies which in some ways we’re similar to later Western guilds and which offered many social services: lodging travelers, engaging in pious works such as caring for orphans, and endowing schools. Because of this growth in commerce the ‘Abbasids also developed a system by which a muhtasib, an inspector made sure that proper weights and measures were given and that dishonest practices of all sorts were avoided.

Arabic poetry reached its greatest heights in the Abbasid era, especially before the loss of central authority and the rise of the Persianate dynasties. Writers like Abu Tammam and Abu Nuwas were closely connected to the caliphal court in Baghdad during the early 9th century, while others such as al-Mutanabbi received their patronage from regional courts.

Learning under the Abassid Dynasty

The reigns of Harun al-Rashid (786 – 809) and his successors fostered an age of great intellectual achievement. In large part this was the result of the schismatic forces that had undermined the Umayyad regime, which relied on the assertion of the superiority of Arab culture as part of its claim to legitimacy, and the Abassids’ welcoming of support from non-Arab Muslims.

A number of medieval thinkers and scientists living under Islamic rule, many of them non-Muslims or heretical Muslims, played a role in transmitting Greek, Hindu, and other pre-Islamic knowledge to the Christian West. They contributed to making Aristotle known in Christian Europe. In addition, the period saw the recovery of much of the Alexandrian mathematical, geometric and astronomical knowledge, such as that of Euclides and Claudius Ptolemy, and these recovered mathematical methods were later enhanced and developed by other Islamic scholars, notably by Al-Biruni, and Abu Nasr Mansur, who is thought to have first derived the Cosine rule and applied it to spherical geometry.

Three speculative thinkers, the Persians al-Kindi, al-Farabi, and Avicenna, combined Aristotelianism and Neoplatonism with other ideas introduced through Islam.

The End of the Caliphate

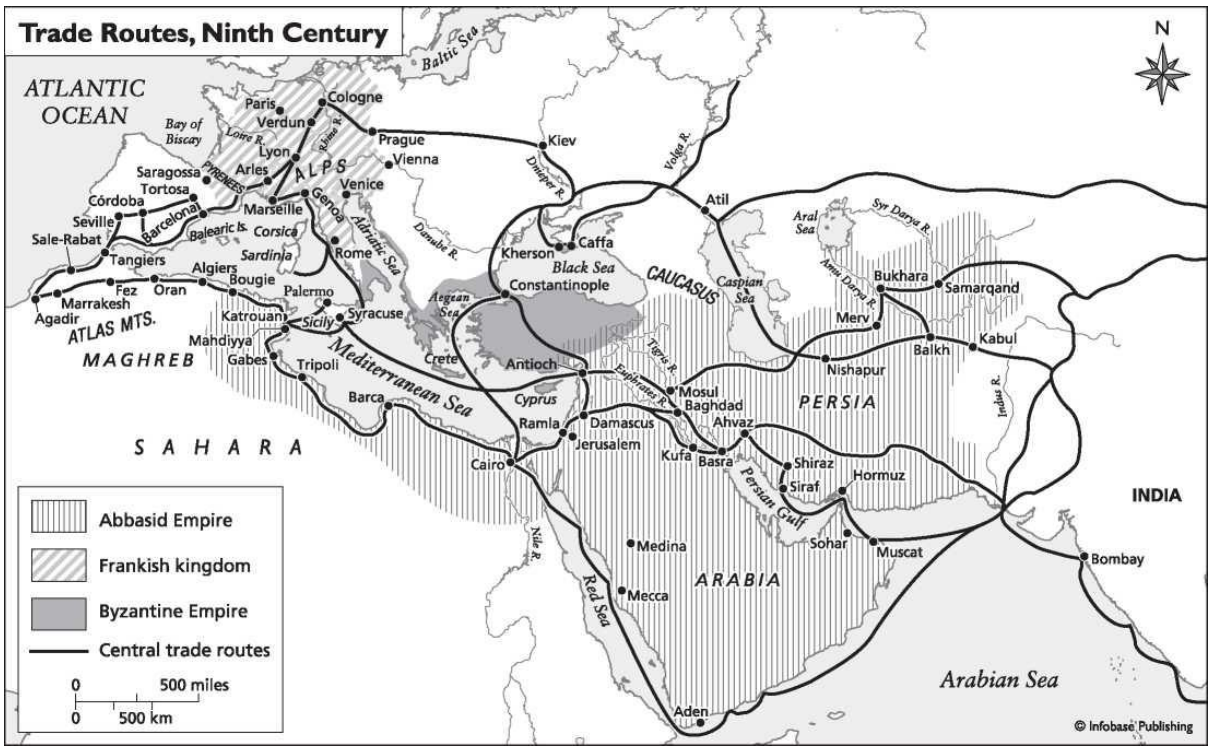
Hulagu Khan sacked Baghdad on (February 10, 1258), causing great loss of life. Al-Musta'sim, the last reigning Abbasid caliphate in Baghdad was then executed on February 20, 1258. The Abbasids still maintained a feeble show of authority, confined to religious matters, in Egypt under the Mamelukes, but the dynasty finally disappeared with Motawakkil III, who was carried away as a prisoner to Constantinople by Selim I.

Trade and Agriculture under the Abbasids

Prior to the civil war, during the reign of al-Rashid, Abbasid prosperity reached such heights that the real motors of imperial expansion may not have been as much military and political in nature as they were economic. Starting from the late eighth century onward, trade and agriculture connected the empire with the entire known world through networks of land and sea routes. By the 13th century, it is estimated that empire-wide trade had become the vital linchpin of a world system, tying the eastern Mediterranean to the Indian Ocean and both of them to China. The Abbasid Empire, a key player in world trade, was at the heart of this world system, if not its chief conduit, as Muslim, Christian, and Jewish merchants operating under its patronage bartered, bought, and used credit to ship textiles, food products, and livestock all over the empire and far beyond. Among the first items to be traded were wood, metal, sugar, and paper.

One of the chief reasons for the efficiency and success of longdistance trade, whether by land or sea, was the unity imposed by Islamic rule. That unity was established from the very first outpouring of Muslim troops into the fertile and cultivable lands of the East Mediterranean and North Africa. Later on, Umayyad and then Abbasid control of the Mediterranean Sea and Indian Ocean created a clearly defined and homogeneous area for transempire trade, unified by Islamic customs and mores and tied by the Arabic language. However, historians have pointed out that while the Abbasid Empire at its height controlled a large proportion of the known world, there were at least two other economic zones that cooperated as well as came into conflict with the Muslim realm, and those were China and the yet-to-be unified and largely underdeveloped European states.

Sociologist Janet Abu Lughod has written that there were striking similarities between economic systems in Asia, the Islamic world, and the West, and that contrary to the belief that capitalism or a money-driven economy only developed in Europe, both the Islamic empire



And China had created capital-intensive economies that competed fairly well with each other (Abu Lughod 1989, ISIS). The Abbasids and, later on, the Italian merchant city-states minted coins in their rulers' names; in China, paper money was introduced in the early ninth century. Credit was widely available so that traders could buy in one place and guarantee payment in another. Banking appeared initially in the Islamic world and was later copied by Europeans: members of merchant families worked for family firms in disparate regions of the world and guaranteed long-term credit and cash payments in a premodern system of family banking. As a result, Muslim traders were able to establish trading posts as far away as India, the Philippines, Malaya, the East Indies, and China. Abu Lughod also shows that even in small Islamic city-states, there was a controlling oligarchy at the head that monopolized trade and organized traders.

An Abbasid-era dirham, the unit of currency, from Baghdad ca. 786-809 (Kenneth V. Pilon/Shutterstock)

According to historian K. N. Chaudhuri, there were four great Asian commodities bought and exchanged in medieval times: silk, porcelain, sandalwood, and black pepper (Chaudhuri 1985, 39). Other products complemented transregional trade, such as shipments of horses from the Gulf; incense from southern Arabia; and ivory, cloth, and metal. There were many important port cities that facilitated this regional trade. Until the advent of the Abbasid Empire, trade was mostly land based and carried out by camel caravans passing from ports such as Jeddah (western Arabia) to Egypt and Yemen. After the conquest of the eastern Mediterranean and the Indian Ocean, Abbasid merchants were able to use the sea to great effect. New port towns developed or, in some cases, were redeveloped from small coastal communities to large trading emporia. For instance, Basra in southern Iraq, although built as a garrison town for Islamic troops, quickly became a major trans-shipment route for goods from Syria, Baghdad, and the coastal Gulf islands to India. Until the 20 th century, Basra remained the main port of shipment to Bombay (present-day Mumbai) and other cities in

Western India. Other famous commercial centers in the Abbasid era were Siraf, a short distance away from Basra on the Persian side of the Gulf, Hormuz at the tip, Sohar in Oman, and Aden in Yemen. There were also the famous East African ports of Kilwa and Mombasa, from which sailors traveled across the Indian Ocean in ships that had been constructed without the use of a single nail.

Who was Ibn al-Haytham

Creative representation of Ibn al-Haytham by the artist Ali Amro

Born around a thousand years ago in present day Iraq, Al-Hasan Ibn al-Haytham (known in the West by the Latinised form of his first name, initially “Alhacen” and later “Alhazen”) was a pioneering scientific thinker who made important contributions to the understanding of vision, optics and light. His methodology of investigation, in particular using experiment to verify theory, shows certain similarities to what later became known as the modern scientific method. Through his *Book of Optics* (Kitab al-Manazir) and its Latin translation (De Aspectibus), his ideas influenced European scholars including those of the European Renaissance. Today, many consider him a pivotal figure in the history of optics and the “Father of modern Optics”.
Ibn al-Haytham was born during a creative period known as the golden age of Muslim civilisation that saw many fascinating advances in science, technology and medicine. In an area that spread from Spain to China, inspirational men and women, of different faiths and cultures, built upon knowledge of ancient civilisations, making discoveries that had a huge and often underappreciated impact on our world.

الهيثم بن الحسن

Ibn al-Haytham, pioneering scientist

Ibn al-Haytham’s work was remarkable for its emphasis on proof and evidence. He is known to have said:

“If learning the truth is the scientist’s goal… then he must make himself the enemy of all that he reads. ” By this he meant it was essential to conduct experiments to test what is written rather than blindly accepting it as true.
Ibn al-Haytham was born in the year 965 in Basra, and died in about 1040 in Cairo. He was one of the earliest scientists to study the characteristics of light and the mechanism/process of vision. He sought experimental proof of his theories and ideas. During many years living in Egypt, ten of which were spent under what we may now call protective custody (house arrest), he composed one of his most celebrated works, the Kitab al-Manazir, whose title is commonly translated into English as *Book of Optics* but more properly has the broader meaning *Book of Vision*.

Ibn al-Haytham made significant advances in optics, mathematics and astronomy. His work on optics was characterised by a strong emphasis on carefully designed experiments to test theories and hypotheses. In that regard he was following a procedure somewhat similar to the one modern scientists adhere to in their investigative research.

Ibn al-Haytham experimented to prove that we see because light from objects travels in a straight line into our eyes.

Different views about how the process of vision could be explained had been in circulation for centuries mainly among classical Greek thinkers. Some said rays came out of the eyes, while others thought something entered the eyes to represent an object. But it was the 11th-century scientist Ibn al-Haytham who undertook a systematic critique of these ideas about vision in order to demonstrate by both reason and experiment that light was a crucial, and independent, part of the visual process. He thus concluded that vision would only take place when a light ray issued from a luminous source or was reflected from such a source before it entered the eye.

Ibn al-Haytham is credited with explaining the nature of light and vision, through using a dark chamber he called "Albeit Almuzlim", which has the Latin translation as the "*camera obscura";* the device that forms the basis of photography. [IYL2015 Call to action]
Out of the 96 books he is recorded to have written; only 55 are known to have survived. Those related to the subject of light included: *The Light of the Moon, The Light of the Stars, The Rainbow and the Halo*, *Spherical Burning Mirrors*, *Parabolic Burning Mirrors*, *The Burning Sphere*, *The Shape of the Eclipse*, *The Formation of Shadows*, *Discourse on Light*, as well as his masterpiece, *Book of Optics*. Latin translations of some of his works are known to have influenced important Medieval and European Renaissance thinkers like Roger Bacon, René Descartes and Christian Huygens, who knew him as "Alhazen". [IYL2015 Call to action] The crater Alhazen on the Moon is named in his honour, as is the asteroid 59239 Alhazen.

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Ibn al-Haytham was born after centuries of intense activity in mathematics, astronomy, optics, and other physical sciences. Although he was preceded by great pioneers such as Aristotle, Euclid, Ptolemy, Al-Kindi, Banu Musa, Thabit ibn Qurra, Ibrahim ibn Sinan, Al-Quhi, and Ibn Sahl, his work was distinguishably novel.Ibn al-Haytham was born after centuries of intense activity in mathematics, astronomy, optics, and other physical sciences. Although he was preceded by great pioneers such as Aristotle, Euclid, Ptolemy, Al-Kindi, Banu Musa, Thabit ibn Qurra, Ibrahim ibn Sinan, Al-Quhi, and Ibn Sahl, his work was distinguishably novel.

Ibn al-Haytham's world

Ibn al-Haytham stands out in this long list as the leading figure in both the science of light and science of vision because his work depended so heavily on experimentally-based demonstrations. His work was important for two reasons:

- Ibn al-Haytham showed that a person saw an object by something entering the eye rather than leaving the eye. Before Ibn al-Haytham, both ideas had been put forward by other scientists and scholars writing in Greek, Latin, Arabic and other languages.
- Ibn al-Haytham used systematic experimentation in his work on optics. Ptolemy, working in the Greek based culture of second century Alexandria, had used a similar approach in his work on optics. However, Ibn al-Haytham's work was distinguishably novel.

Ibn al-Haytham greatly benefitted from being able to use the work of previous generations of scholars that had been translated into Arabic over a period of over two-three hundred years under the patronage of various Muslim rulers and wealthy aristocrats.

This included direct translation of many scientific works from Greek, Syriac and Persian which themselves were the heirs to the great scientific traditions of Ancient Egypt, Babylonia, India and China. In turn, Ibn al-Haytham's work proved to be equally influential on scholars writing in Latin during the Middle Ages and the Renaissance. [IYL2015 Call to action] In this way, he formed part of the intellectual legacy that Latin scholars derived from Muslim civilisation from the thirteenth century onwards including the Renaissance and Early Modern periods.

With new scientific insights such as those of Ibn al-Haytham, as well as medical marvels, astronomical observations, new maps, libraries and advanced schools that taught various mathematical subjects, Muslim civilisation made significant and crucial contribution to the accumulation of scientific knowledge in the pre-modern age that changed the ancient world. These past discoveries have shaped our homes, schools, hospitals, towns, the way we trade, travel and our understanding of the universe.

The dramatic story of Ibn al-Haytham's life

The story of Ibn al-Haytham's life and discoveries is truly extraordinary. Born in the year 965 in Basra, he made significant contributions to our understanding of both vision and light, bringing important new insights into both of these subjects. His brilliant breakthrough, however, came at a time of the darkest episode of his life.

Ibn al-Haytham grew up at a time when schools and libraries flourished in the Muslim civilisation. Students had access to highly trained scholars who could teach a variety of subjects, including law, literature, medicine, mathematics, geography, history and art. Debates and discourses were popular and took place in Arabic. Scholars enjoyed discussing ideas from newly translated ancient manuscripts.

Ibn al-Haytham's scholarly reputation spread well beyond Basra.

He is known to have said, *"If I would be given the chance, I would implement a solution to regulate the Nile flooding"*. This claim reached al-Hakim, the Fatimid caliph in Egypt who invited him to Cairo. Confident of his own abilities, Ibn al-Haytham boasted that he would tame the great Nile River by building a dam and reservoir. But when he saw the extent of the challenge and the marvellous remains of ancient Egypt on the river banks, he reconsidered his own boast thinking. If such a huge project could be done, he reasoned, it would have been done by the brilliant builders of the past who had left us such fantastic architectural relics. He returned to Cairo to inform the caliph that his solution was not possible.
Knowing that that particular caliph did not entertain failure and that his life would be at risk if he were to disappoint him, Ibn al-Haytham feigned madness to avoid the caliphs' wrath. He knew that Islamic law would protect a mad person from bearing responsibility for his failure. Despite the caliph's wild swings of mood, he nevertheless abided by Islamic law. Rather than executing or expelling Ibn al-Haytham from Cairo, the caliph decided to put the scholar under permanent protective custody. That was required by law in order to ensure his safety and that of others. Ibn al-Haytham was placed under what amounted to house arrest, far from the lively discourses and debates to which he was accustomed.

Yet it just as life was at its bleakest moment. Ibn al-Haytham might have made the dazzling discovery for which he is best remembered. Legend says, one day he saw light shining through a tiny pinhole into his darkened room – projecting an image of the world outside onto the opposite wall. Ibn al-Haytham realized that he was seeing images of objects outside that were lit by the Sun. From repeated experiments he concluded that light rays travel in straight lines, and that vision is accomplished when these rays pass into our eyes.

Ibn al-Haytham confirmed his discovery by experimenting with his dark room (calling it Albait Almuzlim)- translated into Latin as *camera obscura*, which simply means "dark room".
After many additional experiments using special apparatus of lenses and mirrors which he built, he laid down his new ideas about light and vision in his seven volumes *Book of Optics*. He was released from prison on the death (disappearance) of the caliph.
Ibn al-Haytham died at the age of 74 in 1040. His greatest work, the *Book of Optics*, had perhaps begun from the confines of imprisonment and was completed around the year 1027- but its impact rippled out across the whole world. Both his optical discoveries, and the fact that they had been validated using hands-on experiments, would influence those who came after him for centuries.
So how did that influence shine its light on later generations? In the early 12th century, Toledo in Spain was the focus of a huge effort to translate Arabic books into Latin. Christian, Jewish and Muslim scholars flocked to the city, where they lived alongside one another and worked together to translate the old knowledge into Latin and then into other European languages. Ibn al-Haytham's *Book of Optics* as well as some of his other scientific works were translated into Latin making them available to European scientists including Roger Bacon, Johannes Kepler and even Leonardo da Vinci.

How Ibn al-Haytham changed the course of science

Ibn al-Haytham's discoveries in optics and vision overturned centuries of misunderstanding. In his experiments, he observed that light coming through a tiny hole travelled in straight lines and projected an image onto the opposite wall.
But he realised that light entering the eye was only the first step in seeing. He built on the work of Greek physician Galen who had provided a detailed description of the eye and the optic pathways. Today the oldest-known drawing of the nervous system is from Ibn al-Haytham's *Book of Optics*, in which the eyes and optic nerves are illustrated. [IYL2015 Call to action]

Ibn al-Haytham suggested that only the light rays that hit the surface of the eye head-on would pass into the eye, creating a representation of the world. It was Kepler in the sixteenth century who corrected this and proposed that the object of sight – what is seen comes from both perpendicular and angular rays that hit the eye to form an inverted image on the retina. [IYL2015 Call to action]

Among Ibn al-Haytham's other insights was his understanding of the crucial role of visual contrast. For example, he realised the colour of an object depends on the colour of the surroundings, and that a contrast of brightness levels explains why we can't see the stars during daytime.

Ibn al-Haytham also subscribed to a method of empirical analysis to accompany theoretical postulates that is similar in certain ways to the scientific method we know today. He realised that the senses were prone to error, and he devised methods of verification, testing and experimentation to uncover the truth of the natural phenomena he perceived. Up until this time, the study of physical phenomena had been an abstract activity with occasional experiments.

In search of evidence, Ibn al-Haytham studied lenses, experimented with different mirrors: flat, spherical, parabolic, cylindrical, concave and convex. His practical results were clear:

"Visual objects seen by us through light refraction – across thick material such as water and glass – are bigger than their real size", he wrote.
After his death, Ibn al-Haytham's writings were more influential in Latin than Arabic. The only significant work in Arabic that built on Ibn al-Haytham's ideas was produced in the early part of the fourteenth century (in present day Iran) by Kamal al-Din al-Farisi, who was himself a brilliant scientific thinker.

When Ibn al-Haytham's *Book of Optics* was translated into Latin, it had great influence and was widely studied/read. It was published as a print edition in 1572 so that it could be made more easily available. The Polish astronomer Johannes Hevelius chose to honour Ibn al-Haytham, alongside Galileo, in his most famous work on the Moon, *Selenographia, published in 1647*.

Polish astronomer Johannes Hevelius honoured Ibn al-Haytham's contribution to optics. This illustration is from Hevelius' s famous Selenographia. Hevelius puts Ibn al-Haytham as the equal of Galileo in this illustration from his book the first to chart the Moon's surface as seen through a telescope.

Some questions Ibn al-Haytham raised remained unsolved for a thousand years. One such was called ‘Alhazen’s problem’ for which he offered a geometrical solution: “Given a light source and a spherical mirror, find the point on the mirror where the light will be reflected to the eye of an observer”. Ibn al-Haytham solved this problem geometrically but it remained unsolved using algebraic methods until it was finally solved in 1997 by the Oxford mathematician Peter M Neumann.

And yet, some mysteries remain. Ibn al-Haytham affirmed that an optical illusion was the reason for the Moon appearing so big when it’s low in the sky close to the horizon in comparison to its size when at the zenith- and still no one knows why this happens. This, and other questions in science, has yet to be solved – leaving a legacy of intrigue for us to tackle today.

Ibn al-Haytham’s scientific method

alhacen.jpg

Hasan Ibn al-Haytham (Latinized Alhazen)

During the International Year of Light 2015(link is external), Ibn al-Haytham was celebrated at UNESCO as a pioneer of modern optics. He was a forerunner to Galileo as a physicist, almost five centuries earlier, according to Prof. S.M. Razaullah Ansari (India). Also known as Alhazen, this brilliant Arab scholar from the 10th – 11th century, made significant contributions to the principles of optics, astronomy and mathematics, and developed his own methodology: experimentation as another mode of proving the basic hypothesis or premise.

by Shaikh Mohammad Razaullah Ansari

Abū Ali al-Ḥasan Ibn al-Haytham al-Baṣrī (965-1040), known in European Middle Ages by the name of Alhazen, was called among Arab scholars as ‘Second Ptolemy’ (Baṭlamyūs Thānī). He was actually a scholar of many disciplines: Mathematics, physics, mechanics, astronomy, philosophy and medicine. He was one of the senior most member of the Muslim scholars’ trio during 10th -11th centuries, the other two were al-Bīrūnī (973-1048) and Ibn Sīnā (980–1037).

From Basra, Ibn al- Haytham shifted to Cairo, where the Fatimid Caliph al-Ḥākim had invited him. The Caliph was a great patron of scientist-scholars, he got built an observatory for the astronomer Ibn Yūnus (d.1009) and he founded a library Dār al–‘Ilm, whose fame almost equaled that of its

precursor at Baghdad, Bayt al- Ḥikma(the House of Wisdom), established by the Abbasid Caliph al-Mā'mūn (reigned 813 – 833).

Ibn al-Haytham was a prolific writer. According to his own testimony, he wrote 25 works on mathematical sciences, 44 works on (Aristotelian) physics and metaphysics, also on meteorology and psychology. Moreover, his autobiographical sketch indicates clearly that he studied very thoroughly Aristotle's (natural) philosophy, logic and metaphysics of which he gave a concise account.

His most famous book in Arabic was on optics, Kitāb fī al-Manāẓir, in Latin Opticae Thesaurus, which was translated anonymously in the 12th /13th century. It deals, in seven volumes, with experimental and mathematical study of the properties of light. Ibn al-Haytham's Discourse on Light and tracts On the Light of Stars, On the Light of the Moon and On the Halo and the Rainbow are the main sources from which his working method can be deduced.

In the sequel, I exemplify the main features of Ibn al-Haytham's method as the design of experiment in order to test a hypothesis, and not using it just for observation or discovery as used by his predecessors.

Scientific method: what does it mean?

The two well known characteristics of the modern scientific method are the theory building and experimentation.While the former is actually a sort of mathematical modeling of observational facts, the latter is not only just observation of a phenomena experimentally, but also includes in it the experimental proof of a hypothesis regrading the phenomena in question. In other words, an experiment is designed to test the hypothesis on which the mathematical theory is actually based.

Recall here that Einstein in his General Relativity (or Theory of Gravitation) predicted that light bends by a large mass of matter by its gravitation like any matter. This hypothesis or deduction of his theory was tested in 1919, 1922, 1947 and 1952 during total eclipses of the Sun. The light of stars located behind the Sun is bent by the mass of the Sun, and could be observed clearly.

In all textbooks of the western world, the Italian physicist Galileo Galilee (1564–1642) is presented as the father of this scientific method. The historian of science, A.C. Crombie states in Augustine to Galileo (paperback Mercury Books, 1964) : " Galilee combined ... his experimental method with the mathematical abstraction [expressed as mathematical equation] of observed regularities ... from which the observation could be deduced".

The two medieval European scholars who were actually the main predecessors of Galilee are Robert Grosseteste (d.1253), and Roger Bacon (d.1294).

Robert Grosseteste was the teacher of Roger Bacon, whose sources for optics were Euclid, Ibn Sina's Al- Qānūn, and al–Kindī's Optics: Libre de aspectibus, the Arabic text of which is not extant. The Latin translation by the Spanish Gerard of Cremona was carried out in the 12th c. Robert propounded his theory of falsification of causes , i.e. experimental proof of testing rival hypotheses or mathematical models.

Roger Bacon's main scientific work was in optics, with the title Opus Maius , and in the sixth chapter of which Roger exemplified the Scientia Experimentalis, i.e., his theory of science and scientific method. His sources were al–Kindi (d. ca.873) , Ibn Sīnā, Ibn al–Haytham , Ibn Rushd (d. 1198). According to Crombie (Robert Grossteste, and the Origins of Experimental Science, Clarendon Press, Oxford, 1953), " Ibn al-Haytham's few optical writings were translated anonymously [already] at the end of the 12th / beginning of the 13th century".

According to the famous German scholar, Anneliese Maier (1905–1971), who analyzed the thoughts of 14th c. natural philosophers and scholastic science, in his book The Predecessors of Galilei in Fourteenth Century(Rome, 1949), "the scientific revolution should not to be interpreted as a linear historical process [emphasis mine] initiated by Galileo's innovation in mechanics and the increased use of experimentation thereafter". In the 17th century scholars adopted many ideas from their scholastic predecessors.

Testing Hypothesis Experimentally

The following hypotheses were tested by Ibn al-Haytham, for which he devised special experiments for various types of lights: Sunlight, twilight/morning light, reflected light from polished surfaces and from opaque bodies, refracted/transmitted light.

Rule 1. Rectilinear propagation of light irrespective of their source of emission.

Rule 2. “Every point of a luminous object ...radiates light along every straight line ... spherically,... I mean in all direction”. A result of this rule proves that the Sun, and even an artificial light source, radiates light from all its part.

On the basis of his experimental results, Ibn al-Haytham classified light sources into three types: luminous, reflecting and transmitting sources. Consequently, he applied his classification to the moon. In his tract: On the Light of the Moon, he investigated the nature of the moonlight and concluded that “ the experiment ... serve to prove that the mode of transmission from the moon is of the same kind as the already known mode of emission from self-luminous objects”.

In his Discourse on Light, Ibn al-Haytham presented his theory of light and particularly the definition of a physical ray. Besides he presented a dynamic concept of refraction of light, that is light is a movement of sort, with its reduced velocity in a denser medium. Further he went one more step and stated “that the path assumed by a refracted ray ... is always the one which is the easier and quicker”. Thus Ibn al-Haytham anticipated the so-called Fermat’s principle of Least Time (the path taken between two points by a ray of light is the path that can be traversed in the least time). Moreover, he discussed also the relation between light and heat.

Using his own designed instruments for investigating reflection and refraction, Ibn al-Haytham found eight rules of refraction.

Mathematisation of Physical Problems

Recall that Ibn al-Haytham substituted beams of light by straight lines and light sources by surfaces from the points of which straight lines originates in all direction (Rule 2 mentioned above). Despite the fact, that this sort of abstraction was known to his Greek predecessors, yet his major achievement lies actually in investigating the functional relationship between his mathematical abstraction and experiment.

Precisely speaking his methodology was the systematic use of experimentation for individual physical phenomena and at the same time the use of mathematical (or functional) representation of the physical phenomenon in question. For instance, in his theory of refraction, the property of transparency of the medium – today defined by refractive index) is related to with the angle of deviation of the refracted ray. In this sense Ibn al-Haytham was surely a forerunner to Galileo as a physicist, almost five centuries earlier.

Views on Authorities

It is by now quite known that the substitution of geocentric system of planets by heliocentric system of the world, as propounded by Copernicus (d.1543) and following him Galileo’s Book: Dialogue Concerning the Two Chief World Systems, the belief in authorities was undermined and questioned. The final blow to this overthrow came by Rene Descartes (d.1650), with his famous book: Discourse de la Methode (Leiden 1637), in which he addressed those scholars “ who profit solely by their natural pure intellect [and refuse to] have faith merely in ancient books, i.e., without contrasting authority with experience and experiment”.

It is astonishing, that Ibn al-Haytham advocated exactly the same research methodology. In his tract, Doubts on Ptolemy, he wrote:

“Truth is sought for its own sake ... It is not the person who studies the books of his predecessors and gives a free rein to his natural disposition to regard them favourably, who is the seeker after truth. But rather the person who is thinking about them [and] is filled with doubts .. .who follows proof and demonstration rather than the assertion of a man whose natural disposition is characterised by all kind of defects and shortcoming.... A person who studies scientific books with

a view to knowing the truth, ought to turn himself into a hostile critic of everything that he studies ... if he takes this course, the truth will be revealed to him and the flaws ... in the writings of his predecessors will stand out clearly".

To sum up, it may be recalled that Ibn al-Haytham had to concentrate on the refinement and sophistication of antique methods of empirical observations, thereby developing his own methodology: experimentation as another mode of proving the basic hypothesis or premise.

The Irony of Islamic Middle ages

I would like to conclude on a despairing note by pointing to the irony of Islamic Middle ages in which even a practical science of optics remained in oblivion, despite thoroughly researched by Ibn al-Haytham. Strangely enough only one commentary on Ibn al-Haytham's Optics was written in three centuries.

On the other hand, during the so-called 'dark ages' in Europe, Ibn al-Haytham's optical Opus was immortalised by the English poet Geoffrey Chaucer (1320-1400) in "The Squire's Tale(link is external)" (Canterbury Tales):

> *"They spoke of Alhazen and Vitello,*
> *And Aristotle, who wrote, in their lives,*
> *On strange mirrors and optical instruments".*

Here Alocean refers to Ibn al-Haytham's (Alhazen/Alhacen is the latinised form of Al-Ḥasan), and Vitello, to the Polonis scholar Witelo (13th c.) whose book on optics is based substantially on Ibn al-Haytham's Optics. It was attached to the Risner's edition of Opticae Thesaurus. Witelo's treatise contributed a good deal in transmitting the essentials of optical researches of Middle Ages down to Kepler and Descartes in the seventeenth century. Consequently the optics and its bye-product, the scientific method, indicate a continuity of development of sort during the sixteenth and seventeenth centuries Europe, which centuries are wrongly considered as a revolutionary period or a break from the past, thanks to the genius of al-Ḥasan Ibn al-Haytham.

Learn more* about light *in the Courier

Read also Over the Moon, by Hatim Salih. July-August 2009

Shaikh Mohammad Razaullah Ansari

Emeritus Professor of Physics at the Aligarh Muslim University, Aligarh (India), S.M. Razaullah Ansari has also chaired the International Commission for Science and Technology in the Islamic World.

Ansari's major work is the critical edition of Zîj-i Muhammad Shâhî, the astronomical-mathematical tables in Persian got compiled by Rajah Sawai Jai Singh (18th c.), famous for his observatories with masonry instruments.

Another major project on which he has been working is the Descriptive Catalogue of Scientific Manuscripts in Arabic and Persian, extant in the libraries of erstwhile Indian Subcontinent. For that reason, he has been a Consultant during 2006-07 to the International Project: Islamic Scientific Manuscripts Initiative, sponsored by Max Planck Institut für Wissenschafts-Geschichte (Berlin) and Dept. of Islamic Studies of McGill University (Montreal).

S.M. Razaullah Ansari participated at The Islamic Golden Age of Science for actual knowledge-based society: The Ibn Al-Haytham example Conference held at UNESCO, on 14 September 2015.

Who was Ibn al-Haytham

Creative representation of Ibn al-Haytham by the artist Ali Amro

Born around a thousand years ago in present day Iraq, Al-Hasan Ibn al-Haytham (known in the West by the Latinised form of his first name, initially “Alhacen” and later “Alhazen”) was a pioneering scientific thinker who made important contributions to the understanding of vision, optics and light. His methodology of investigation, in particular using experiment to verify theory, shows certain similarities to what later became known as the modern scientific method. Through his *Book of Optics* (Kitab al-Manazir) and its Latin translation (De Aspectibus), his ideas influenced European scholars including those of the European Renaissance. Today, many consider him a pivotal figure in the history of optics and the “Father of modern Optics”.
Ibn al-Haytham was born during a creative period known as the golden age of Muslim civilisation that saw many fascinating advances in science, technology and medicine. In an area that spread from Spain to China, inspirational men and women, of different faiths and cultures, built upon knowledge of ancient civilisations, making discoveries that had a huge and often underappreciated impact on our world.

الهيثم بن الحسن

Ibn al-Haytham, pioneering scientist

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“If learning the truth is the scientist’s goal… then he must make himself the enemy of all that he reads. ” By this he meant it was essential to conduct experiments to test what is written rather than blindly accepting it as true.
Ibn al-Haytham was born in the year 965 in Basra, and died in about 1040 in Cairo. He was one of the earliest scientists to study the characteristics of light and the mechanism/process of vision. He sought experimental proof of his theories and ideas. During many years living in Egypt, ten of which were spent under what we may now call protective custody (house arrest), he composed one of his most celebrated works, the Kitab al-Manazir, whose title is commonly translated into English as *Book of Optics* but more properly has the broader meaning *Book of Vision*.

Ibn al-Haytham made significant advances in optics, mathematics and astronomy. His work on optics was characterised by a strong emphasis on carefully designed experiments to test theories and hypotheses. In that regard he was following a procedure somewhat similar to the one modern scientists adhere to in their investigative research.

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Out of the 96 books he is recorded to have written; only 55 are known to have survived. Those related to the subject of light included: *The Light of the Moon, The Light of the Stars, The Rainbow and the Halo*, *Spherical Burning Mirrors*, *Parabolic Burning Mirrors*, *The Burning Sphere*, *The Shape of the Eclipse*, *The Formation of Shadows*, *Discourse on Light*, as well as his masterpiece, *Book of Optics*. Latin translations of some of his works are known to have influenced important Medieval and European Renaissance thinkers like Roger Bacon, René Descartes and Christian Huygens, who knew him as “Alhazen”. [IYL2015 Call to action] The crater Alhazen on the Moon is named in his honour, as is the asteroid 59239 Alhazen.

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- Ibn al-Haytham used systematic experimentation in his work on optics. Ptolemy, working in the Greek based culture of second century Alexandria, had used a similar approach in his work on optics. However, Ibn al-Haytham's work was distinguishably novel.

Ibn al-Haytham greatly benefitted from being able to use the work of previous generations of scholars that had been translated into Arabic over a period of over two-three hundred years under the patronage of various Muslim rulers and wealthy aristocrats.

This included direct translation of many scientific works from Greek, Syriac and Persian which themselves were the heirs to the great scientific traditions of Ancient Egypt, Babylonia, India and China. In turn, Ibn al-Haytham's work proved to be equally influential on scholars writing in Latin during the Middle Ages and the Renaissance. [IYL2015 Call to action] In this way, he formed part of the intellectual legacy that Latin scholars derived from Muslim civilisation from the thirteenth century onwards including the Renaissance and Early Modern periods.

With new scientific insights such as those of Ibn al-Haytham, as well as medical marvels, astronomical observations, new maps, libraries and advanced schools that taught various mathematical subjects, Muslim civilisation made significant and crucial contribution to the accumulation of scientific knowledge in the pre-modern age that changed the ancient world. These past discoveries have shaped our homes, schools, hospitals, towns, the way we trade, travel and our understanding of the universe.

The dramatic story of Ibn al-Haytham's life

The story of Ibn al-Haytham's life and discoveries is truly extraordinary. Born in the year 965 in Basra, he made significant contributions to our understanding of both vision and light, bringing important new insights into both of these subjects. His brilliant breakthrough, however, came at a time of the darkest episode of his life.

Ibn al-Haytham grew up at a time when schools and libraries flourished in the Muslim civilisation. Students had access to highly trained scholars who could teach a variety of subjects, including law, literature, medicine, mathematics, geography, history and art. Debates and discourses were popular and took place in Arabic. Scholars enjoyed discussing ideas from newly translated ancient manuscripts.

Ibn al-Haytham's scholarly reputation spread well beyond Basra.

He is known to have said, *"If I would be given the chance, I would implement a solution to regulate the Nile flooding"*. This claim reached al-Hakim, the Fatimid caliph in Egypt who invited him to Cairo. Confident of his own abilities, Ibn al-Haytham boasted that he would tame the great Nile River by building a dam and reservoir. But when he saw the extent of the challenge and the marvellous remains of ancient Egypt on the river banks, he reconsidered his own boast thinking. If such a huge project could be done, he reasoned, it would have been done by the brilliant builders of the past who had left us such fantastic architectural relics. He returned to Cairo to inform the caliph that his solution was not possible.
Knowing that that particular caliph did not entertain failure and that his life would be at risk if he were to disappoint him, Ibn al-Haytham feigned madness to avoid the caliphs' wrath. He knew that Islamic law would protect a mad person from bearing responsibility for his failure. Despite the caliph's wild swings of mood, he nevertheless abided by Islamic law. Rather than executing or expelling Ibn al-Haytham from Cairo, the caliph decided to put the scholar under permanent protective custody. That was required by law in order to ensure his safety and that of others. Ibn al-Haytham was placed under what amounted to house arrest, far from the lively discourses and debates to which he was accustomed.

Yet it just as life was at its bleakest moment. Ibn al-Haytham might have made the dazzling discovery for which he is best remembered. Legend says, one day he saw light shining through a tiny pinhole into his darkened room – projecting an image of the world outside onto the opposite wall. Ibn al-Haytham realized that he was seeing images of objects outside that were lit by the Sun. From repeated experiments he concluded that light rays travel in straight lines, and that vision is accomplished when these rays pass into our eyes.

Ibn al-Haytham confirmed his discovery by experimenting with his dark room (calling it Albait Almuzlim)- translated into Latin as *camera obscura*, which simply means "dark room".
After many additional experiments using special apparatus of lenses and mirrors which he built, he laid down his new ideas about light and vision in his seven volumes *Book of Optics*. He was released from prison on the death (disappearance) of the caliph.
Ibn al-Haytham died at the age of 74 in 1040. His greatest work, the *Book of Optics*, had perhaps begun from the confines of imprisonment and was completed around the year 1027- but its impact rippled out across the whole world. Both his optical discoveries, and the fact that they had been validated using hands-on experiments, would influence those who came after him for centuries.
So how did that influence shine its light on later generations? In the early 12th century, Toledo in Spain was the focus of a huge effort to translate Arabic books into Latin. Christian, Jewish and Muslim scholars flocked to the city, where they lived alongside one another and worked together to translate the old knowledge into Latin and then into other European languages. Ibn al-Haytham's *Book of Optics* as well as some of his other scientific works were translated into Latin making them available to European scientists including Roger Bacon, Johannes Kepler and even Leonardo da Vinci.

How Ibn al-Haytham changed the course of science

Ibn al-Haytham's discoveries in optics and vision overturned centuries of misunderstanding. In his experiments, he observed that light coming through a tiny hole travelled in straight lines and projected an image onto the opposite wall.
But he realised that light entering the eye was only the first step in seeing. He built on the work of Greek physician Galen who had provided a detailed description of the eye and the optic pathways. Today the oldest-known drawing of the nervous system is from Ibn al-Haytham's *Book of Optics*, in which the eyes and optic nerves are illustrated. [IYL2015 Call to action]

Ibn al-Haytham suggested that only the light rays that hit the surface of the eye head-on would pass into the eye, creating a representation of the world. It was Kepler in the sixteenth century who corrected this and proposed that the object of sight – what is seen comes from both perpendicular and angular rays that hit the eye to form an inverted image on the retina. [IYL2015 Call to action]

Among Ibn al-Haytham's other insights was his understanding of the crucial role of visual contrast. For example, he realised the colour of an object depends on the colour of the surroundings, and that a contrast of brightness levels explains why we can't see the stars during daytime.

Ibn al-Haytham also subscribed to a method of empirical analysis to accompany theoretical postulates that is similar in certain ways to the scientific method we know today. He realised that the senses were prone to error, and he devised methods of verification, testing and experimentation to uncover the truth of the natural phenomena he perceived. Up until this time, the study of physical phenomena had been an abstract activity with occasional experiments.

In search of evidence, Ibn al-Haytham studied lenses, experimented with different mirrors: flat, spherical, parabolic, cylindrical, concave and convex. His practical results were clear:

"Visual objects seen by us through light refraction – across thick material such as water and glass – are bigger than their real size", he wrote.
After his death, Ibn al-Haytham's writings were more influential in Latin than Arabic. The only significant work in Arabic that built on Ibn al-Haytham's ideas was produced in the early part of the fourteenth century (in present day Iran) by Kamal al-Din al-Farisi, who was himself a brilliant scientific thinker.

When Ibn al-Haytham's *Book of Optics* was translated into Latin, it had great influence and was widely studied/read. It was published as a print edition in 1572 so that it could be made more easily available. The Polish astronomer Johannes Hevelius chose to honour Ibn al-Haytham, alongside Galileo, in his most famous work on the Moon, *Selenographia, published in 1647*.

Polish astronomer Johannes Hevelius honoured Ibn al-Haytham's contribution to optics. This illustration is from Hevelius' s famous Selenographia. Hevelius puts Ibn al-Haytham as the equal of Galileo in this illustration from his book the first to chart the Moon's surface as seen through a telescope.

Some questions Ibn al-Haytham raised remained unsolved for a thousand years. One such was called ‘Alhazen’s problem’ for which he offered a geometrical solution: “Given a light source and a spherical mirror, find the point on the mirror where the light will be reflected to the eye of an observer”. Ibn al-Haytham solved this problem geometrically but it remained unsolved using algebraic methods until it was finally solved in 1997 by the Oxford mathematician Peter M Neumann.

And yet, some mysteries remain. Ibn al-Haytham affirmed that an optical illusion was the reason for the Moon appearing so big when it’s low in the sky close to the horizon in comparison to its size when at the zenith- and still no one knows why this happens. This, and other questions in science, has yet to be solved – leaving a legacy of intrigue for us to tackle today.

Ibn Sina on Education

by Abd Al-Rahman Al Naqib*Published on: 17th January 2009*

Tags:
Abd al-Rahman al Naqib - Education - Ethics - Ibn Sina - Social Sciences -

This study presents the theory of education in the philosophy of Ibn Sina, considered by ancient and modern scholars alike as the most famous of the Muslim philosophers. In his philosophical system, Ibn Sina outlined a complete theory of education and teaching. Departing from his view of the human being and of the relationship between the mental faculties and the body, and from a precise conception of knowledge and ethics, Ibn Sina's educational theory deals with the aims of education, the educational stages and the teaching methods for different classes of age, from infants to higher instruction of teeangers, with a focus on the teaching of girls.

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Note of the editor

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1. Introduction

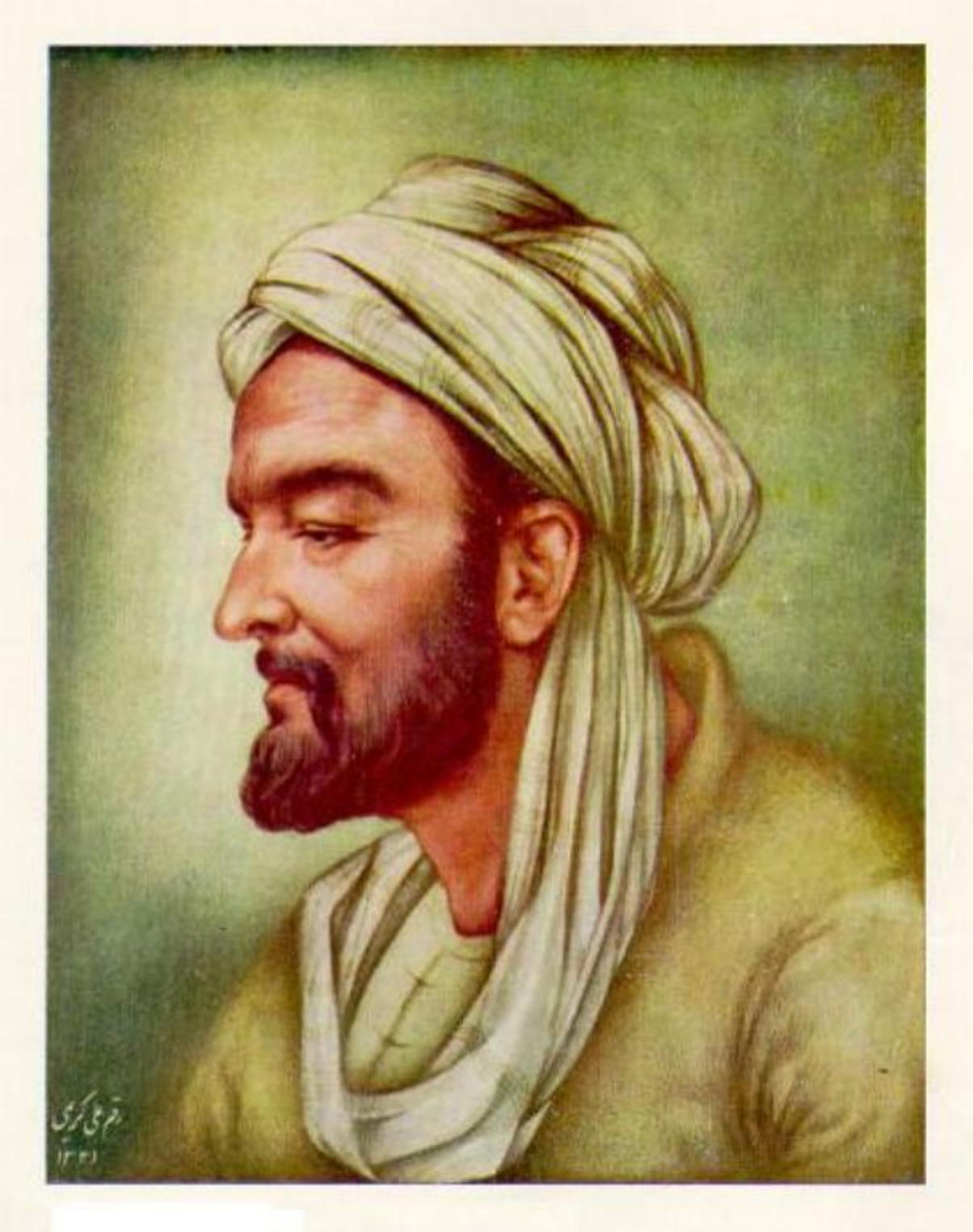

Figure 1: Modern portrait of Ibn Sina (Source).

This study attempts to present the educational aspects of an Ibn Sina, known in the west as Ibn Sina (370?-428H – 980?-1037 CE), considered by ancient and modern scholars alike as the most famous of the Muslim philosophers [2]. Thus al-Dhahbi describes him as 'the leader of Islamic philosophy' [3]. George Anawati has prepared a full bibliography of Ibn Sina's writings [4]. In 1950, to commemorate the thousandth anniversary of his birth, the Dar al-Kutub al-Misriyya (Egyptian National Library) published a printed list of the titles of his works and their

commentaries which are preserved there. We need only consult this list, containing more than 150 printed works and manuscripts and including all the branches of knowledge in his day, even poetry, to evaluate the extent of the culture which Ibn Sina acquired and handed on to us.

Ibn Sina's most famous works are those on philosophy and medicine. His philosophical views have engaged the attention of Western thinkers over several centuries, and his books have been among the most important sources in philosophy. In medicine, his great work, *al-Qanun* (The Canon), was translated into Latin towards the end of the twelfth century CE, and became a reference source for medical studies in the universities of Europe until the end of the seventeenth century [5].

Ibn Sina has attracted the attention of scholars, past and present, who have written books, treatises and articles on him. One of these aspects, however, has not been very widely discussed, namely his views on education. Although Ibn Sina's writings on this subject, in comparison with his vast output on other subjects, are in fact considered to be very scarce, we do nonetheless find he deals with the same problems that confront educators today. He speaks about humanity, society, knowledge and ethics. He devoted a treatise entitled 'Politics' to education; and he speaks at some length in 'The Canon' about the upbringing of infants. Thereby, Ibn Sina represents a lively illustration of the meeting between philosophy and education, for the educator and the philosopher are both faced with the same problems: truth, goodness, the nature of the world, the meaning of knowledge and human nature, and so on. Obviously, Ibn Sina the philosopher has his own views on education. In addition, if we consider that Ibn Sina undertook teaching on a practical level for a considerable length of time, we realize that we have here a thinker whose philosophy was transformed into an educational theory that he himself practiced.

2. The man and his age

Figure 2: Ibn Sina drawing by A. Suheyl Unver (Source).

The Sheikh al-Ra'is Sharaf al-Mulk Abu 'Ali al-Husayn b. 'Abd Allah b. al-Hasan b. 'Ali Ibn Sina (known in Europe as Avicenna) was born in the village of Afshana in the vicinity of Bukhara (in what is now Uzbekistan), in 370 H / 980 CE —the generally accepted date [6]— of an Ismailian family concerned with intellectual sciences and philosophical inquiry, all of which had its effect upon the scientific career of Ibn Sina [7].

Ibn Sina lived in the fourth century of the Islamic era, the most flourishing Abbasid period in respect of learning and knowledge, which stands in complete contrast to the political situation at that time. Learning was much in demand, scholars were numerous, libraries were filled with the outpourings of the scholars of Islam, and with translations made from the sciences of other nations in accordance with the desires of caliphs and viziers.

It was just around the time of Ibn Sina's birth and in the subsequent years that Islamic Arabic culture reached its peak. Since the Arabic language was the accepted vehicle for the transmission of knowledge in this era, Ibn Sina studied Arabic under Abu Bakr Ahmad b. Muhammad al-Barqi al-Khwarizmi. As soon as he had mastered Arabic (his mother tongue was Persian), his father obtained for him a teacher of the Qur'an and another for literature. The young pupil learned quickly from his two teachers, and before he was 10 years old he knew the Qur'an and a considerable amount of literature as well, becoming 'almost a prodigy', as Ibn Sina says of himself [8]. Next he developed a leaning towards philosophy, geometry and mathematics, so his father sent him to the school of Mahmud 'al-Massah' (the surveyor), a man learned in arithmetic, algebra and the movement of the heavens, as reported by al-Bayhaqi [9]. He also studied *fiqh* (Muslim law) and the Sufism movement with Isma'il al-Zahid al-Bukhari. And no sooner had Abu 'Abdallah al-Natli, the philosopher, arrived in Bukhara than Ibn Sina's father invited him to his house, hoping that the boy would learn intellectual subjects from him. If al-Natli had any noticeable success, it is that he

diverted the boy from a preoccupation with law and Sufism in favour of the theoretical sciences and philosophical studies.

Before long, the professor sensed that the boy no longer needed him, for Ibn Sina was very anxious to acquire learning and had a real craving for the sciences of wisdom. He was then attracted by medical science, and devoted himself to it for a brief time, until he surpassed all the scholars of his age in this science. Ibn Sina says: 'Then I desired to study medicine, and took to reading the books written on this subject. Medicine is not one of the difficult sciences, so naturally I became proficient in it in the shortest time, until the excellent scholars of medicine began to study under me. I began to treat patients, and through my experience I acquired an amazing practical knowledge and ability in methods of treatment' [10].

Ibn Sina was not content with the theoretical study of medicine, but he also practiced it from humanitarian motives and in order to put his learning to good use. He achieved all this while still no more than 16 years of age. Then he devoted himself to intensive study and reading for a year and a half, in which time he read through logic and all known sections of philosophy. Before Ibn Sina had reached the age of 18, his scholarly fame for philosophical inquiries and medical knowledge had spread far and wide [11].

It is clear from Ibn Sina's biography that he was quick to learn, with a vast memory, and wrote with ease. When he was 21 years old, he composed the book *al-Majmu'* (The Compendium), at the request of some of his pupils; in this he dealt with all of the theoretical sciences, except mathematics. Despite the political turmoil reigning in the land of Transoxania [the portion of Central Asia corresponding to the region between the Amu Darya and Syr Darya rivers; the editor], which obliged him to move house a number of times, and the fact that he was acting as minister for certain princes, this did not prevent him from both studying and teaching science. He always had his own students and his study circles wherever he went, and this continued right up to the time of his death, Friday during Ramadan 428 H (1037 CE). He was buried at Hamadan in Persia [12].

3. The philosophical foundations of Ibn Sina's educational views

3.1. His view of the human being

The human being, in Ibn Sina's view, consists of both hidden (*sirr*) and open (*'alan*) elements. Known to us is the perceptible human body with its organs and its cells. 'Sensory perception stops at its exterior, while anatomy (dissection) enables us to learn about the interior; the hidden part consists of the powers of its mind' [13]. These mental powers motivate the human being, and cause it to carry out its various activities and behave as a human being'. To Ibn Sina, the human is a tangible body on the outside, revealed within by means of anatomy —as we see in his books, such as *Al-Qanun* (The Canon)— and we do not find any difficulty today in accepting this. We still have to look at the mental powers or faculties that motivate this body.

Figure 3: A class at the Gazanfer Aga Madrasa founded in 1566 (image from *Divan-i Nadiri*, Topkapi Palace Museum Library, H. 899) (Source).

What are the mental powers, and what is their function? Ibn Sina classifies these mental faculties into three groups.

First, the group of vegetative faculties, which humans and plants both share. They are concerned with the survival of the human being, growth through nutrition, and preservation of the species through reproduction. They thus comprise three faculties: feeding, growth and reproduction [14].

This group is followed by the faculties that make animals superior to plants, and are shared by human beings and animals. Typically, they allow the human being to be attracted to what it desires, and to be repelled by anything harmful arousing fear or anger. They comprise, in his view, two faculties: a faculty of motion and a faculty of comprehension or perception. Each is, in its turn, divided into other faculties: the motive faculty consists of an instinctive reaction, and a rational movement, permitting the human either to act or desist from action; comprehension is also divided into a perceptive faculty of the exterior world through the five senses —sight, hearing, smell, taste, touch— and one directed from within, by way of common sense, imagination, memory and reflection [15].

Finally, there is the group of faculties which distinguish the human being from the animal. In Ibn Sina's view they comprise two faculties: an active faculty directing the human's practical conduct, and a cognitive faculty directing his intellectual conduct. Both are given the name 'intelligence', but the first is practical and the second is contemplative [16].

3.2. The relationship between the mental faculties and the body

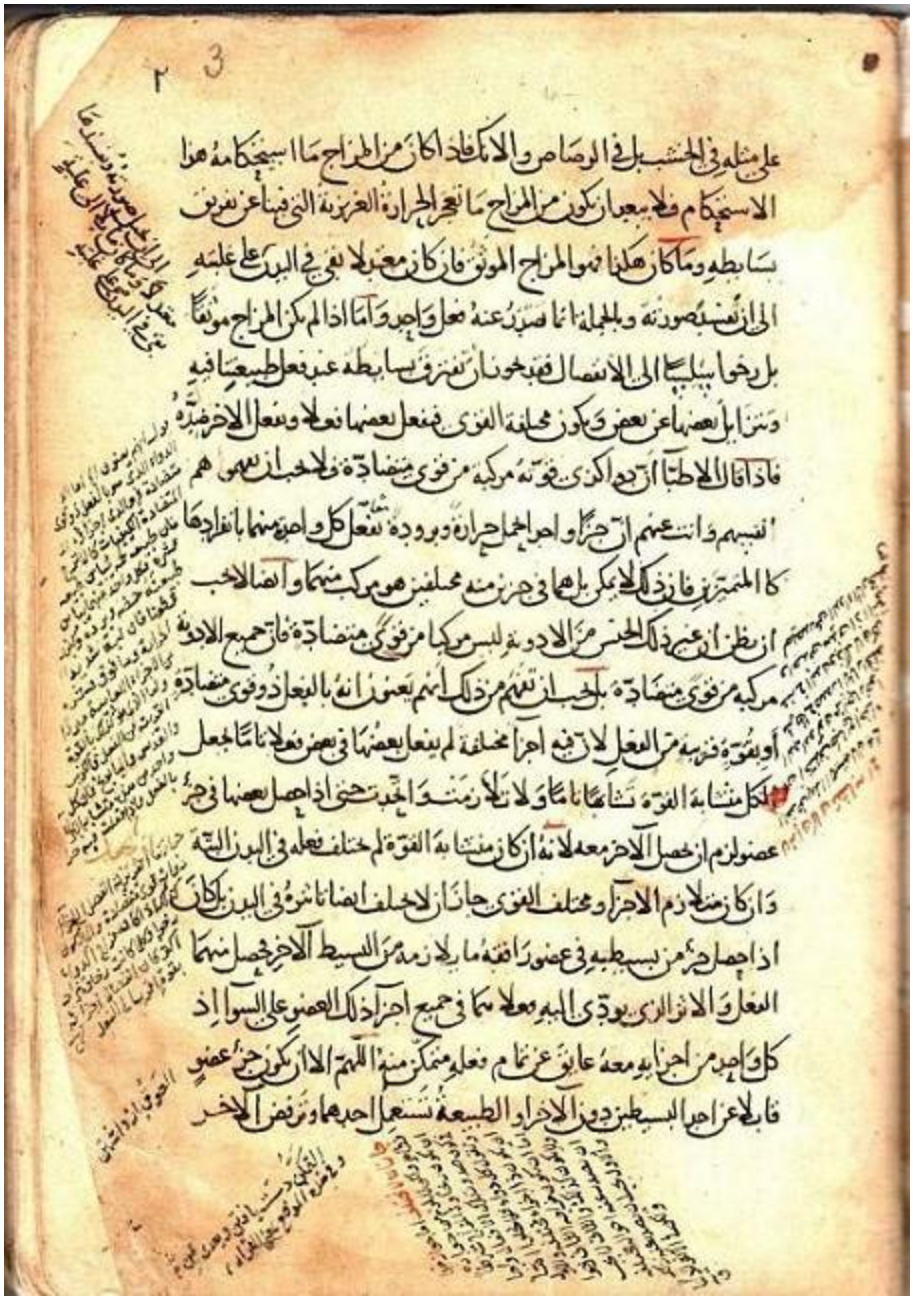

Figure 4: Page from the oldest copy of the second volume of *The Canon Of Medicine* by Ibn Sina, preserved in The Institute of Manuscripts of Azerbaijan National Academy of Sciences; part of Memory of the World Project sponsored by the UNESCO (Source).

All these faculties are merely different functions of the human soul. For the human soul is one, and those three powers are different functions of it [17]. To Ibn Sina, the soul is immaterial, and is quite different from the substance of the body [18]. It is not pre-existent, coming into being together with the body [19]; but it survives and does not perish when the human being dies. Ibn Sina says: 'When the body dies and decays, the substance of the soul is released from its connection with the body; and if it is perfected in knowledge, wisdom and good deeds, it is drawn towards the divine lights, the lights of the angels and of the heavenly kingdom, just as a needle is drawn towards an enormous mountain by magnetic force; the divine presence flows over it, and it achieves real tranquillity, as the call comes to it from the heavenly beings: 'Oh soul at complete rest, return to thy Lord, well pleased and well pleasing. Enter then among my devoted servants! Enter My heaven!'.' [20]

3.3. Is the human being good or evil by nature?

Ibn Sina is of the opinion that the human being is born 'upon the natural disposition' and is neither good nor bad by nature, although tending more to good than to evil; and this human being changes and adapts according to the influences of the environment and its education systems. If he is accustomed to evil, he will become evil; if accustomed to good, he becomes good. On this point, Ibn Sina says: 'When the child is weaned, then his education and his moral training begin, before he is attacked or overcome by blameworthy morals or objectionable characteristics. For evil morals so quickly take over the young boy, and bad habits soon prevail; and if any of these gain influence over him they overcome him, and then he cannot separate

himself from them nor struggle against them' [21]. Ibn Sina emphasizes this elsewhere by saying: 'All moral characteristics, the good and the bad, are acquired; and it is possible for the human being, when he has as yet no specific moral character, to obtain them for himself; and when his soul also chances upon some specific characteristic, he may move, by his own volition, away from it towards its opposite' [22].

When we refer to Ibn Sina's writings on this subject, we are given an insight into an Avicennian social theory based on two clear fundamental principles:

3.4. The social nature of the human being

The human being, as created by God, is not able to live in isolation but needs society for his survival, his growth and his education. Ibn Sina says: 'The human being differs from all other animals in being unable to live well as an isolated individual […] with no partner to help him satisfy his needs. He must be supported by another of his kind, who, in turn, must also be supported by him and by his like, so that, for instance, one will provide vegetables for another, while the other makes bread; one will sew when the other provides the needle. When they join forces they are complementary. This is why human beings are compelled to found societies' [23].

3.5. The divine nature of society

The whole of society must submit to the righteous holy law of God, through the Prophet who legislates, guided by divine revelation. For society needs someone to legislate its affairs and this legislator must be a human being who stands out from the others through qualities which ensure that his word is obeyed and the whole people follow him. This is Ibn Sina's justification for the existence of the Prophet, the specific miracles with which God distinguished him, and the need for the prophecy. Ibn Sina says: 'So it is necessary that there should be a Prophet, and necessary that he should be a human being, and also that he should possess a special quality not found in other people, so that they are aware of something in him not found in themselves; thus he is set apart from them and has miraculous powers' [24].

3.6. The gate of ijtihad must be left open

Since the Prophet, in the Avicennian scheme of things, is the one to lay down laws governing society by revelation from God, it is necessary that the gate of *ijtihad* (personal interpretation of Islamic law) be left open to allow for any new events and circumstances in the following eras, and especially anything connected with political and practical affairs. The Prophet defines the general principles in these matters, while particular implementation is left to the circumstances. Ibn Sina says: 'A great deal of concerns, especially in social affairs, must be entrusted to personal interpretation; for there are judgements concerning special circumstances, which cannot be precisely determined. […] Particular rules should not be laid down for them, and making such laws would lead to confusion, for they change with the times' [25].

3.7. The choice of the Caliph

Since the Prophet was a human being with a limited life span, he must have a successor or *khalifa* (caliph). This successor is the one to rule after the Prophet, his mission being to implement 'the teachings of the Prophet'. This means that every ruler in Islam is a successor.

So how is this successor to be chosen? This has been one of the greatest problems in Islamic thinking throughout the ages. Ibn Sina's solution was for the choice to be made by the Prophet's command in his life time, and by consultation and consensus of those in authority after his time. 'The Prophet did not appoint a successor, and did not wish the people in authority to choose anyone unless they were sure he alone had political power; that he was able, courageous, virtuous and with an ability to organize, knowledgeable in the holy law so as to be unsurpassed in understanding its secrets and fathoming its depths.' Obedience will be paid to the ruler who

fulfils these conditions and possesses these qualities. When these conditions are contravened, then it is obligatory for all to oppose him; if they do not, they disobey God and are unbelievers [26].

From all the above it is clear that society, as seen by Ibn Sina, is a collection of individuals very differently endowed with skills and capacities. This differentiation requires some kind of specialization, and this demands co-operation between the individuals in society and interaction between them. If this co-operation and interaction take place haphazardly, the social system may break down. Thus there is a need for 'a ruler' who governs life in society. His task is to implement the principles of the law, wherever there is a text, and he is an independent interpreter (*mujtahid*) who consults people in authority where there is no text. The ruler or the prince has an urgent and very real need to conduct this consultation [27].

Although this allegorical picture of society, as Ibn Sina saw it, differed in certain respects from the Iranian society in which he lived, this was in fact the society on which he based his educational thinking, for in this field we see him maintain the inheritance of this 'divine society' represented in its beliefs, rites of worship and its ethical code. He would recommend that this was the inheritance to be presented to the child in the first stages of his education.

4. His view of knowledge and ethics

4.1. Knowledge

Ibn Sina considered that the soul, with its various faculties, is the path to knowledge or perception for it distinguishes between sensory perception and intellectual perception. The means of sensory perception, as already stated, are the five external senses and the five internal senses. These external and internal senses are especially relevant to sensory perception. Sensory perception occurs when sensory stimuli reach the organs of perception and are registered and comprehended by the sensory faculties. Ibn Sina says: 'It appears that every perception is the acceptance of the picture of the thing perceived, in one way or another' [28]. And he says of sensory perception itself: 'The pictures of all the things perceived by the senses are conveyed to the organs of perception and are impressed upon them, and are then perceived by the sensory faculties' [29]. Sensory knowledge, in Ibn Sina's view, is acquired knowledge, its source being the sensed stimuli, and its means the external and internal faculties of sense. The subject of intellectual knowledge is then simply the thing perceived, and its means is the human's speculative faculty entrusted to him by God, which is capable of acquiring that rational knowledge.

In order that intellectual knowledge should be effective, it must have a particular structure and an instrument to regulate its operation, and also to verify the soundness of the thought and reasoning; this instrument is logic. For logic is the theoretical art or the instrument which protects the intellect from making a mistake [30].

Figure 5: Front cover of *Ibn Sina, Avicenne: la vie & l'œuvre* by Sleim Ammar (Tunis: L'or du temps, 1998) (Source).

4.2. Ethics

Ibn Sina saw moral character as an expression of 'a natural disposition whereby certain actions issue from the soul with ease, without prior thought' [31]. This means that character is not merely the practice of good behaviour, but the practicing of it at every appropriate occasion because the person has accustomed himself to it and is unable to act otherwise. We can describe a man as truthful only when he is habitually truthful in his speech, and the same applies for other admirable moral characteristics. In the same way, we can describe a man as a liar only when he habitually tells lies, and the same for other character failings.

For the human being to achieve an excellent morality, he must govern his reason well in all his conduct, and punish his soul if it departs from the right path, and reward and encourage it when it

follows the path of virtue. Ibn Sina says: ‘The human being must prepare for his soul both reward and punishment, and govern it thereby’ [32].

It is also obligatory for the human being, if his soul encounters a moral evil, to recognize its opposite, and force his soul to go towards this excellent virtue and accustom it to that extreme path, in order that his soul shall eventually acquire the middle path.

In all this, the reference point is reason. When the human being knows how to obey the commands of reason, he is on the road to being educated or virtuous. Reason is what defines good conduct, and the standards by which it is defined are the middle path on the one hand and equity on the other. Reason can itself recognize the middle path for every virtue, since virtue stands in the middle between two bad characteristics. Reason recognizes equity from the harmony among these virtues, so that no virtue is dominant over the others, and the human being can maintain an even balance in all his morality, without exaggerating one virtue at the expense of the others. It is to be noted here that, while the foundation of spiritual and ethical values found in the Qur’an and the Sunnah (the words and deeds of the Prophet) is based on the religious constraint deep in the human soul, for Ibn Sina it arises from the domination of reason over the faculties of wrong-doing. Now it is clear that to comprehend moral values, their simple acceptance by reason is not enough. It is necessary rather that they should take root in the heart, where the ‘moral sense’ becomes a part of the human beings behavioural structure.

Ibn Sina did grasp the fact that such a conception of ethics is that of scholars or philosophers, or at least of an élite. He is not concerned with the common people in this ethical theory, since they do not act because they are persuaded by, or respect, reason, but rather through dread of punishments, in this world and in the hereafter [33].

In Ibn Sina’s view, then, morality is an acquired matter, not inborn, and it is within a person’s capacity to acquire any such morality he wishes through ‘habituation’, ‘imitation’, ‘fear’ or ‘wisdom’. Ibn Sina considered that the process of acquiring morality began from ‘the infant’s birth’, because the child is exposed to problems and difficulties soon after birth and in the early stages of childhood, and these influence his psychology and temperament, and hence his ethical development. For this reason Ibn Sina paid great attention to the early stages of childhood and everything connected with it: the morality and culture of the wet nurse, the teacher, and the child’s companions in school or the place where he studies.

5. Ibn Sina’s educational views

5.1. The aims of education

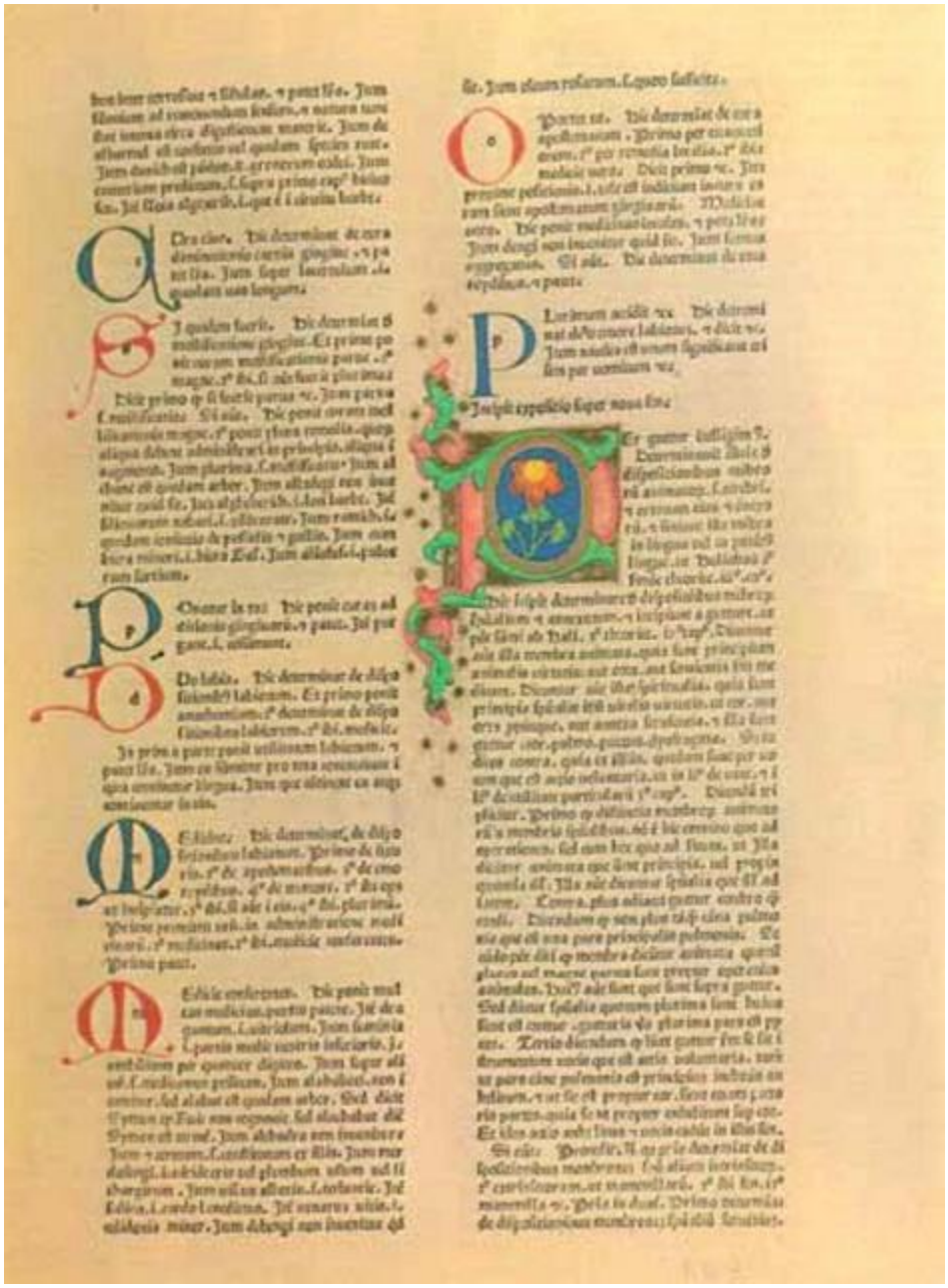

Figure 6: Page from an illuminated manuscript of the Latin translation of the *Canon of Medicine* by Ibn Sina (Source).

Ibn Sina sees the aims of education as the overall growth of the individual: physical, mental and moral; followed by preparation of this individual to live in society through a chosen trade according to his aptitudes. So Avicennian education does not neglect physical development and everything implied by it: physical exercise, food and drink, sleep and cleanliness [34]. It does not aim exclusively at intellectual development and the amassing of knowledge; likewise Ibn Sina does not devote his attention to the moral aspect alone, but aims at the formation of a personality complete in body, mind and character. He does not restrict the task of education to creating the complete citizen, but rather sees that education must also prepare him for a profession whereby he can contribute to the social structure, because society, in Ibn Sina's view, is built entirely on 'co-operation', on the specialization of each individual in a craft or profession and on the mutual exchange of services between its individuals.

Although Ibn Sina was a philosopher and thus belonged to a group of people who believed that Greek thought was that of an educated élite such that philosophers had an undisputed superiority over all others, yet for him the aim of education was not restricted to the training of philosophers. This was particularly because he lived in the fourth century of the Islamic era, quite apart from the fact that this Greek idea was that of an élite. Therefore Ibn Sina makes 'the education of the philosopher' one of his educational aims among others at the specialization stage, to which anyone who wished could direct himself in accordance with his aptitudes and inclinations. This was the difference between his education system and that of al-Ghazali, for example, or al-Qabisi; for while we find that 'the education of the philosopher' was hardly

included in their writings, Ibn Sina goes into great detail about it, the sciences which should be studied, and the aim and the benefits of each one of them.

We can say then that education in Ibn Sina's opinion is the making of an upright citizen, sound in body and mind, and preparing him for some intellectual or practical work. Intellectual work could be connected to the traditional sciences or to the theoretical sciences that Ibn Sina esteemed so highly. He counts 'industry' or 'crafts' as a kind of instruction requiring vocational preparation and specialization. He says: 'Instruction and learning include the practical, like carpentry and dyeing, for it is only acquired by practice of that craft' [35].

5.2. The educational stages

The infant stage: from birth until the second year

Ibn Sina's concern with the child begins from birth. 'When he is born, the child's umbilical cord must be cut at once, above four fingers' length, and tied with clean, fine wool twisted lightly, so as not to cause pain; if we wish to swaddle him, then the midwife must first massage his limbs gently; she must inspect his body where this is necessary, moving every limb into the best position; all of this by gentle touching with the tips of her fingers which should become a regular habit, and she should often wipe his eyes with silk or something similar' [36].

Ibn Sina is greatly concerned with everything connected with this stage: sleep, bathing, suckling, exercise suitable to the infant's age. About the infant's sleep, Ibn Sina says: 'He should be put to sleep in a room with a mild temperature, not cold; the room should be fairly well shaded, with no direct rays of light. When he lies in his cot, he head should be higher than the rest of his body. Care must be taken that the cot does not allow his neck or limbs or his spine to be twisted in any way' [37].

Ibn Sina is insistent that the infant should be bathed more than once a day, and that the mother should herself suckle her child: he speaks at length on the mother's milk, the normal length of breast-feeding, the number of feeds per day, and weaning, which should be undertaken gradually. From his long discourse we shall mention briefly the following extracts: When the infant sleeps after feeding, the cradle should not be rocked violently, which would disturb the milk in his stomach, but only gently. To cry a little before feeding is beneficial. Breast-feeding normally lasts two years, and when the infant desires something besides milk this should be given gradually without forcing him. When his teeth begin to appear, he can move in gradual stages from being fed on mother's milk to stronger food. At first this can be bread chewed by the nursing mother, then bread soaked in water and honey, juice or in milk. This should be given to him in small quantities and he should gradually be kept from the breast. As Ibn Sina says, 'weaning should be gradual and not take place all at once' [38].

The stage of childhood

This lasts from the third to the fifth year, at the time when 'the child's body strengthens, his tongue is free, and he is ready for instruction, and his hearing is attentive' [39]. In 'The Canon', he defines the start of the sixth year as the end of that stage, whereupon he enters 'the stage of primary teaching'. Ibn Sina says: 'And when he has reached the age of 6 years, he should be brought to the tutor and the teacher' [40]. We see Ibn Sina not concerned here with any specific kind of teaching, but merely with creating a happy childhood as regards physical, mental and moral health. Therefore he concentrates here on three educational concerns:

(i) The child's morals, and keeping him away from any harmful influences which might affect his soul and his morals.

(ii) Development of the body and movement. Regarding the need for play and exercise in that stage, Ibn Sina says: 'When the child wakes from sleep, it is best for him to be bathed, then let

him play for an hour; then he is given a little food to eat, then he is allowed to play for a long time, then he is bathed, then fed. Children should not be allowed to drink water straight after food, for then it would go into their system raw without being digested' [41]. Games form a necessary element in the child's life at this stage, whereby he acquires various physical and motor skills. He also learns how to live in a group and benefit from that life.

(iii) The development of taste and behaviour. Ibn Sina had an interest in music and considered it necessary for the child to listen to it, so that from the time he is in the cradle, he goes to sleep to the sound of music. That prepares him later to learn music; and this education in taste will be further refined in the next stage, when he learns simple poetry with easy rhymes, bringing the child pleasure as well as encouraging him to appreciate virtue.

The first stage of teaching

This begins at the age of 6 and ends approximately at 14 years of age. It is on reaching this age that the child must begin receiving education of a more serious kind, gradually moving away from games and sport, and beginning organized study. 'Until [children] complete their fourteenth year, they must gradually decrease their sporting activities' [42].

At this stage, children learn 'the principles of Islamic culture', from the Qur'an and Arabic poetry, calligraphy, and Islamic rules of good conduct. This is a common stage for all children, since preferences have not yet appeared. Later, aptitudes make their appearance, and in accordance with these every individual can be given particular instruction.

Ibn Sina considers that group instruction and not individual instruction is best at this level. He advises that the child be brought up with others, saying: 'The child should be taught alongside the children of the nobility (the great or the rulers) whose conduct is good and whose habits are acceptable. For one child will teach another, learning from him and becoming his friend. If one child is left alone with the teacher, that is most likely to be unsatisfactory for them both; when the educator moves from one pupil to another, the risk of boredom is less, the pace of activities is more rapid and the child is eager to learn and succeed' [43].

The specialized education stage (age 14 onwards)

This comes after the child has completed general primary teaching, and his aptitudes have become apparent either to continue in the field of education or to learn a craft and earn a living. In the light of these aptitudes, the young person defines for himself the type of study or the type of vocational work that appeals to him during the higher or specialized stage.

Ibn Sina emphasized the need to have regard for the young person's preferences at this level when defining his future, his studies and the choice of profession; he insists that young people should not have any kind of study or work forced on them that does not correspond to their abilities and inclinations. The teacher must know 'that not every craft the child desires is possible nor opportune for him, but the one that conforms to his nature and suits him. If skill and crafts were simply obtainable on demand, without question of appropriateness or suitability, then no one would be devoid of them, and people would all agree to choose the most noble skills and the highest of crafts' [44].

What then are the standards for defining educational and vocational inclinations among students at this stage? And how can the teacher direct the student to a type of learning or profession that he sees as suitable for him?

Ibn Sina considers that this is evident directly from the conduct of the child, and 'the boy's guide', either his father or his teacher, will notice specific inclinations. From the practical angle, this can be ascertained by observing the student's conduct. Defining the true origin of inclination or ability is for Ibn Sina a difficult matter: 'These choices and these suitabilities and conformities have

obscure and hidden causes which tax human understanding, and are too subtle to be measured or identified, so only the Almighty knows them' [45].

Ibn Sina remarks that students differ in their aptitudes and abilities, and sees the need of educational and professional guidance at that stage. There is nothing unusual about that in an age when science and knowledge were in full expansion, when crafts and professional groups abounded, and when trade guilds were found everywhere. Likewise Ibn Sina was aware of the 'mentally retarded' and the 'simple-minded', who were incapable of benefiting from any kind of theoretical or practical education. He considers that they and their like must be given a special place apart where they would live under the supervision of a warden. Those for whom there was no hope of improvement should have their care and their sustenance guaranteed. Ibn Sina says: 'It may happen that a person's nature is incompatible with any culture or attention, and he learns nothing from them. This can be seen from the fact that people of intelligence have wished to educate their sons, and have expended much effort and expense on that purpose, without attaining their objective' [46].

Ibn Sina points out very clearly the necessity for educational and vocational guidance. He appreciated the very close connection between education and the economic and social needs of society, as well as the role of individual aptitudes and abilities in defining the type of learning or trade in which each student should specialize; thus, he makes the higher stage of education that of specialization. Each student would then specialize in the science or the trade which he wished to be his future occupation, and the source of his income in working life. Ibn Sina perceives too that this specializing stage comes only after a period of general education in which all students participate, and where they learn the principles of Islamic culture, before allowing their talents and special aptitudes to come to the fore when all that is completed. So it is on this basis that the higher specialized stage follows.

6. Teaching methods

6.1. Infants under 6 years

Figure 7: Commemorative medal issued by the UNESCO in 1980 to mark the 1000th birth anniversary of Ibn Sina. The obverse depicts a scene showing Avicenna surrounded by his disciples, inspired by a miniature in a 17th-century Turkish manuscript; whilst on the reverse is a phrase by Avicenna in Arabic and Latin: "Cooperate for the well-being of the body and the survival of the human species" (Source). The UNESCO established the Avicenna Prize for Ethics in Science in 2002 (see brochure: Avicenna and the ethics of science and technology today, UNESCO, 2004).

We have pointed out that Ibn Sina is concerned at this stage with the child's sensory and motor development and with moral and emotional training. We are not aware of Ibn Sina having indicated any specific methods at this stage, apart from physical exercise and music; one for the child's growth and his physical and motor development, so that he should acquire thereby a great many moral and mental habits; and the other to refine his feelings and to heighten his emotions.

Ibn Sina is very much concerned with games at this age, as well as in primary education. He shows us the role of exercise in education and its necessary place in the child's life, and explains that exercise differs according to age, and also with the child's ability. For exercise may be much or little; it can be very vigorous, demanding considerable physical strength; it can also be slight; swift or slow; it can be rapid, combining strength and speed; and again it can be relaxing. Each of these types has its own appropriate place and necessity in the life of the young child [47].

But Ibn Sina is as concerned with play and exercise at this level of education as he is with 'musical education'. We know that Ibn Sina was skilled in this art, both as a composer and a performer [48]. So it is in the capacity of an expert that he mentions the feelings of pleasure, joy, purity and the sense of exaltation which music brings about in the child: and also the way the child can learn to perceive harmony and discord, treble and bass, and how this comes about. Ibn Sina speaks at length about music, its composition and rhythm, and the instruments used [49].

So sport and music are the most important components of the method in this stage. They are the two methods of instruction which prepare the child for organized 'primary teaching' in the next stage, when he reaches 6 years of age.

6.2. Methods at the 'primary' stage (6 to 14 years)

The components of study in this stage are the Qur'an and its memorization, learning to read and write, acquiring the outlines of religion and study of some Arabic poetry; besides which he is again aware of the need for play and exercise. Ibn Sina says: 'When the boy's joints strengthen, and his tongue is apt, and he is ready for instruction, and his hearing is attentive, he begins to learn the Qur'an, and is shown letters of the alphabet, and is instructed in the outlines of religion. The boy should recite the rajaz (poetic verse), then the qasida (classic ode); the rajaz is easier and is more quickly learned because its stanzas are shorter and its rhythm lighter' [50].

The child should first recite the rajaz, since it is easier to remember. The verses the child memorizes must make plain the usage of good manners and of learning, and the disgrace of ignorance and foolishness; it must encourage respect towards parents, acceptable behaviour, hospitality to guests, and high moral standards [51]. This means that the poetry which Ibn Sina wants to be presented to the child at this stage is literature with a message, which contributes to the boy's training, and giving him that moral education which Ibn Sina considers to be the human being's goal and the source of his happiness.

The curriculum put forward by Ibn Sina reminds us of society's concern at that time with Islamic culture and its basic elements: the Qur'an, poetry, devoutness and ethics. On the other hand, he does not ignore the child's need for play, movement and diversion, so that his curriculum does not really differ very much from that followed by the modern child in the majority of Islamic countries today, except for its concentration upon 'memorizing the Qur'an' and in giving this learning 'absolute priority'.

6.3. Methods of higher instruction (age 14 onwards)

Instruction at this stage is specialized according to the pupil's future occupation that has been chosen depending on his inclinations and aptitudes. This is an open-ended education, meaning that it continues throughout life. Ibn Sina says: 'When he has finished learning the Qur'an and memorizing the fundamentals of the language, at that time one should look into what occupation is desired for him, and he should be directed on this path; if [his teacher or guardian] wishes him

to study literature, then to the study of language he adds that of epistles, speeches, argument and dialogue, and similar subjects; calculation is explained, and he is initiated into administration through a practical course; care is taken with his handwriting; and if he seems destined for another discipline, he is guided accordingly' [52].

Ibn Sina divided the education of his day into theoretical instruction and manual or practical instruction (trade, jewellery making or another craft). This practical learning 'is acquired by diligent practice in the activity of that craft' [53], or by being trained in it. Theoretical education, on the other hand, is that which is acquired from 'speech heard or understood, which naturally conveys a belief or an opinion, or creates an impression which did not exist before' [54]. This theoretical teaching is also made up of two kinds: 'transmitted' theoretical teaching, and intellectual or philosophical theoretical teaching. Each type of theoretical or practical teaching—and likewise every form of transmitted or intellectual teaching—has its means and methods which prepare the individual for specialization in the chosen field. We would wish that Ibn Sina had spoken in greater detail about these three methods of teaching (transmitted, intellectual and vocational). Unfortunately, he restricted himself to drawing attention to them, which does, however, indicate their existence at that time. His subsequent writings speak at greater length about the methods by which the students of the intellectual sciences were taught [55].

6.4. The teaching of girls

Ibn Sina did not speak about girls as much as he did about boys. However, the fourth century of the Islamic era witnessed great activity in the field of education from which women shared to a certain extent since there were some outstanding women lawyers, poets and singers at that time [56]. Perhaps this is due to the fact that, in Ibn Sina's view, a woman did not need to earn her living like a man, but he made it clear that the man was expected to protect and care for her, and support her financially [57]. Thus women did not need to follow specialized or higher education, such as the man needed in order to prepare him for work or a craft from which he would earn his living in the future.

The teaching required by a woman was such as to fit her to be a wife, mother and sister. It appears that it was customary in Ibn Sina's day for this education to be carried out at home and to be taken care of by the girl's family or by a private tutor assigned to this task. It is clear that Ibn Sina acknowledged this individual style in teaching girls, and left their teaching to their families, who would give them whatever moral, religious and cultural preparation they desired.

7. Methods of instruction

7.1. The method of learning the Qur'an, calligraphy and Arabic literature

In the lands of Transoxania in Ibn Sina's day, handwriting was taught by the Qur'an teacher, as Ibn Khaldun makes clear in his *Muqaddima* [58]. It appears that when Ibn Sina says: 'When the boy's joints strengthen, and his tongue is apt, and he is ready for instruction, and his hearing is attentive, he begins to learn the Qur'an, and is shown letters of the alphabet […]' [59], he refers to the practice current in his day for teaching 'handwriting' by drawing on a wooden 'slate'. The teacher would draw the letters of the Arabic alphabet, and the child would have to learn them, both by heart and by hand, until he could write and pronounce them perfectly. Then came the next stage — composing individual words and sentences. After that the pupil could begin writing with his own 'slate' the Qur'anic verses which he had to learn by heart.

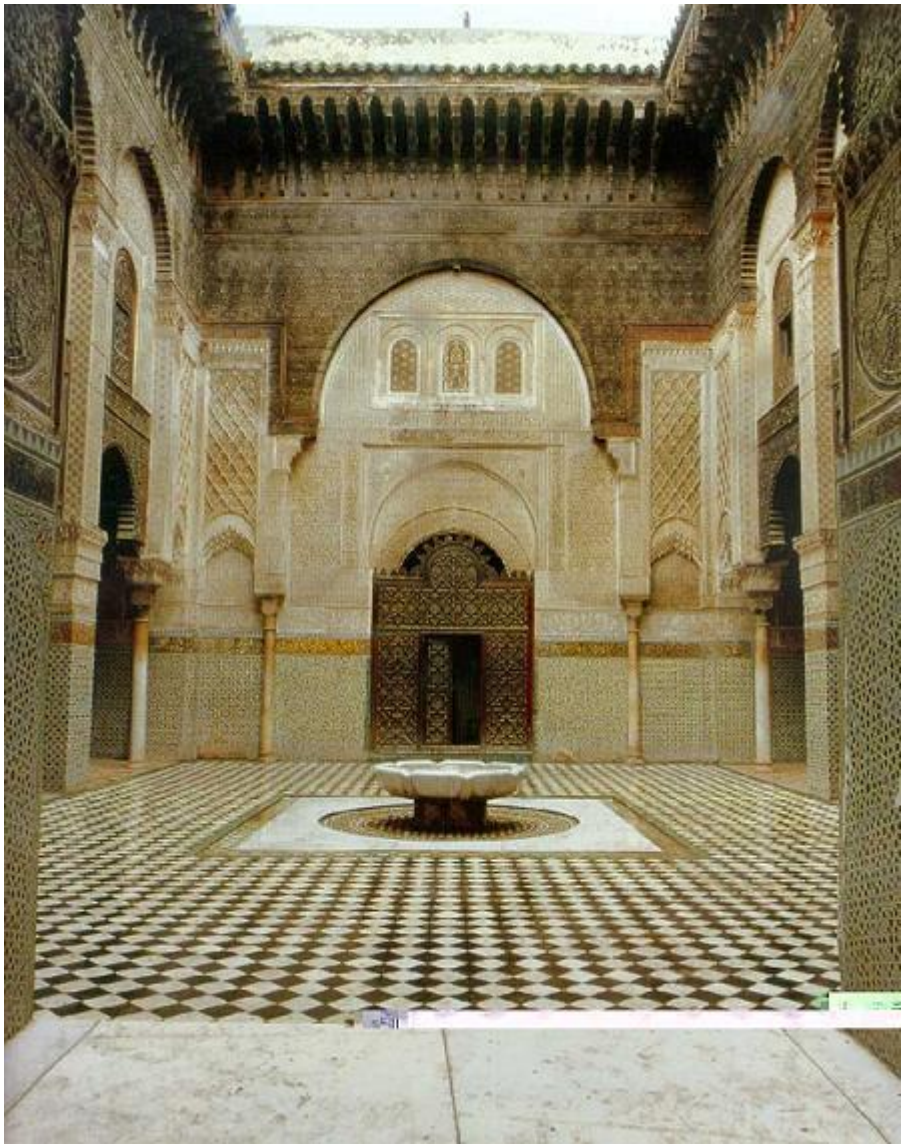

Figure 8: Madrasat al-'Attarin (Attarin school) in Fez, Morocco, a classical school built in 1350-55 CE by the Merinid Sultan Abu 'Inan. Guide de la ville de Fès (**Source**).

Ibn Sina says: 'And when he has reached the age of 6 years, he should be brought to the the tutor and the teacher' [60]; to the tutor so that he can memorize some Arabic poetry and to the teacher to memorize the holy Qur'an. Ibn Sina considers that the tutor should choose poems that are simple in expression and language, with short stanzas and a light meter so that students can easily memorize and understand them. The tutor must be careful to select poetry which has been composed with a high moral purpose, praising noble virtues and condemning misdeeds, because the child during these years is strongly influenced by what he reads and hears [61].

7.2. Styles of moral education

Ibn Sina shows a profound understanding of the psychological bases of moral education. Here he has a double approach, since he is interested both in a concern for incentives, as represented by good examples, a healthy environment, encouragement, persuasion and kindness; and also in preventive measures, such as admonition with anger and punishment.

Ibn Sina was concerned a lot about the harm that could result from physical punishment, permitting it only in cases of necessity, considering that excessive beating includes an element of revenge and does not achieve the desired educational effect [62].

7.3. Various methods of higher education

When we read accounts of the teaching methods followed by Ibn Sina himself in his study circles and in imparting learning to his students, we find that he did not restrict himself to any one method. Sometimes he dictated his lessons to the students, sometimes he held discussions with them; most often he gave them explanations, composed treatises or books to present his point of view, or replied to some epistle, and he would advise his students to read, investigate and study, indicating to them particular reference books for every branch of learning.

7.4. Practical application

After one had chosen the particular branch of learning in which one was going to specialize and had made some progress, Ibn Sina advised the student to put this learning into practice. If the student was studying medicine, he should try to apply himself in a practical way to this profession. If he was studying literature, calligraphy and composition, he should try to earn his living by his pen. Ibn Sina's intention was for the student to become more responsive to his studies and to have greater faith in their usefulness, as well as perfecting them through practical application, at the same time as learning to earn a living. Ibn Sina says: 'If the boy is immersed in his craft to some extent, then it is a good moment for him to earn his livelihood from it, because it brings two advantages: first, when he is rewarded by the enjoyment of earning through his own craft and recognizes its potential, he will have esteem for it, and will be all the more motivated to excel in it and to explore all its secrets, and, secondly, he becomes accustomed to earning his own livelihood' [63].

*7.5. Teacher training*Ibn Sina perceives how important it is to make a good choice of teacher, and to give him a good theoretical and moral training. Indeed, the teacher's role in educating young people goes beyond presenting them with facts, for students acquire from their teachers a great many habits, ideas and values. Therefore, Ibn Sina requires that the teacher should be an excellent person, discerning the values of society and moral virtues so that the students will follow him as a guide and model. Ibn Sina says: 'The educator must be intelligent, a man of religion, […] skilful at instructing children, dignified, calm, far removed from foolishness or pleasantries, not given to levity or slackness in the youth's presence; neither rigid nor dull; on the contrary, he should be kind and understanding, virtuous, clean and correct. He is one who has served the leaders of the nation, knows the kingly virtues in which they take pride and the correct manners used in society' [64].

Ibn Sina noticed that the teacher not only conveys knowledge and facts to his students, but brings them into contact with those values and ideas in which he believes, and those manners and virtues with which he is endowed. If he for his part transmits knowledge with care and feeling, then the students will copy his manners and his virtues, effortlessly and without realizing it, in the process of 'learning by imitation' [65].

This glance at Ibn Sina's educational thinking shows him as an original thinker, with distinctive educational views. In addition, he was the leader of a philosophical school which influenced education both in the Islamic east and the Christian west [66]. For these many reasons, we still have a great deal to learn from him today.

Science in the Golden Age

Written by Paul Lunde
Illustrated by Michael Grimsdale
Additional illustrations courtesy of Bodleian Library

Towards the end of the 10th century, Ibn al-Nadim, son of a Baghdad , bookseller and boon companion of Abbasid caliphs, compiled an annotated bibliography of books that had passed through his hands during the course of his long and active life. The sheer number of books that he lists, to say nothing of the range of their subject matter, is astonishing: Aristotle appears beside Sindbad the Sailor, Euclid beside the stories of Goha, Plato beside the poems of'Antar ibn Shaddad.

The most striking feature of Ibn al-Nadim's catalog, however, is the number of books dealing with science. In a chapter entitled *The Reason Why Books on Philosophy and Other Ancient Sciences Became Plentiful in This Country,* Ibn al-Nadim relates a strange story of how Aristotle appeared in a dream to the Caliph al-Ma'mun and assured him that there was no conflict between reason and revelation. Thus reassured, al-Ma'mun set about obtaining the works of the Greek philosophers, the first step toward founding the famous House of Wisdom, a center for the translation of Greek scientific works into Arabic. Ibn al-Nadim told the story this way:

This dream was one of the most definite reasons for the output of books. Between al-Ma'mun and the Byzantine emperor there was correspondence ... so al-Ma'mun wrote to the Byzantine emperor asking his permission to obtain a selection of old scientific manuscripts, stored and treasured in the country of the Byzantines. After first refusing, he finally complied, and al-Ma'mun sent forth a number of scholars, among them al-Hajjaj ibn Matar, Ibn al-Batrik, Salman, the director of the House of Wisdom and many others. They selected books from those they found and brought them back to al-Ma'mun, who ordered them to prepare translations of them.

Though the House of Wisdom was founded in 830, Abbasid interest in Greek science had begun almost with the founding of the dynasty in 750 and by the time the House of Wisdom was launched, that interest had already been expressed in a number of important fields. The first Arabic translations of the medical works of Galen and Hippocrates, for example, were made by the official translator of the second Abbasid caliph, al-Mansur, builder of Baghdad. These sparked the interest in medicine so characteristic of Islam.

In 809, the Caliph Harun al-Rashid founded the first hospital in the Islamic World, and within a short time no major city in the empire was without one. The translator of these medical texts died in 800 - the year that Charlemagne was crowned Holy Roman Emperor. His son, Ibn al-Batrick, was among those scholars sent by al-Ma'mun to the Byzantine court in search of manuscripts.

But why should an Abbasid caliph, upholder of the Holy Law of Islam, dream of Aristotle, pagan philosopher to an alien race? Why did the Muslim community, engaged first in the great excitement of the conquests, and later in the difficult and absorbing task of administration, trouble with the science and philosophy of the Greeks, the lore of Persia and the mathematics of India?

The answers to these questions lie in the extraordinary cross-fertilization of once separate intellectual traditions that occurred as a result of the Muslim conquests of the seventh and early eighth centuries. These conquests united the ancient civilizations of the Middle East - to say nothing of North Africa andSpain - under a single rule for the first time since Alexander the

Great, and Baghdad, from its foundation in 763, became a meeting place for Persians, Greeks, Indians, Copts, Berbers, Sogdians, Turks and even Chinese.

These people spoke many different languages, represented a great variety of cultures and an even wider variety of religions. Jews, Christians - of every possible variety - Manicheans, Hindus, Buddhists and even pagans jostled each other in the streets of the new capital. Yet the Abbasids, who tended to encourage talented men whatever their origin, absorbed them all and they, eager to contribute their talents helped to transform the empire.

The most single striking effect of the unification - of Anatolia, Iran, Syria, Iraq, Egypt, Palestine, North Africa and Spain - under Islamic rule was the opening of formerly closed frontiers - frontiers that had been closed politically, linguistically and intellectually since the death of Alexander the Great in the fourth century B.C. The Arabic word which we translate as "conquest" literally means "openings" - *futuh* — and this was indeed the effect of the Muslim conquests. For centuries the Byzantines had been at war with the Persians; now that major political and cultural frontier had fallen and students from the ancient university at Gondeshapur were able to meet colleagues from the philosophical schools of Alexandria in the streets of Baghdad and the effects were dramatic: no less than a scientific renaissance. It was rather as if Russia and America were to be united under the benevolent rule of a third party and able to freely exchange scientific information.

At first, contacts between scholars of such different backgrounds were limited - because of the lack of a common language. But by the time al-Ma'mun conceived the idea of the House of Wisdom, Arabic had already become the language of international scholarship as well as the language of Divine Revelation - and this was one of the most significant events in the history of ideas. Greek, long the language of philosophical and scientific inquiry, gave way to Arabic, and it was through the lens of Arabic that Western scholars, after the long half-light of the Dark Ages, first looked on the pages of Plato and Aristotle.

Another intellectual strand which was woven into the pattern of Islamic intellectual life during the early Abbasid period was that of Persia. The Abbasid movement had its origin in Khorasan, and particularly in the oasis of Marv (now in the Soviet Union), which had been the home of a medical school under the Sassanids. The Barmakid family, which supplied the Abbasid caliphs with their advisors and prime ministers from 750 until 803, was responsible for fostering translations from Pahlavi historical and scientific works into Arabic. It was through Pahlavi that the Arabs first came into contact with the learning of India, which had a long tradition of intellectual activity in the fields of astronomy, medicine and mathematics.

The Barmakids were also responsible for establishing the first paper mill in Baghdad.

Until the capture of Chinese paper makers by Muslim forces at the Battle of Talas in 751, precious books - such as the Koran -had been written on parchment, while papyrus was used for ephemeral government documents. Neither was very suitable, parchment because its price was prohibitive, papyrus because it decayed in the damper, colder climates outside its native home of Egypt. Paper, on the other hand, was the perfect writing material: cheap, long-lasting and attractive. This "invention" - for so it was - had an effect on education and scholarship as important as the invention of printing in the 15th century. Books were now within the reach of everyone, and soon schools were attached to most mosques, and libraries became common.

Unlike the Byzantines, with their suspicion of classical science and philosophy, the Muslims were actively enjoined by the Traditions - the *dicta* of the Prophet - to "seek learning, though it be in

China." Another well-known Tradition states: "The search for knowledge is obligatory for every Muslim"; another that "The ink of scholars is worth more than the blood of martyrs."

In obedience to these injunctions, the first generations of Muslim scholars had devoted themselves to making the language of the Koran a vehicle for the expression of scientific ideas. Now, with the establishment of the House of Wisdom, with its library and staff of scholar-translators, the work could begin.

The job that lay before these men was Herculean. It was nothing less than the transfer of what had survived of the philosophical and scientific tradition of the ancient world - first into the Arabic language, and then into the conceptual framework of Islam. In the process, old errors were corrected and the experimental method, the basis of all scientific progress, was clearly enunciated.

According to a tradition which early Muslim scholars loved to quote, L Aristotle had inscribed above the door of his house: "Let no one enter who does not have a knowledge of mathematics." This science, together with logic, its handmaiden, was seen as the basis of all others and al-Farabi, the great Arab philosopher, who died in 950, placed logic and mathematics near the head of his *Catalog of Sciences* - a book which in its Latin translation had a considerable influence upon the curricula of medieval European universities. He arranged the sciences as follows : (1) the linguistic sciences (2) logic (3) mathematics (4) physics (5) metaphysics (6) politics (7) jurisprudence and (8) theology.

Accordingly, al-Hajjaj ibn Yusuf ibn Matar, who accompanied the first embassy to the Byzantine court, brought back a copy of Euclid's *Elements* and made two translations, one for the Caliph Harun al-Rashid and the other for al-Ma'mun. These translations served as the basis for a critical edition prepared by two of the most famous translators associated with the House of Wisdom, Ishaq ibn Hunain and Thabit ibn Qurra. Muslim scholars also translated a commentary to Euclid by Hero of Alexandria, the third century B.C. inventor and mathematician, who developed a prototype of the steam engine.

This was not the only work on Euclid to find its way into Arabic. Translations were also prepared of works either by Euclid or attributed to him on the subjects of optics, music, ethics, logic and weights and measures. The foundations laid by these translations of Euclid were buttressed not only by the translation of Hero's commentaries, but by at least 11 major works by Archimedes, including a treatise on the construction of a water-clock. Nichomachus of Gerasa (Jerash) had written a book on number theory in the second century, heavily influenced by Pythagorean theories, and this provided the basis for some of the more arcane Islamic speculations in this field. Other late classical mathematicians, men like Theodosius of Tripoli, Apollonius of Perga, Theon and Menelaus were also translated into Syriac and/or Arabic by the staff of the House of Wisdom.

Armed with these translations, as well as certain Indian works, the great age of Islamic mathematical speculation began. Its early development was intimately linked with two other disciplines based upon it: astronomy and music, or the science of harmonics.

The first great advance on the inherited mathematical tradition was the introduction of Arabic numerals. Scholars working at the House of Wisdom first became aware of them in translations of Indian astronomical works, and hence called them "Indian." These numerals embodied the place-value theory which allowed numbers to be expressed by nine figures plus zero (Arabic *sifr,* "cipher") and not only simplified calculation of all sorts but made possible the development of algebra.

Muhammad ibn Musa al-Khwarizmi, born in the town now called Khiva, seems to have been the first to systematically explore their use in his book, *Addition and Subtraction in Indian Arithmetic,* later translated at Toledo into Latin under the title *Algorismi de numero indorum* and introduced as "Arabic numerals" into the West. Al-Khwarizmi used both Greek and Indian sources and their cross fertilization led to his famous *Kitab al-Jabr wa al-Muqabala,* the first book on algebra; the word "algebra" is derived from the second word in his title and originally meant "bone-setting." Al-Khwarizmi used it as a graphic description of one of the two operations he uses to solve quadratic equations.

Interest in geometry began with the translation, as we have seen, of Euclid's *Elements.* The Islamic world responded to geometry even more whole-heartedly than it had to algebra, as the beautifully drawn geometric proofs which adorn the pages of Arabic manuscripts on the subject attest. Its study influenced both architecture and the decorative arts and Ibn Khaldun recommended the study of geometry as good training in logical thought:

Geometry is useful because it enlightens the intelligence of the man who cultivates it and gives him the habit of thinking exactly. Indeed, all the geometrical proofs are characterized by the clarity of their arrangement and by the evidence of their systematic order. That order and that arrangement make it impossible for any error to creep into the argument. Therefore the minds of people who are engaged in these studies are not in danger of being deceived and their intelligence is sharpened.

The great North African historian, in striking and homely image, goes on to say that the study of mathematics in general "is like soap for the clothes, which washes away the dirt and cleans the spots and stains."

The men most responsible for encouraging the study of geometry were the sons of Musa ibn Shakir, al-Ma'mun's court astronomer. These three men - Muhammad, Ahmad and al-Hasan - devoted their lives and fortunes to the quest for knowledge. Their devotion to the cause of science is all the more remarkable by virtue of the fact that they were private citizens; their interest in these matters shows how widely the scientific renaissance of the ninth century reached. Ibn al-Nadim says of them:

These men were some of those who took extreme pains to study the ancient sciences, for the sake of which they gave generously what was required, taxing themselves with fatigue. They dispatched to the Byzantine country men who sent scientific manuscripts back to them.

They hired translators from various districts and kept them in attendance for many years, so that they brought to light wonders of learning. The sciences in which they were most interested were geometry, mechanics, dynamics, music and astronomy.

The "Banu Musa", or "Sons of Musa," as they were called, not only spon-. sored translations of Greek works, but wrote a series of important original studies of their own: The impressive title of one of their works by Muhammad Ibn Musa reads: *The Measurement of the Sphere, Trisection of the Angle, and Determination of Two Mean Proportionals to Form a Single Division Between Two Given Quantities.* His interests were not limited to geometry, however; he also wrote works on celestial mechanics, the atom, the origin of the earth, and an essay on the Ptolemaic universe. His brother Ahmad wrote a fundamental work on mechanics, while al-Hasan wrote a study of the geometrical properties of the elipse. Al-Hasan was perhaps the most gifted geometrician of his

time. He translated the first six books of Euclid's *Elements* and is said not to have finished it because he was by then able to work out the remaining propositions himself.

In terms of influence on mathematics in the West, the most important work of the Banu Musa was *On the Measurement of Plane and Spherical Figures,* which was translated in the 12th century by Gerard of Cremona under the title *Verba filiorum Moysi filii Sekir, id est Maumeti, Hameti, Hasan.*

The Banu Musa served a number of caliphs and occasionally were even involved in practical projects such as the construction of a canal. They were also famous for discovering perhaps the greatest of the scholars of the ninth century, Thabit ibn Qurra. While returning from a trip to Byzantium in search of manuscripts, Muhammad ibn Musa stopped in the town of Harran, where he met Thabit ibn Qurra, working as a money changer. Muhammad was so struck by Thabifs mastery of Syriac, Greek and Arabic that he persuaded Thabit to go to Baghdad - where such talents would find a suitable reward. There, Muhammad personally presented his *protege* to the Caliph al-Mu'tadid, who was so struck in his turn by Thabifs learning and intelligence that he appointed him court astrologer.

To the small coterie of scholars at the House of Wisdom, Thabit was invaluable, if only because his knowledge of Greek and Syriac was unrivaled. This latter language was important, for in many cases the writings of the Greek scientists were either preserved in Syriac versions, made by Nes-torian scholars of Iraq and Persia, or more frequently translated first into Syriac and then into Arabic. The reason for this was that the Christian communities, whose language was Syriac, tended to know Greek but not Arabic, while Muslim scholars found it easier to acquire a knowledge of Syriac, which is closely related to Arabic, than they did to learn Greek.

Most early translations prepared under the auspices of the House of Wisdom were done in this way, through the cooperation of teams of scholars of different religious and linguistic backgrounds. Thabits success was due as much to his linguistic abilities in the three major languages as to his very great natural gifts.

Thabit immediately set about correcting some of the earlier translations of important works, such as Ishaq ibn Hunain's editions of Ptolemy's *Almagest* and Euclid's *Elements.* His translations of key works by Archimedes, such as the famous *Measurement of the Circle,* were done into Latin in the 12th century by the indefatigable Gerard of Cremona, a worthy successor to Thabit.

Thabit also wrote more than 70 original works in the fields of mathematics, astronomy, astrology, ethics, mechanics, music, medicine, physics, philosophy and the construction of scientific instruments. He wrote valuable commentaries on Aristotle, Ptolemy and Euclid, as well as a series of introductions to other Greek thinkers.

Finally, his sons formed a dynasty of scholars that lasted to the end of the 10th century. His son Sinan was the most famous physician in Baghdad, director of several hospitals and court physician to three successive caliphs. He was an author as well, and wrote books on history, mathematics, astronomy and politics.

His son, Ibrahim ibn Sinan ibn Thabit, was also a prominent scientist, perhaps better known as, an instrument maker. When Ibrahim was 17 years old, he first became interested in various ways of reckoning time by the sun, and wrote a systematic treatise on the construction of sundials which remained standard for many years. One of Ibrahim's brothers, Thabit, named after his grandfather, was director of various hospitals, as well as the author of a work on history.

Thabit ibn Qurra and his descendants, together with the Banu Musa, led lives of extraordinary dedication to science and were enormously productive. The effect of both their translations and their original works - on their own and succeeding generations of scholars-was pervasive.

The Banu Musa and Thabit ibn Qurra and his sons did not work in isolation. The works that issued from the House of Wisdom were the product of many different men - linguists, editors, researchers, scribes and technical advisors. We unfortunately know little about how the House of Wisdom was organized. But we do know that these scholars developed certain academic techniques, such as collating as many different manuscripts of a given work as possible in order to establish a critical text, glossaries, annotations written in the margin of the page and the compilation of dictionaries of technical terms. These techniques are still basic to all academic research. Ibn al-Nadim lists 57 translators who were associated with the House of Wisdom and says that the running costs of the organization, including maintenance, came to 500 gold dinars a month.

Two other men also played critical roles in the transmission of Greek learning to the Muslim world: Hunain ibn Ishaq - known to the Latin west as Joanitius - and Qusta ibnLuqa, from Baalbek.

Born near al-Hira, the old capital of the Lakhmid dynasty in Iraq, Hunain ibn Ishaq was the son of an apothecary, who, recognizing his son's bent for medical studies, sent him to Baghdad. In the capital, Hunain found powerful supporters in the Banu Musa and set about learning Greek, and was soon translating the entire canon of Greek medical works into Arabic - including Galen, Hippocrates and the famous Hippocratic oath, obligatory then for Muslim physicians as it is everywhere today. Hunain was in many ways the most gifted of the translators associated with the House of Wisdom. His scholarly methods were impeccable, and he tended to translate more freely than many of the others, whose translations tended to err on the side of literalism - sometimes to the point of virtual incomprehensibility by those who did not know the original text.

Hunain also wrote at least 29 original treatises on medical topics. The most significant of these was a collection of 10 essays on ophthalmology. This work covers, in systematic fashion, the anatomy and physiology of the eye and the treatment of various diseases which afflict the vision. It is the first Arabic medical work to include anatomical drawings, and those that illustrate surviving manuscripts are very accurately drawn. This book was translated into Latin and for centuries remained the authoritative treatment of the subject in both Western and Eastern universities.

Hunain lived a life of exemplary piety and by his example did much to lend dignity to the medical profession. The Cdliph al-Mutawakkil, seeking to test Hunain's integrity, ordered him to prepare a poison; ″I have learned only the actions of beneficial drugs, confident that this is all that the Commander of the Faithful would want of me," replied Hunain, and was rewarded by being made the director of the House of Wisdom.

Qusta ibn Luqa was also an accomplished translator and scholar. Ibn al-Nadim, in fact, considered him an even better translator than Hunain, and says: "He was never subject to criticism, being a master of literary style in the Greek tongue and excelling also in Arabic diction." Qusta wrote some 40 original works on an intriguing variety of subjects: politics, medicine, "burning mirrors," insomnia, paralysis, diseases which affect the hair, fans, the cause of wind, an introduction to logic, a book of anecdotes about the Greek philosophers, dyes, nutrition, an introduction to geometry, astronomy and "The Bath," to mention only a few.

Yuhanna ibn Masawaih was one of the early directors of the House of Wisdom. He served under four caliphs - al-Ma'mun, al-Mu'tasim, al-Wathiq and al-Mutawakkil. He wrote almost exclusively about medical problems, in particular gynecol-ogy. Ibn al-Nadim related the following anecdote, which shows that the scholarly milieu of ninth century Baghdad was not unrelievedly serious:

Ibn al-Hamdun, the court companion, made fun of Ibn Masawaih in the presence of al-Mutawakkil, where upon Ibn Masawaih said to him, 'If in the place of your ignorance there were intelligence, it could be divided among a hundred black beetles so that each one of them would be more intelligent than Aristotle.

Perhaps the greatest of the ninth century physicians was Abu Bakr Muhammad ibn Zakariya al-Razi, from the important Iranian town of Rayy. Al-Razi, known to the West as Rhazes, wrote, according to a bibliography of his writings compiled by al-Biruni in the 11th century, 184 works. Fifty-six of these dealt with medical topics. Al-Razi was»deeply versed in the classical medical tradition, as it had been made accessible in the translations that poured forth from the House of Wisdom, but his originality lay in his open advocacy of experiment and observation.

The authority of the Greek philosophers and scientists was so great that lesser men were content to accept their views without question. Not al-Razi, who questioned everything, and relied more on his own observations than on received attitudes. His gigantic compendium called *al-Hawi,* "The All-Encompassing," contains al-Razi's daily observations and diagnoses. He wrote a very important work on smallpox and measles, in which he correctly differentiates their symptoms for the first time.

A friend of Ibn al-Nadim gave the following lively account of al-Razi L at the height of his powers:

When I questioned a man, one of the people of Rayy, of great age, about al-Razi, he said: 'He was an old man with a large sack-shaped head, who used to sit in his clinic with students around him...a patient would enter and describe his symptoms to the first persons who met him. If they had knowledge of what was wrong, good; but if they did not, he would pass from them to others. Then, if they hit upon the diagnosis, good; but if not, al-Razi himself would discuss the case. He was generous, distinguished and upright with the people. He was so kindly, compassionate with the poor and the sick that he used to bring them substantial rations and provide nursing for them...He was never found when not taking notes or transcribing them, whether to make a rough draft or a revised copy'.

It is impossible to give an adequate idea of the range of al-Razi's thinking, even in the field of medicine (he was a philosopher and mathematician as well as a physician) but two titles give us a sense of the man's wit and common sense: *The Reason Why Some Persons and the Common People Leave a Physician Even if He Is Clever* and *A Clever Physician Does Not Have the Power to Heal All Diseases, For That Is Not Within The Realm of Possibility.*

Unlike their modern counterparts, these Muslim scholars did not specialize. They investigated any subject that interested them, for they regarded all fields of knowledge as essentially one. Perhaps the best illustration of this is al-Kindi, "The Philosopher of the Arabs," of whom Ibn al-Nadim says: "He was the most distinguished man of his time and unrivaled during his period for his knowledge of the ancient sciences as a whole."

Al Kindi was the first Muslim philosopher to show that there was . no essential conflict between Greek rationalism and Revelation. He was profoundly religious, and sought to use Aristotelian logic to support essential Islamic dogmas. But what is astonishing about al-Kindi is the range and depth of his speculations. He wrote about logic, philosophy, geometry, calculation, arithmetic, music, astronomy and a great many other things. He wrote an introduction to arithmetic as well as an almost endless list of important works: *The Use of Indian Arithmetic; That the Sphere Is the Largest of Bodily Forms and That the Circle is the Greatest of All Plane Shapes; That the Surface of the Sea is Spherical; Calculating the Azimuth on a Sphere; An Introduction to the Art of Music; Projection of Rays; An Explanation of the Cause of the Retrogression of the Stars; The Reason Why Rain Rarely Falls in Certain Places; Areas of Vaulted Chambers; How to Form a Circle Equal to the Surface of A Designated Cylinder; Determination of the Hours on a Hemisphere by Means of Geometry; The Cause of Vertigo; The Reason Why the Highest Part of the Sky is Cold, While the Part Near the Earth is Warm; The Reasons for Cloud Formations; Calculation and Making an Instrument to Determine the Distances of Heavenly Bodies, Crossbreeding the Dove, Species of the Bee* - and more.

Al-Kindi, and to a certain extent, al-Farabi, his successor, demonstrate the liveliness of Muslim thought as the 10th century drew to a close. Al-Farabi wrestled with many of the same philosophical problems as al-Kindi and wrote a book entitled *The Perfect City,* which expresses the degree to which Islam had first assimilated Greek ideas and then impressed them with its own indelible stamp. *The Perfect City* is an essay on what might be called ethical urbanism - the ideal city should be founded on moral and religious principles, and from there would flow the physical infrastructure. Al-Farabi undoubtedly had the magnificent round city of Baghdad, The City of Peace, in mind, which was consciously constructed on the pattern of the ancient cosmological cities of the east, its round form representing the Cosmos and its four gates the cardinal points of the compass.

With the death of al-Farabi in A.D. 950, the first period of Islamic scientific thought drew to a close. It had begun in 763 with the foundation of Baghdad; it had seen first the translation of the intellectual patrimony of the ancient world into Arabic, and then the first attempts to enlarge the intellectual horizons of that inheritance. Practically, the same period witnessed the development of certain basic social institutions to a very high point — hospitals, universities, libraries, charitable institutions and public services, such as the post and water supply. During the next 300 years, although the political empire of the Abbasids would slowly fragment, the intellectual and scientific progress would continue, although now centered in provincial centers - particularly Khorasan and Spain.

A popular anecdote illustrates the intellectual background of the times. The inventor of the game of chess was granted a single request by the ruler to whom the game was first presented. The inventor's request was simple. He wanted as many grains of wheat as would result if one placed one grain on the first square of the board, two on the second, four on the third, eight on the fourth, and so on until the 64th square of the chess board. The ruler agreed to grant what seemed a modest request, but when he came to fulfill it, he discovered to his chagrin that the chess board would contain all the grain in the kingdom.

Al-Biruni, an 11th-century Persian scholar, wanted to know exactly how many grains of wheat were involved in this problem. He arrived at the figure 18,446,744,073,709,551,615, and anyone who thinks medieval computational methods primitive, should try to solve this problem without the use of a calculator.

Al-Biruni accompanied Mahmud of Ghazna's famous expedition against India in 1001. While there he learned Sanskrit and wrote a *History of India* based on native sources and his own

observations. Al-Biruni's accuracy in determining the number of grains of wheat in the chessboard problem is reflected in his historical work. Like his predecessors in Baghdad, he reveals both wide-ranging interests and a concern with practical problems. For example, he is the first known writer to identify certain geologic facts, such as the formation of sedimentary rock. He was a great mathematical astronomer and was centuries ahead of his time in criticizing the Ptolemaic model of the universe.

Al-Biruni was also the author of a most detailed treatment of spherical trigonometry. Trigonometry is in fact an innovation of Muslim mathematicians, who were the first to clearly define the sine, cosine and cotangent functions. Other mathematicians, such as Nasir al-Din al-Tusi, also the author of an important work on ethics, greatly advanced mathematical theory in allbranches, and'Umaral-Khayyam, better known in the West as a poet, wrote the clearest and most elegant textbook of algebra ever produced.

Many of these advances took place as a spin-off of the consuming . interest in astronomy so characteristic of Muslim lands at the time. Observatories were everywhere, and both physical and mathematical models of the universe were produced, and tables giving the distances of the fixed stars and the planets were continually refined. The size of the earth was measured to a degree of accuracy not attained again until the present century. The Muslim world, however, never abandoned the earth-centered theory of the universe which it had inherited from the Greeks.

In physics, al-Biruni and his compatriot, 'Umar al-Khayyam, both wrote on the subject of specific gravity and developed formulae for determining both the specific and the absolute weight of any object. The interest in mirrors and lenses which had engaged some scholars associated with the House of Wisdom led to sophisticated theories of optics. Ibn al-Haitham, who wrote in the 10th century, was perhaps the greatest Muslim scientist to devote himself to optics. He was the author of the most important book on the subject, *The Book of Optics,* in which he gives a detailed treatment of the anatomy of the eye. He rejected the classical notion that rays issue from the eye, and correctly stated that instead the eye receives light from the object perceived.

The inventiveness of later Muslim thinkers was turned to practical fields such as agriculture and irrigation. Ibn al-Haitham had proposed a plan to dam the Nile as early as the 10th century, and although this project had to wait until the 20th century to be realized, other, less ambitious projects were common. Dams, reservoirs and acqueducts were constructed throughout the Islamic world and some of these systems survive to this day. Muslim engineers perfected the water wheel, and developed many different kinds, powered by man, animals, wind, river and tide.

Well-digging and the construc tion of the elaborate under ground water systems called *qanat* required a high degree of engineering skill. Some of these *qanat* are as much as 15.5 meters (50 feet) deep and they were built with a very slight inclination over a long distance in order to tap underground water. They were provided with manholes so that they could be cleaned and repaired. By being placed underground they reduced water-loss through evaporation to a minimum.

Agriculture was dependent in much of the Middle East on irrigation, and a series of important books were written on soil analysis, water and what kinds of crops were suited to what soils. The passion for new plants, both for nutritive and medicinal purposes, led to widespread plant introductions: cotton, rice, mulberry trees, citrus fruits, cherries, all of which were adapted to new soils and climates in their spread from the East to the West. The technique of grafting was carried to a high art, particularly in North Africa and Spain.

Zoology and Botany were both actively cultivated sciences, and works like al-Damiri's *Lives of the Animals* contain much interesting material. In the field of botany, Abu Hanifa al-Dinawari, a 10th century scholar, made notable contributions.

Throughout the classical period of Islam, intellectual activity in every field was vigorous, first in Baghdad, later in Cairo and the regional capitals of Anatolia, Iran and, still later, in India. The Arabs accepted the classical heritage, fertilized it with the thought of India and the East and elaborated, criticized and corrected it; they then passed it on to the West where it formed the basis for the great technological achievements that have since transformed the world.

Abbasid Revolution

After the end of the Rightly Guided Caliphate, in which Abu Bakr, ‘Umar, ‘Uthman, and ‘Ali led the Muslim world, the caliphate came to the Umayyad family in 661. Mu’awiya, the first Umayyad caliph, led the Muslim world from his capital of Damascus, and passed on rule to his son, Yazid, in 680. This marked the beginning of the caliphate being a family dynasty, as it would continue until its abolition in 1924. During the 1292 years of the caliphate, the title has passed a few times between different families. The first time this happened was during the upheaval of the late 740s, when the Abbasid family overthrew the Umayyads and came to power, establishing one of the most powerful Muslim empires of all time.

Problems With The Umayyads

The Umayyad Caliphate at its greatest extent.

During the 89 years of Umayyad rule, the Muslim world experienced exponential growth geographically, militarily, and economically. Muslim armies pushed into India in the east and into Spain and France in the west. With an economy buoyed by such conquests, the Umayyad caliphate became incredibly wealthy, leading to a relatively stable society.

Despite these achievements and power, there was trouble for the Umayyads brewing under the surface of the society. The first problem was the inequitable treatment of non-Arabs. As the Muslim empire pushed into non-Arab lands in North Africa, Spain, and Persia, huge numbers of non-Arab non-Muslims came under Umayyad control. For the most part, their lives were left undisturbed, with freedom of religion being one of the core principles of Islamic government. In Islamic law, non-Muslims in a Muslim state are required to pay a tax known as the *jizya*, or poll-tax. For most parts of the empire, this tax was

lower than the pre-Islamic taxes of the Byzantine or Sassanid Empires, so no discontent came from this aspect of the government.

For Muslims however, the Umayyad caliphate chose not to tax them at all, besides the *zakat*, which is an obligatory form of worship involving donating a certain percentage of wealth towards the needy. For non-Muslims newly under Umayyad rule, conversion to Islam clearly had some financial advantages. If they converted, they would be exempt from the jizya tax and would instead have to pay the zakat, which would be lower in most cases. While the jizya was not oppressively high, a lower tax rate is always attractive to a logical human beings, thus the logical thing to do was to convert.

However, the Umayyad caliphate saw a major problem with mass conversions to Islam based on tax rates. If a big enough proportion of the population converted to Islam and stopped paying the jizya, tax revenues would go way down, leading to financial instability. To combat this problem, the Umayyads decided to continue to tax recent converts as if they were still non-Muslims. The implications of this were huge.

First of all, doing so contradicted Islamic law, which legitimized the Umayyads to an extent. Equal treatment of all Muslims had been one of the most attractive messages of Prophet Muhammad ﷺ, and this policy clearly went against his teachings. Furthermore, most of the converts who were being taxed were non-Arabs. The vast majority of the Arabs of the empire were in the Arabian Peninsula and had converted during the life of the Prophet ﷺ, and were thus not subject to the jizya. This created a unequal society based on race. Arab Muslims had more privileges while non-Arab Muslims were treated as inferior.

The Umayyad caliph ‘Umar ibn ‘Abd al-’Aziz, who ruled from 717 to 720 recognized the numerous problems with this policy and reversed it as soon as he came to power. Due to his Islamically-based reign, historians and Islamic scholars consider him the “fifth rightly guided caliph” after Abu Bakr, ‘Umar, ‘Uthman, and ‘Ali. The rest of the Umayyad ruling family opposed his reforms however, and he was poisoned after 3 years in power. With his death, the equitable treatment of all races in the Umayyad Empire also ended, and serious plans to remove the Umayyads from power began.

The Abbasids

From the beginning of Umayyad rule in 661, one of the major problems they had was legitimacy. Unlike the first four caliphs, the Umayyads were not chosen by popular opinion or by respected community leaders. Umayyad rule was essential based on their ability to keep the Muslim world united and organized after the upheaval of ‘Ali’s time.

One group that offered an alternative to Umayyad rule was the people who favored the rule of ‘Ali’s family. They reasoned that since ‘Ali was the Prophet ﷺ’s cousin and son-in-law, his family had the most right to rule. This ideology found supporters among the people of Iraq as well as the Hejaz, where the

descendants of ‘Ali lived. Later, this political ideology would morph into a new sect known as the Shi’a, but in the 700s, they were indistinguishable from traditional Islam, and only differed on politics.

The problem with the people who supported rule being given to the Prophet ﷺ’s family was that they lacked the organizational skills and power to overthrow the Umayyads and establish themselves. That is where another group that was related to the Prophet Muhammad ﷺ stepped in – the Abbasids.

The Abbasid family was descended from the uncle of the Prophet ﷺ, ‘Abbas ibn ‘Abd al-Muttalib. By the early 700s, the family had settled in Humayma, an oasis town in what is now the sandy country of Jordan. Being close to the center of Umayyad power in Damascus, the Abbasids could clearly see when subtle cracks began to develop in Umayyad society based on inequality, and chose to use that as a springboard to claim power for themselves.

The Abbasids sent secret missionaries to the Persian provinces of the empire in the 730s and 740s, where discontent against the Umayyads was a common sentiment. Since most Muslims in this area were non-Arabs, the Abbasids knew they could count on the support of these people. In order to get the support of the more pious-minded, the Abbasids claimed that one of the descendants of ‘Ali had officially transferred the right to rule to the Abbasid family. Whether or not this actually happened, it helped give the Abbasids some legitimacy as the rightful rulers of the Muslim world, something the Umayyads lacked.

Revolution

In 747, after years of secretly getting promises of support throughout the eastern part of the Muslim world, the Abbasids decided the time was ripe to openly revolt. Their distinctive black banners and flags were raised near the ancient city of Merv, in the province of Khurasan, where popular support was very strong for the revolutionaries.

Led by a mysterious figure known as Abu Muslim, the supporters of the Abbasid family in Khurasan promised a return to the utopian ideals of the Prophet Muhammad ﷺ and the early caliphs. Other than that, the promises of the Abbasids were vague, and intentionally so. The important thing to the Abbasids and their supporters was the removal of the Umayyad family from power, other issues would be solved afterwards.

After securing the city of Merv and exiling the Umayyad governor, Abu Muslim began to send the Abbasid armies westward, towards the rest of Persia and Iraq. The Umayyad position had never been particularly strong in Persia, probably due to the fact that their rule was resented by the large non-Arab population, and the Abbasid revolution began to snowball into a larger movement as it rolled through the Iranian plateau.

Meanwhile, the Abbasid family had fled Humayma for the relatively safer Iraq. After an arduous journey through the Syrian desert, they arrived in Kufa, not long before the armies that were fighting for their

rule began to appear on the eastern horizon. With the support of the local people, the Abbasids organized an overthrow of the local Umayyad government, installing the Abbasids as the rulers of the city. It was in Kufa that the first public show of allegiance was given to Abul-Abbas, who was declared the first Abbasid caliph in 749.

All of this symbolic transfer of caliphate would have meant nothing without the forceful removal of the Umayyads. The Abbasid army finally met the bulk of the Umayyad forces near the Zab River in northern Iraq. The two armies could not have been more different. The Umayyads with their white flags represented the Arab Syrians who had been the most important social group in the 89 years of Umayyad rule. The black flag-waving Abbasid soldiers represented the undermined and forgotten non-Arabs of the empire and those who desired a more Islamic-based government.

At the climactic Battle of the Zab in early 750, the Abbasid force completely smashed the Umayyad army. The Syrian army was effectively routed and ceased to exist. The Abbasids were able to march right into the Umayyad homeland in Syria and take control of Damascus, relatively peacefully. The last Umayyad caliph, Marwan II, fled to Egypt, where he was found by Abbasid agents and executed. In the transitional mayhem, the Abbasids managed to round up almost every member of the Umayyad family and execute them in the years after 750, except for one young man, Abd al-Rahman. Fleeing from the Abbasid armies during his teen years, he managed to escape to al-Andalus – the Iberian Peninsula – and establish Umayyad rule there, where it would last until 1031.

After the revolution, the Abbasids managed to create a more equitable Islamic society as they had promised, but failed to fulfill all the hopes that came along with their overthrow of the Umayyads. From their new capital in Baghdad, the Abbasids established a dynasty much like the Umayyads that came before them. Despite giving non-Arabs a more equal role in society, the Abbasids failed to honor their vague promises to go back to the early days of the caliphate and that utopian society. Like the Umayyads, and every other dynasty in Islamic history, there were positive and negative aspects to Abbasid rule.

Conclusions

When studying Islamic history, it is important to avoid painting any one group as 100% good or 100% bad. With the exception of the Prophet ﷺ and his companions, almost every historical figure, movement, and empire has good and bad qualities. When applying this understanding to the Umayyad and Abbasid caliphates, we can appreciate the achievements and lofty ideals of both, while still understanding that they were both less than perfect and had their flaws.

Early Qur'ans (8th–Early 13th Century)

Department of Islamic Art, The Metropolitan Museum of Art
Julia Cohen
Department of Islamic Art, The Metropolitan Museum of Art
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The Qur'an is Islam's holiest book. Revealed to the prophet Muhammad by the archangel Gabriel, it is considered by Muslims to be the written record of the word of God. In the year 610 A.D., the Prophet frequently visited a mountain cave called Hira', located outside of Mecca, to meditate and pray. On one such visit, Gabriel asked him to recite the first five verses of the Qur'an. He commanded: "Read in the name of your Lord who created; Created man from an embryo; Read, for your Lord is most beneficent; Who taught by the pen; Taught man what he did not know" (Sura 96).

The divine revelations continued over the course of the next twenty years, first in Mecca, and then in Medina following the migration (*hijra*) of Muhammad and his followers in 622 A.D. (equivalent to the first year of the *hijri* calendar). Toward the end of his life, Muhammad began to create a physical copy of the revelations, but he was unable to complete this project before his death in 632 A.D. In the following years, his most trusted companions undertook the task of collecting them from written and oral sources. The final codified consonantal form of the Qur'an is thought to have been produced during the reign of 'Uthman (r. 644–56 A.D.), the third of the four Rightly Guided Caliphs (*al-khulafa-yi al-rashidun*). The text has remained almost unaltered to the present day. Because of its divine nature, the Qur'an has been considered by Muslims to be the "mother of all books," or the *Umm al-Kitab*, and its impact on the arts of the book in the Islamic world has thus been indelible.

The Qur'an is composed of 114 suras (chapters) arranged in order of descending length excluding the first. Many manuscripts, however, are divided into thirty sections, or *juz'*, of equal length (37.142). In this format, the entire Qur'an can be read over the course of a thirty-day month (usually during the month of Ramadan), with one volume being

undertaken each day. Other less common units of division, the *manzil* and the *hizb*, divide the text into seven or sixty parts, respectively.

Arabic is written with twenty-eight letters of only eighteen distinct forms; dotting above and below these primary forms distinguish between otherwise identical letters. Early Qur'ans often left out these markings (*i'jam*) as well as short vowels that appear as symbols above and below letters, assuming that the text would be used as a memory aide for recitation by readers who were already familiar with its content.

The earliest Qur'ans were written in the *hijazi* script, a script that predates kufic. This script is characterized by the rightward sloping of the tall shafts of the letters. The calligraphic style kufic, so named after its origins in the city of Kufa in present-day Iraq, is characterized by more static and angular upright letters that were well suited to writing on parchment as well as to use in architecture and decorative objects. During the Abbasid period, Qur'an manuscripts were produced on horizontally-oriented parchment to match the style of kufic script in which letters were usually extended to create justified margins (37.142). In some cases, individual words were even split across two lines for aesthetic reasons. Simple verse markers composed of stacked diagonal lines or in the form of rosettes were used to guide the reader, but words were typically left unvoweled and without consonant points (*i'jam*).

While early single-volume Qur'ans were often large and even monumental for use in recitations (2004.87), others were miniature in scale (62.152.2) and may have been used as talismans. Regardless of size, great attention was paid to preparing the parchment to receive ink and to the calligraphy itself. In some cases, the parchment was dyed a rich color, further elaborating on the already complex process of preparing the ground (40.164.1a). This practice was first employed in Christian Byzantine manuscripts, which were sometimes dyed purple and written on with gold or silver ink, perhaps inspiring one particularly luxurious manuscript now known as the Blue Qur'an (2004.88).

As paper was imported along trade routes from China to the Middle East, Qur'ans were produced in this new material, which was more economical and easier to prepare than parchment. The introduction of paper into the region allowed for the production of far more Qur'ans than had previously been possible. In North Africa and Al-Andalus, however, parchment continued as the preferred medium for Qur'ans until the fourteenth century (42.63). Despite a continued conservative use of this material, these manuscripts were stylistically very different from earlier kufic Qur'ans, instead employing the *maghribi* (western) script, characterized by fine spidery lines whose full curves descend deeply below the line of text. Ornate verse markers in the shape of medallions, together with other decoration, further differentiate these later parchment Qur'ans from their predecessors. These illuminated elements not only beautify the Qur'an, but they also serve a primary purpose of aiding in recitation and prayer.

In other regions, Qur'ans were produced on paper in the "new style" script, sometimes referred to as "Eastern kufic" or "Broken kufic" (2007.191). This script, with taller letters and more variation in line thickness, marked a shift to vertically oriented Qur'an manuscripts. The difference between tall and short letters is highly exaggerated in "new style" script, where the letters *alif* and *lam* extend far above the main line of the text (29.160.23). Qur'ans from this period often include more ornate decoration and diacritical marks than earlier Qur'an manuscripts (40.164.5ab).

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Madrasa al-Mustansiriyya

Baghdad, Iraq

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- **DATA**
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In 1227/625 AH, the thirty-seventh Abbasid Caliph al-Mustansir Billah (r. 1226-1242) commissioned the construction of al-Madrasa al-Mustansiriyya, a theological school in the capital city of Baghdad named in his honor. Construction lasted for six years and the school opened in 1234/631 AH. In addition to being one of the oldest madrasas that still stands, the Mustansiriyya is doubly significant as the earliest example of a universal madrasa: that is, a theological institution in which all four madhabs (rites) of orthodox Islamic law were taught.[1]

Although descriptions contemporary to the foundation of the school do not exist, later medieval descriptions suggest that the complex originally comprised the theological school, a library, a hospital, and a pharmacy. The library may have been ravaged during the Mongol raid and occupation of Baghdad. We know that the building eventually fell out of use as a school and became something of a caravanserai.

We know that craftsmen occupied the building as early as 1750/1163 AH from the report of Carsten Niebuhr, a European traveler who recorded the inscriptions on the madrasa during his travels in Iraq. A century later in 1865, the madrasa was converted to a customs office under the Ottomans. By 1945, however, the Iraqi Directorate of Antiquities had initiated a campaign to restore this historic monument and cleared the surrounding area from shops and structures. In 1960, the restored madrasa became a museum for Islamic art and culture (The Museum of Islamic Art in Baghdad).

Form

The madrasa is a rectangular complex situated on the east side of the Tigris on the downstream side of the Shuhada' Bridge, right on the riverbank. In the early twentieth century, it was surrounded by souqs. Today, the immediate commercial district around the madrasa has been demolished to return the site to its original borders.

The main entrance is a monumental portal that projects from the façade of the building's northeastern side. The relatively small arched doorway is set within a recession in the shape of a pointed arch. Surmounting the doorway within the recession is a field of geometric ornament, topped in turn by the 10-line foundation inscription of Mustansir. Framing this recession are three concentric moldings with variations on geometric star-and-polygon patterns, each following the contour of the pointed arch.

The madrasa's southwestern, river-facing façade is adorned with a geometric pattern of interlocking zigzags formed by square brick plugs that project from the façade. Below this is a monumental inscription band describing a restoration that Ottoman Sultan 'Abd al-'Aziz stretches the length of the river façade commissioned in 1865. This may replace an older inscription.

The entrance portal leads to the rear of an iwan that opens directly onto the building's central courtyard through an ornate portal. This portal consists of three archways: the central archway is fully open and leads onto the iwan interior itself while the two side arches are blind except for small doorways cut into their base that give onto enclosed rooms behind. All three are set within a large rectangular block rising above the height of the surrounding building that is divided into fields decorated with various carved geometric patterns.

Directly across from the entrance portal, on the long southwestern façade of the courtyard, a three-arched portal of nearly identical composition opens onto the madrasa's prayer hall. In the prayer hall portal, all three arches are fully open.

Flanking the entrance iwan and prayer hall portals on each side are arcades on two stories, each with six pointed archways. The first pointed archway on each side gives onto a stairwell communicating between first and second stories, and the other five lead onto a covered portico. Five doorways on the rear wall of the portico give onto narrow cells that would have been used as bedchambers.

On the courtyard's southeastern and northwestern short sides, a large central iwan rising two stories is flanked on either side by arcades on two stories, with three archways per story on either side. These archways give onto a portico leading onto cells and hallways that lead behind the cells to other service rooms.

Notes:

1. Schmid, *Madrasa des Kalifen al-Mustansir*, 1

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We are all caliphs!

The history of the Caliphate is, with a few exceptions, an unstable and unhappy one. In this essay, Stefan Weidner explains why the self-appointed caliphs of today, like the ISIS leader in Iraq, have little in common with the caliphs of old

Credible historians attest that caliphs did indeed exist at one time, and that the last caliph of any (albeit modest) global historical significance was deposed just ninety years ago. Nevertheless, caliphs have always also been figures of fairy tale and fantasy, not much different to fairies, magicians, dragons and flying carpets. If the word caliph has an aura, this is not a by-product of historical reality, which was an unhappy tale from the outset, but rather of wishful thinking – political on the part of Muslims, infused with nostalgia for the Orient on the part of the West.

The literal meaning of the word caliph – in Arabic, "khalîfa" – is nothing other than "successor" or "deputy". The first caliphs were thus called because they were both the spiritual and political successors of the Prophet Muhammad in leading the fledgling Islamic community.

When the Prophet died in the year 632, his provisions were woefully inadequate. The Koran was, insofar as it was in written form at all, a chaotic, fragmentary collection of loose sheets. Muhammad was not blessed with a surviving son who could have succeeded him, and in the absence of this son he had not specified who, instead, should carry his legacy forward.

For this reason, his closest friends decided amongst themselves who should be the Prophet's first "successor". His name was Abu Bakr, and he ruled for just two years before dying. Abu Bakr and the three subsequent caliphs were considered by ensuing generations to be "righteously guided", supposedly acting as Muhammad would have done, because unlike later leaders they had known him personally.

The Golden Age

It could indeed be said that, without them, Islam would not have existed. Not even the Koran would have been passed on, if the third caliph, Uthman (in Turkish: Osman), had not begun at least partially to record in written form what was being circulated at the time as the Koran (which literally translates as oral "recitation").

Written word: The systematic writing-down of the Koran began under Caliph Uthman. Before this, Muslims had passed on its message orally

To this day, all fundamentalists, Salafists and other religious nostalgics still invoke what they perceive as this golden age and believe they can revive it if they only conduct themselves as Muslims did during the era of the righteously-guided caliphs.

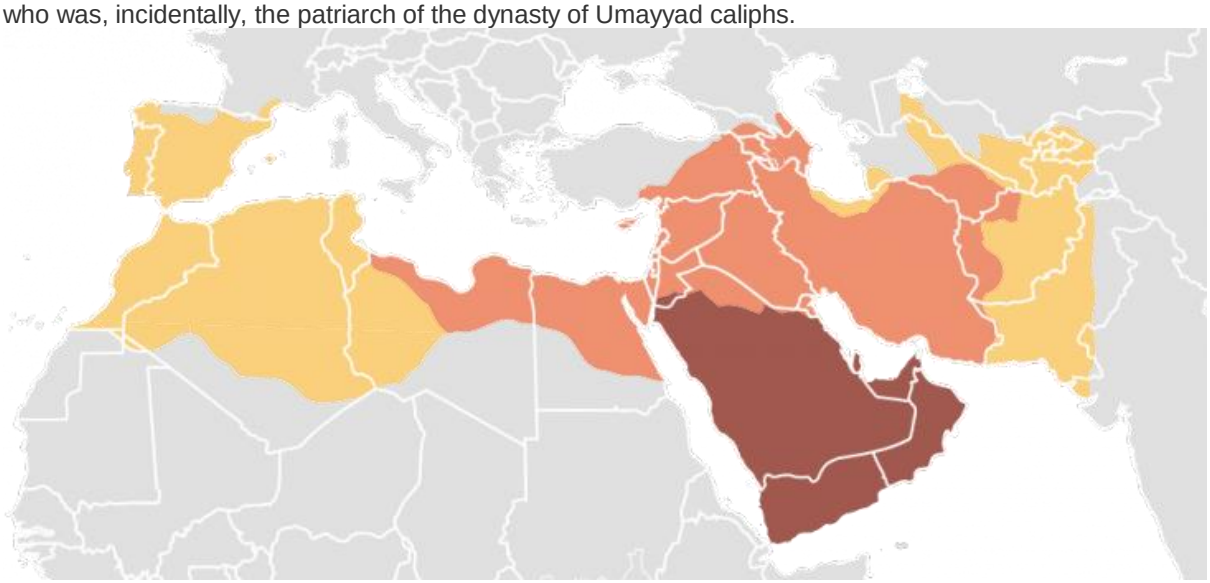
The great charm of this historical fiction is further enhanced by the fact that this epoch precedes the dispute between the Sunnis and the Shiites. Or, more precisely: it was this very dispute that brought the era to an end!

Weak point

These days, many non-Muslim observers forget that, for most Muslims, Islam also means believing in the righteous guidance of these first caliphs, just as for Christians the acts of the apostles following the death of Christ are an integral part of the salvation history.

However, from the perspective of the rational historian, this is a weak point in Islam. Of the first four caliphs, three were murdered, and it often appears that the only way in which they served as an example to the later ones was in the violent manner of their death. They did succeed in disseminating Islam far beyond the Arabian Peninsula, but they were not able to stem its internal division.

Even before the Prophet's cousin Ali, the fourth and last of the Righteously Guided, was murdered in the year 661, his opponent Mu‘awiya had laid claim to the Caliphate from Damascus. This resulted in a civil war (Arabic: "Fitna"), which could be described as the longest in the history of the world – it still endures to this day. Since then, the followers of Ali have been referred to as Shia. They were defeated in the battle against Mu‘awiya's troops, but were able to hold their own in many regions of Iraq and Iran.
If the ISIS leader Abu Bakr al-Baghdadi wants to wage war as Caliph – primarily against the Shia, whom he regards as infidels – he is not reviving the golden age of Islam but the era of the "Fitna", the internal Islamic civil war. He is acting not so much as the successor of Abu Bakr, whose name he shares, but of Mu‘awiya, who was, incidentally, the patriarch of the dynasty of Umayyad caliphs.



A huge empire uniting different peoples, languages and religions: The map shows the maximum extent of the Caliphate at the time of the Prophet Muhammad (brown), under the four Righteously Guided caliphs (red) and under the Umayyad caliphs (yellow)

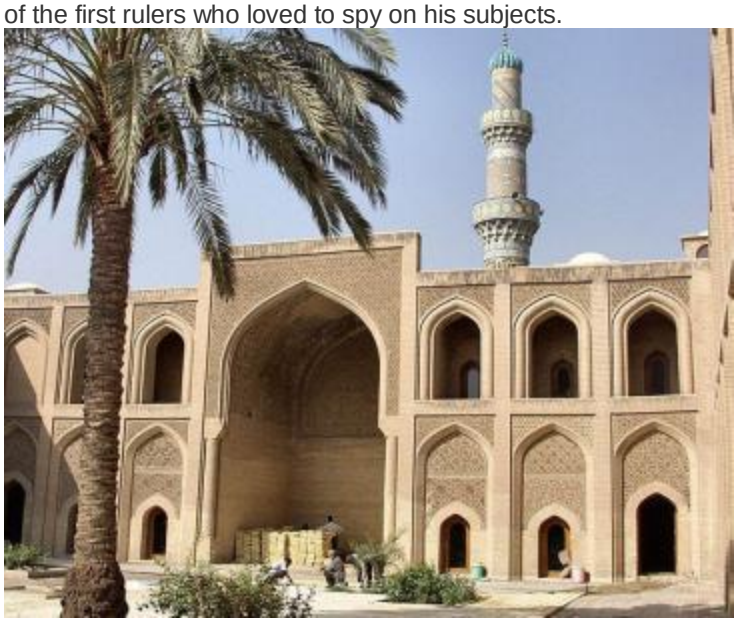
Whereas previously the caliph was decided upon by consultation among leading figures – on condition, naturally, that he, like the Prophet, was a member of the Quraysh tribe – with Mu‘awiya the Caliphate was inherited along dynastic lines and was generally passed from father to son.

Parallel caliphates

When the word "caliph" is used in the West, we think less of the early period of Islam and more of the era of the great Islamic golden age and development of power: of the Umayyad caliphates in Damascus (661 - 749) and Cordoba (929 - 1031), the Abbasid caliphate in Baghdad (749 - 1258) and the Fatimids in Cairo (969 - 1171).
We still have a living successor to the Fatimid caliphs today, and he too is rather like a character from a storybook: the Aga Khan. However, anyone who is puzzled by these dates has good reason to be so. Yes, they overlap: at the turn of the millennium there were three caliphates in parallel.
On the one hand, this was because the caliph in Baghdad had long been unable to substantiate his claim to the spiritual and political leadership of the Islamic world, and had degenerated into a puppet of local rulers and their armies. However, at the same time, the caliphate retained its special aura and laid claim to the religious and political leadership of all Muslims.
The era of the most famous of all the caliphs, Harun Ar-Rashid (who ruled from 786 - 809), was by then long over and already fading into obscurity, mythologised and glorified by storytellers of all kinds.
Should the ISIS caliph Abu Bakr al-Baghdadi regard not only the righteously-guided caliphs but also Harun Ar-Rashid as a model, we would be perfectly justified in laughing. Harun Ar-Rashid's vizier – in other words, the one wielding true power – was a not-very-Sunni Persian by the name of Ja'afar al-Barmaki, and his most famous court poet was Abu Nuwas, a homosexual and drunkard who indulged in all manner of blasphemy. One of the most famous streets in Baghdad still bears his name.

"1001 Nights" or historical reality?

If we believe the stories of the "Thousand and One Nights", in which the triad of Harun Ar-Rashid, the vizier Ja'afar al-Barmaki and Abu Nuwas make numerous appearances, and which has probably informed the Occidental appreciation of the Caliphate more than reality has done, the most famous caliph was also one of the first rulers who loved to spy on his subjects.



One of the oldest universities in the world: Al-Mustansiriya University in Baghdad was founded under the Abbasid Caliph Al-Mustansir (r. 1226-1242). Another of the first universities was founded in Cairo by the Fatimids: Al-Azhar University, still a centre of Islamic scholarship today

In order to do this he would dress as a regular citizen, leave his palace and mingle with the people, ostensibly to see if all was well in his realm, but actually in search of entertaining stories. This was the period the Arab poet Adonis (b. 1930), one of the heirs of Abu Nuwas, has described as a first Islamic modern age: an era of spiritual and religious awakening uninhibited by taboo; a period that, in truth, has more of an impact on the character of Islam today than the era of the righteously-guided caliphs, whose actual historical impact eludes objective comprehension.

The fact that we know so much more about Harun Ar-Rashid is, not least, due to a media revolution implemented under his rule: the first Arab paper factory was established in Baghdad in the year 800. The Arabs had already encountered paper fifty years earlier through Chinese prisoners of war. However, it was only now that affordable writing material became available en masse.

Muslims made use of this as no other culture had done before. Only now was the proliferation of oral tradition collected, systemised and ordered. This is true of Arabic grammar as well as of Islamic law, and of the tradition of the deeds and sayings of the Prophet, known as the Hadith – which fundamentalists in particular invoke to this day, without attaching much importance to the time lapse between Muhammad's death and the collation of the material, more than one-and-a-half centuries later.

Multicultural influences

Another important aspect of the caliphates' golden age has been forgotten over the course of time. The boom in poetry, philosophy and religious matters was only possible because these caliphs – including the Andalusian and the Fatimid – ruled over multi-ethnic, multi-religious, multi-lingual or, to put it simply, multi-cultural populations. The city of Baghdad, founded only in 762, would never have become a metropolis without immigrants. "From all nations, far and near, they arrived there, and people from all regions preferred it to their homeland," the ninth-century geographer al-Ja'kubi wrote about Baghdad.

At the time, the dispute over who are the better Muslims – those with Arab forefathers, or converts from other countries whose faith is born of genuine conviction rather than their ethnic origins – caused

considerable upheaval. The era produced a genuine Arabic word for multiculturalism: "shu'ubiyya". Indirectly, "shu'ubiyya" not only undermined the Arabs' claim to leadership but also that of the caliph, who was supposed to be descended from the Quraysh tribe and thus a true Arab.
This presages a problem that is always virulent today whenever someone claims to speak for all Muslims: just because the Koran is written in their language, do Arabs have a more genuine connection to Islam than Turks, Iranians, Afghans, Indonesians, or converts from the West? But if it is scarcely imaginable that Arab Muslims would ever accept an Indonesian or Iranian national as their caliph, why then should Indonesian or Iranian Muslims follow an Arab caliph?

Historical nadir

A further aspect should not be overlooked: insofar as the caliphs possessed secular power at all, they always also ruled via adherents of other religions. These always included Christians and Jews, often also Zoroastrians, and had they not been tolerated, indeed incorporated into the apparatus of power, the heyday of the caliphates would have been inconceivable.

Fantasy and reality: The image of the Islamic caliphs in the West is heavily influenced by the tales of the "Thousand and One Nights". In reality, there were bitter political disputes over the leadership of the caliphate. These are at the heart of the enduring enmity between Sunnis and Shia Muslims, who disagreed over the choosing of the Prophet's successor

There were Christians with knowledge of the Greek and Syrian languages, which the philosophers and physicians of Antiquity translated into Arabic, and adherents of Iranian religions, whose mother tongue was Persian, continued the administrative tradition of the Sassanid Empire, shaping Arabic into a flexible official language and lingua franca of a great empire.
With their mercenary-converts from all around the world, ISIS is also somehow multicultural. But its hatred of everything that is different or of a different creed exposes its dream of a Caliphate as unsustainable.
It is of course also feasible to think that the Caliphate at some point become a little too 'multi' to function as a serious power for more than a couple of centuries. However, it is more probable that at some point no one really believed that the caliph actually was a representative of Muhammad, even if the blood of the Quraysh still flowed in his veins. Too many caliphs had turned out to be impotent and incapable and had destroyed the aura of the office. When the Mongols conquered Baghdad in 1258 and murdered the last Abbasids, the institution of the Caliphate had reached its historical nadir.

The renaissance of the Caliphate

But the idea experienced a renaissance! Paradoxically, Europe played a significant role in this process. In the course of the nineteenth century, European states increasingly presented themselves as protectors of Christians in Muslim nations, above all in the Ottoman Empire – a convenient way of interfering in the domestic affairs of these countries, not unlike the way Russia is doing in Ukraine today with regard to Ukrainian Russians.

End of the Caliphate: The most drastic "reform" undertaken during the establishment of the modern Turkish nation state after World War One was the abolition of the Ottoman Sultanate and Caliphate by Mustafa Kemal

The Ottomans tried to present themselves in the same way for Muslims living outside their sphere of power – particularly in their dispute with Russia, which incorporated numerous Muslim territories into its empire. The way to do this was to revive the concept of the Caliphate. Although the title "caliph" was often attached to the Ottoman Sultans, it wasn't officially invoked until the nineteenth century. Emergent pan-Islamism, which aimed to impress upon Muslims their religious identity and unity beyond concrete political power constellations, also contributed to this renaissance.

The idea of the caliphate then increasingly functioned as a lifeline for the disintegrating Ottoman Empire. If not in terms of power-politics, the leadership claim should at least be manifested on the religious level. This had few practical effects, apart from the fact that the Caliphate suddenly became a talking point again among Islamic intellectuals.

Abolition of the Caliphate

However, there was one person who definitely had no use for the concept: Mustapha Kemal, known as Atatürk. In 1922, Turkey's national assembly voted to abolish the Sultanate, but not the Caliphate maintained by the Turkish state, which was now perceived as a purely spiritual office.

This might have developed into a kind of Islamic Vatican City, with the caliph becoming what the Europeans always wanted him to be, a kind of Islamic Pope. But Atatürk reflected on the matter and, two years later, passed a law abolishing the Caliphate. He claimed it had become superfluous, because

government and republic in any case represented the only legitimate caliphate – an extremely brusque reinterpretation of the office, steeped as it was in tradition.
Because there has been nothing and no one since then who could appoint a Caliph, those who want to assume this office have to appoint themselves, whether others like it or not – just as Abu Bakr al-Baghdadi has just done, or a few years ago in Germany Metin Kaplan, the so-called Caliph of Cologne.
Who is supposed to, or wants to, be a follower of these self-appointed caliphs is another question. But perhaps this becomes irrelevant if we simply interpret the word of God correctly. In verse 165 of the sixth sura, as well as in several other, similar suras, the Koran says: "It is he (God) who has made you (people) into successors (caliphs) upon the earth."
Perhaps this contains the seed of an Islamic argumentation in favour of democracy. Whether we like it or not: according to the Koran, we are all caliphs!

Stefan Weidner

Translated from the German by Nina Coon

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We are all Caliphs

Well, according to the Quran, Sura 33, Vers 72, Caliph simply means 'Representative of God in the material world'. Or human being. Whatever Muslim tradition has done with the concept of Caliphate is not part of the Religion of Islam properly spoken; So every single human being alive is a caliph, Muslim or otherwise. Abolishing the so called Caliphate as a political reality is the most briljant act that Mustafa Kemal Ataturk ever did. The Muslims, unfortunately, have mostly proven to be ungrateful and devoid of knowledge...