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## **Historical background of Arab achievements in the Islamic Golden Age**

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## Historical background of Arab achievements in the Islamic Golden Age

### *Contexto histórico das realizações árabes na Idade de Ouro Islâmica*

Ali Haj Mohammed<sup>\*1</sup>

#### **Abstract**

This paper aims to identify the Arab achievements during the Islamic Golden Age. It identifies the major inventions and creations, particularly in the field of Science, and their influence on the rest of the world, most specifically the West. It also comments on the issue of the consequences of the Arab invasion of Europe and the creation of network trading between East and West. Finally, it deals with the challenges in the Arab world today, underlining lack of proper use of resources as main obstacles for attracting investors.

**Key words:** Arab, Islam, Expansion.

#### **Resumo**

Esta contribuição visa identificar as realizações dos Árabes durante a Idade de Ouro Islâmica. Identifica as principais invenções e criações, especificamente no campo da Ciência, e a sua influência no resto do mundo — mais especificamente no Ocidente. Para além disso, comenta sobre o tema das consequências das invasões árabes na Europa e a criação de redes comerciais entre o Leste e o Oeste. Finalmente, a contribuição aponta os desafios do mundo árabe de hoje, salientando a falta de recursos como principal obstáculo para atrair investidores.

**Palavras-chave:** Árabe, Islão, Expansão.

#### **Introduction**

After Prophet Mohammed death, the Islamic empire expanded from Atlantic Ocean to Central Asia. The most powerful empires were the Umayyad, Abbasids, the Safavids, the Mughals and Ottomans. During Golden Age of Islam many notable scientists, astronomers, doctors, mathematicians and philosophers emerged during that period (Robinson, 1996, pp. 2-90).

The Islamic Empire influenced the development of world history. As Muslims of the Islamic Empire expanded their empire, they were opened to ideas and customs of the people they conquered. Along with those ideas and customs were those from Greece, Rome and Asia — which influenced and became a part of Muslim culture. Each conquered civilization had its own importance to the development of the Islamic Empire and how it made major advancements. The developments and

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advancements in science made during the time of the Islamic Empire include medicine, geography and mathematics. The Islamic Empire influenced the development of world history. In the Islamic Empire, Muslims made significant contributions to medical science by studying the Greek physicians.

Muslims used herbs and foods to develop and prepare drugs. They used and created techniques, such as the process of distillation, which are still used today to manufacture pharmaceutical drugs. Muslim doctors learned through dissection and the study of anatomy. Surgical standards, ideas of personal hygiene and how to correctly diagnose illnesses rose during the Islamic Empire. In the Islamic Empire, the first exams in order to legally practice medicine were given to insure doctors had medical knowledge. The first school of pharmacy and an encyclopaedia of drugs were created in the Islamic Empire. A doctor, in the Islamic Empire, Ibn Sina wrote. The encyclopaedic Canon of Medicine, which was used into the 1650s. As the Islamic Empire spread, Muslims knowledge of medical science also spread. Medicine is as important in the modern world today as it was in the Islamic Empire years ago. Medicine has enabled us to inoculated and vaccinate against diseases, advances more and more through research, such as complex surgeries, such as organ transplants, to be completed successfully and as a direct result the saving of a life (Byrne, 2008, pp.1-33) Medicine, through the study of anatomy, has allowed us to learn more and more about the human body.

In the Islamic Empire, many Muslims were traders; therefore, they travelled in the empire and explored distant lands. Because of the need for navigation advancements, Muslims took interest in astronomy, navigation, and maps and developed advancements. Muslims in the Islamic Empire first used and studied maps drafted by the Greeks and later, as they learned more about the land they conquered, they added improvements and constructed more maps. The Muslim geographers were they first to use measurements and scales to make the most accurate maps. A geographer of the Islamic Empire, al-Idrisi, was the first to combine maps of past and present findings, which included the geographic features. A Greek invention adopted by the Muslims was the astrolabe, a small instrument called which allowed observers to chart the positions of the stars and thus calculate their own position on Earth. Muslim enhanced the astrolabe. Astronomy, navigation, and maps are as important in the modern world today as it was in the Islamic Empire years ago. Without navigation methods and maps travelling distances accurately would be near impossible. Because of advancements in navigation as well as in transportation, travelling has been made easier, faster and more affordable (Sharma, 1995, pp. 8-10)

In the Islamic Empire, Muslims learned a number system from India. The number system had ten figures, which included zero — which meant an empty place value. It was Muslims in the Islamic Empire who first mixed the Indian number system with the Greek science of mathematics. Europeans called this system “Arabic”. This Arabic numeral system is used today. Muslims also borrowed the idea of decimals from India. Algebra, which is known as al-jabr meaning “restoring”, is a worldwide concept that is taught as a part of the arithmetic curriculum in schools. Mathematics is as important in the modern world today as it was in the Islamic Empire years ago. Mathematics paved the path for other branches of science and provide an accuracy that otherwise wouldn’t be available. Mathematics is a stable, unchanging concept that is necessary in everyday life, such as counting, telling time and exchange of money and goods (Van Sertima, 1992, p. 393).

It is evident that the advancements made in the Islamic Empire influenced the civilizations that followed and its remains (developments and advancements) are a part of our modern world today. The Islamic Empire influenced the development of world history. The civilizations conquered by the Muslims had important influences on the development and advancements of the Islamic Empire. The developments and advancements in science made during the time of the Islamic Empire included medicine, geography and mathematics.

### ***The Islamic golden age***

During a limited period of time period, corresponding to the end of the first Millenary of the Christian Era, a number of artists, scholars, poets and philosophers and traders participated to technology, agriculture, economic and industry (Turner, 1997, p. 270). A number of important educational and scientific centres have opened during the golden age such as Public and psychiatric hospital (Syed, 2000, pp. 2-9).

The first universities to issue diplomas were the Bimaristan medical university-hospitals of the medieval Islamic world, where medical diplomas were issued to students of Islamic Medicine who were qualified to be practicing doctors of medicine from the 9th century. Al-Zahar, founded in Cairo, Egypt in the 975 CE, offered a variety of academic degrees, including postgraduate degrees, and is often considered the first full-fledged university. The library of Tripoli is said to have had as many as three million books (before it was destroyed by crusaders). The number of important and original medieval Arabic works on the mathematical sciences far exceeds the combined total of medieval Latin and Greek works of comparable significance, although only a small fraction of the surviving Arabic scientific works have been studied in modern times.

A number of distinct features of the modern library were introduced in the Islamic world, where libraries not only served as a collection of manuscripts as was the case in ancient libraries, but also as a public library and lending library, a centre for the instruction and spread of sciences and ideas, a place for meetings and discussions, and sometimes as a lodging for scholars or boarding school for pupils. The concept of the library catalogue was also introduced in medieval Islamic libraries, where books were organized into specific genres and categories (Micheau, pp. 998-991).

The Islamic Empire significantly contributed to globalization during the Islamic Golden Age, when the knowledge, trade and economics from many previously isolated regions and civilizations began integrating through contacts with Muslim and Jewish explorers and traders (Labib, 1969, pp.79-96). These trade networks helped establish the Islamic Empire (including the Rashdin, Umayyad, Abbasid and Fatimid and caliphates) as the world's leading extensive economic power throughout the 7th–13th centuries (Hobson, 2004, pp, 29-30). By the 11th century, mills operated throughout the Islamic world, from al-Andalus and North Africa to the Middle East and Central Asia (Lucas, 2005, pp. 1-30) (see Figure 1).

Muslim traders enabled the diffusion of many crops and farming techniques between different parts of the Islamic world, as well as the adaptation of plants and techniques from beyond the Islamic world. Crops from Africa such as sorghum, crops from China such as citrus fruits, and numerous crops from India such as rice, cotton and sugar cane, were distributed throughout Islamic lands, which normally would not be able to grow these crops (Watson, 1974, pp. 8-35).

During the Muslim Agricultural Revolution, sugar production was refined and transformed into a large-scale industry, as Arabs and Berbers built the first sugar refineries and established sugar plantations. Sugar production diffused throughout the Islamic Empire from the 8th century. Muslims developed a scientific approach to agriculture based on three major elements; sophisticated systems of crop rotation, highly developed irrigation techniques, and the introduction of a large variety of crops which were studied and catalogued according to the season, type of land and amount of water they require.

An early market economy and early form of merchant capitalism was developed between the 8th–12th centuries, which some refer to as "Islamic capitalism" (Labib, 1969, pp. 79-96). A vigorous monetary economy was created on the basis of a widely circulated common currency (the dinar) and the integration of monetary areas that were previously independent. Business techniques and forms of

business organization employed during this time included early contracts, bills of exchange, long-distance international trade, early forms of partnership such as limited partnership and early forms of credit, debt, profit, loss, capital, capital accumulation (Banaji, 2007, pp. 47-74). This included circulating capital, expenditure, revenue, cheques, promissory notes, savings accounts, transactional accounts, loaning, exchange rates, bankers, money changers, ledgers, deposits, assignments, and the double-entry bookkeeping system (Labib, 1969, pp. 79-96).

Muslim engineer also invented crankshafts and water turbine employed gears in mills and water-raising machines, and pioneered the use of dams as sources of water power, used to provide additional power to watermills and water-raising machines. Such advances made it possible for many industrial tasks that were previously driven by manual labour in ancient times to be mechanized and driven by machinery instead in the medieval Islamic world. The transfer of these technologies to medieval Europe had an influence on the Industrial Revolution (Lucas 2005, pp. 1-30).

**Figure 1. Map of the Medieval Islamic empire**



Adapted from the source:

[http://d-maps.com/carte.php?lib=umayyad\\_empire\\_in\\_the\\_8th\\_century\\_map&num\\_car=1974&lang=en](http://d-maps.com/carte.php?lib=umayyad_empire_in_the_8th_century_map&num_car=1974&lang=en)

What is essential to underline is that the knowledge of these industries actually circulated, and was later transmitted to Europe, especially during the Latin translations of the 12<sup>th</sup> century. For example, the first glass factories in Europe were founded in the 11<sup>th</sup> century by Egyptian craftsmen established in Greece. The agricultural and handicraft industries also grew during this period.

The Labour forces in the Islamic empires were drawn from different ethnic and religious backgrounds, men and women were taking part in different economic and occupations activities. Women held a number of posts in the primary and secondary sectors as workers, investors, nurses, lenders and scholars. Slaves played an important role in the Islamic economy. Large number of Slaves was sent to eastern Africa a. Slaves often known in central Asia as *Mamluk*.

In technology a number of inventions were produced during the Islamic golden age such as camera. Coffee, soap bar, tooth paste, carpets, *inter alia* (Vallely, 2006). Early scientific methods were developed in the Islamic world, where significant progress in methodology was made, especially in the works of Ibn Al-Hythem (Alhazen) in the 11th century, who is considered a pioneer of experimental physics (Rosanna, 2003) which some place in the experimental tradition of Ptolemy Ibn al-Haytham (Alhazen) wrote the book of optics, in which he significantly proved that vision occurred because of light rays entering the eye, and invented the camera obscura to demonstrate the physical nature of light rays (Lindberg, 1968, pp. 154-176).

Jabber bin Hayyan (Geber) is considered a pioneer of chemistry, as he was responsible for introducing an early experimental scientific method within the field, as well as the still, retort, and the chemical processes of pure distillation, filtration, crystallization, purification, oxidisation and evaporation (Vallely, 2006). Among the achievements of Muslim mathematicians during this period include the development of algebra and algorithms by the Persian and Islamic mathematician Muhammad ibn Musa al-Khwarizmi the addition of the decimal point notation to the Arabic numerals introduced by Sind ibn Ali (Cesk, 1980)

Muslim physicians made many significant contributions to medicine in the fields of anatomy, experimental medicine, ophthalmology, pathology, the pharmaceutical sciences physiology, surgery, etc. They also set up some of the earliest dedicated hospitals including the first medical schools and psychiatric hospitals (Hanafy, 1996, pp. 55-62). Abu al-Qasim helped lay the foundations for modern surgery in which he invented numerous surgical instruments including the surgical uses of catgut, the ligature, surgical needle, retractor, and surgical rod (Vallely, 2006).

Ibn Sina helped lay the foundations for modern medicine (Cesk, 1980), which was responsible for the discovery of contagious disease, introduction of quarantine to limit their spread, introduction of experimental medicine, evidence-based medicine, clinical trials distribution of diseases by water and soil skin troubles, sexually transmitted diseases, perversions, nervous ailments, use of ice to treat fevers, and separation of medicine from pharmacology (Saad, Azaizeh and Said, 2005, pp. 475-479).

### ***Arab invasion of Sicily***

The new religion spread quickly westwards through the territories of the Byzantine Empire. By 640, Muslim forces were advancing across North Africa, conquering Sicily in 652 and the Iberian Peninsula in 711. By early 8th Century the Arab dominated the Mediterranean favoured the movement of trade in Europe right from the beginning of the Arab expansion westward. The Arab encouraged the gold trade and helped the progress of agriculture many European despite of being Christian benefit from it. The Islamic side of the Mediterranean was the networks of trading between East and West Asia, and the Muslim states controlled other routes along which precious commodities were carried back and forth. Alexandria was the entry port for good arriving by land from the Egyptian coast of the red sea as well as Syria.

In Europe, the main destination for these luxury imports was Sicily. Sicily was controlling the trade in the Mediterranean and their merchants were principally responsible for the movement of Islamic goods into Europe. Sicily is close to Tunisia on the North African coast, and this proximity has played an important role in the island's history. Conquered by Muslims armies from Tunisia in 652, it was ruled by Muslim dynasties until the Norman Conquest in the 11th century.

Sicily is a region that though now part of Europe, was, for several centuries, part of the Islamic world. Under the Normans, Islamic cultural influences remained strong on the island. These were constantly

reinforced by the goods which arrived in Sicily and southern Italy through trade and the close diplomatic contacts maintained between the Norman kings and the Fatimid caliphs in Cairo. Arabic was spoken by several of the Norman kings of Sicily, and remained one of the languages spoken at court in Palermo. Objects and buildings created in Sicily were adorned with Arabic inscriptions.

### ***Arab invasion of Spain and Portugal***

Spain, and to some extent Portugal, was the most important meeting place between the Christian and Muslim worlds of the Mediterranean. The Berbers were a people who had for centuries inhabited North Africa. General Tariq ibn-Ziyad, led the 18,000 Arab army men to overthrow the Visigoths and by 714, they practically had all of Spain under Arab rule. The Arabs rule Spain for 800 years. During that length of time they greatly influenced the land by incorporating their architecture, culture, customs, and scientific knowledge upon the Hispania-Romans.

Al-Andalus was the name given to the Iberian Peninsula. The Muslims or the Moors divided Al-Andalus into five administrative areas Andalusia, Galicia and Portugal, Castile and Leon Aragon and Catalonia and Septimania (O'Callaghan, 1983, p. 142). They considered the Christian and Jewish communities to be "peoples of the Book" Having pushed them to the remote northern edges of the Cantabrian mountains, in Asturia and Pyrenees, they were permitted to practice their religion, but not without paying special taxes. During the 800 years of Islamic rule, the Christians continued with their battle against the Arabs. However, under the Arab's rule, the Al-Andalus become part of the Umayyad Empire. Headed by a Caliph, the person holding the highest position of authority in the Muslim temporal world, the Umayyad Caliphate were responsible for the early spread of the Islam religion. Caliph Emir Abd al-Rahman I, the first ruler of Al-Andalus, established the city of Cordoba as the capital of Al-Andalus. He cleared the way to maintain centralized control over Al-Andalus. Where as Caliph Emir Abd al-Rahman II (822-853) laid the foundation for the arts and sciences and architecture of the Caliphates and Caliph Emir Abd Rahman III (912-926) reigned supreme in academia, in arts and sciences, including astronomy, medicine and mathematics. Caliph Al-Hakem built the greatest libraries in the Islamic world. Caliph Hisham II-(Al-Mansur) (980- 1000), a skilful military commander assumed doctoral powers against the kingdom of Leon. In the ongoing battles with the Christians, he led expeditions for booty in Spanish Christian territories. In the eyes of Muslims he was a hero. In the eyes of Spanish Christians he was a scourge. He died on the battlefield.

Caliph Hisham II- (Abd-al Malik) son of Al-Mansur replaced his father along with the doctoral leadership supported by his Berber army. They made frequent attack on Castilla, Leon and Argon until his death in when the Christians began to have significant military success. The History of the Arab Peoples, in arts and agriculture, learning and tolerance, Al-Andulus was a beacon of enlightenment to the rest of the world. Agriculture surpassed anything elsewhere on the continent. Moorish filigree silver and leatherwork became famous throughout the Mediterranean. In engineering, the skill of the Spanish Moors had no parallel and the splendour of their architecture was manifest in the glorious mosques of Cordoba, the Giralda and Alcazar of Seville, and the Alhambra of Granada. Its excellence in art and literature, mathematics and science, history and philosophy defined this brilliant civilization (Hourani, 1962).

During Arab rule, Spain became a civilized nation because of the major contributions in arts and sciences, including astronomy, medicine and mathematics. The greatest libraries in the Islamic world were built at that time. By 1008 the Muslim leadership became vulnerable. By the 15th century, the Muslim Rule Umayyad Empire was demolished. Islamic culture was present in Europe for nearly 800

years. Muslims continued to live in Spain until they were expelled in the early 17th century, but their cultural influence lived on far longer, since after so many centuries of interaction and assimilation.

### ***The Arab World today***

The Arab World stretching from the Atlantic Ocean in the west to the Arabian Sea in the east, and from the Mediterranean Sea in the north to the Africa and the Indian Ocean in the southeast. It consists of twenty-two countries and territories with a combined population of 358 million people straddling North Africa and Western Asia.

Agriculture is the primary economic activity in the Arab homeland. The most important food crops are wheat, barley, rice, maize, dates and millet. These are largely consumed within the region, while cotton, sugarcane, sugar beets and sesame are exported as cash crops. The Arab homeland today is a rich composite of many diverse influences. Various ethnic, linguistic and religious groups inhabit the region. Yet, Islam and the Arabic language constitute its two predominant cultural features. The Arab people, spread over a vast area, enjoy common bonds of history and tradition. Members of twenty-five different countries, the Arabs consider themselves to be one nation. The Arab people are further united through their membership and participation in the League of Arab States (See Figure 2). One of the oldest regional organizations in the world, the Arab League was founded on March 22, 1945, even before the formal establishment of the United Nations. The primary objective of the Arab League, as it is commonly called, is to facilitate maximum integration among the Arab countries through coordination of their activities in the political sphere as well as in the fields of economics, social services, education, communications, development, technology and industrialization (Habib, 1991).

***Figure 2. Map the Members of the League of the Arab States in 2011***



Source: Vardion (2011). [http://commons.wikimedia.org/wiki/File:Arab\\_world.png](http://commons.wikimedia.org/wiki/File:Arab_world.png)  
[http://commons.wikimedia.org/wiki/File:Arab\\_world.png](http://commons.wikimedia.org/wiki/File:Arab_world.png)

The Arabs did not make use of their resources and knowledge to be one of the main players on the international arena. Today the Arab world depends heavily on foreign imports. Locally produced goods almost do not exist. Investments in the Arab world face many barriers that are the same toward a comprehensive and sustainable development. The lack of ability to deal with the intractable problems of the country like in many Arab countries there is the case of tribal and political ethnic, sectarian conflicts. As in Sudan, Yemen, Somalia, Algeria, Lebanon, Iraq and Palestine as the most important factor for attracting investments is the stability. There is a significant disparity in population size between the Arab states. Egypt and Yemen are considered overpopulated while most Arab countries are relatively underpopulated. Also the population growth can lead to poverty, and causing problems like water shortage and traffic jams. This increase problem has not been dealing with as one aspect of comprehensive development.

The reasons for the Arabs not using their resources and knowledge to be a major player in the global arena can be traced back to west colonialism of some Middle East countries. Most Middle Eastern countries gained their independence only by the mid of the 20<sup>th</sup> century under one single party rule, which resulted in dictatorship regimes. The ongoing Arab-Israeli conflict has shifted the balance of power in terms of economic development and military between East and West. The absence of Arab Unity in terms of economic cooperation and creation of a single market economy as other regions did the rest. Moreover, conflicts between Arab countries in the regions, based on identity and internal tribal problems, increased the difficulties of coordination.

As a result of the political and social factors underlines, a lack of technology and investment is visible in most of the Arab world today, as well as dependency on foreign aids and foreign interventions.

Globalization led, instead of opportunities, to political and economic crises in the Arab World until today. However, things are changing, with the Arab revolutions today (*Arab spring*), starting with political changes the current regimes. The Arab nations are anew starting to realize its important role on the international stage, just as it did in the golden age. However, the Arab world still must adopt regional economical and political development cooperation and integration plans build on trust and alliances among each other, an alliance based on an essential ingredient: the will of welfare and of peace with the rest of the world.

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