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The impact of Andalusian cities on the transmission of translated Arab-Islamic heritage to Europe during the middle ages (Córdoba and Toledo as models)

L'impact des villes andalouses sur la transmission du patrimoine arabe-islamique traduit en Europe au moyen age (Cordoue et Tolède comme modèles)

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Abstract:

The chief agent for the passage of information within the Arab-Islamic scientific tradition was translation, and it made an important contribution to the intellectual and cultural progress of Europe. The "darkness of ignorance" may well have lasted centuries in Europe without this intercultural passage. Al-Andalus, more particularly Córdoba and Toledo, became great centers of transmission, bridging civilizations through scholarly and cultural exchanges. These cities were opened up to scholars, translators, and thinkers who toiled with great efforts to preserve and disseminate Arab-Islamic knowledge. It is essential to grasp this process of transmission in order to value Europe's intellectual borrowing from the Arab-Muslim world, particularly in medicine, astronomy, mathematics, philosophy, and engineering. Despite this, much of the literature that has been produced does not highlight the particular contributions of Córdoba and Toledo. It is limited to describing Al-Andalus as a monolithic construct rather than mentioning the particular contributions of individual cities. This study seeks to address this issue by looking at the particular contribution of these cities to the movement of translation, the mechanics of knowledge transfer, and their enduring impacts on the scientific and cultural evolution of Europe.

Córdoba, situated on the strategic Guadalquivir River, was one of the most civilized cities in medieval Europe, rivaling both Baghdad and Cairo in their intellectual and cultural influence. Córdoba had been a great center of learning under Abd al-Rahman al-Nasir and Al-Hakam II, with an enormous library and an active book trade. It attracted scholars from diverse backgrounds, including Muslims, Christians, and Jews, fostering an unprecedented atmosphere of knowledge exchange. The city's madrasas and translation centers played a key role in preserving and transmitting scientific and philosophical works, which had an influence on European scholars later.

Toledo maintained this intellectual tradition when it was reconquered by the Christians in 1085. Through the initiative of monarchs like Alfonso VI, who spurred the pursuit and translation of Arabic texts, Toledo was a repository of Arabic learning, unlike other cities that were conquered and which suffered cultural withdrawal. The Toledo School of Translators, led by scholars like Gerard of Cremona and Dominicus Gundissalinus, became influential for the transfer of Arab-Islamic knowledge to Latin Europe. These translators rendered foundational works on medicine, philosophy, mathematics, and astronomy into Latin, directly shaping the intellectual underpinnings of the European Renaissance.

Both cities played a central role in disseminating passionate cultural exchange between European and Islamic intellectual production. Córdoba's vast centers of learning and libraries, and Toledo's translation movement work, saved and transmitted the major works that would otherwise have been lost. The study delineates how the intellectual heritage helped Europe to develop out of the Dark Ages and towards the Enlightenment. If not for the works of Córdoba and Toledo, some of the milestones of scientific and philosophical works would never have reached Europe, irretrievably diverting its intellectual trajectory. This book recognizes the interconnectedness of civilizations and the unmistakable imprint of Arab-Islamic learning on European progress, revealing how the two cities came to be the fulcrum of an exchange of knowledge that shaped human fate.

Keywords: Arab heritage, Europe, Translation, Transmission.

Résumé :

Le patrimoine intellectuel et culturel de l'Europe a été grandement influencé par le patrimoine scientifique arabo-islamique, la traduction étant le principal moyen de transmission des connaissances. Sans cette transaction, l'Europe serait peut-être restée pendant des siècles dans les « profondeurs de l'obscurité ». Al-Andalus, notamment Cordoue et Tolède, a joué un rôle essentiel dans cette transmission, établissant des liens entre les différentes civilisations grâce à des échanges culturels et scientifiques. Ces villes étaient le siège de savants, de traducteurs et d'intellectuels qui travaillaient sans relâche pour conserver et transmettre les connaissances arabes et islamiques. Il est crucial de comprendre ce processus de transmission afin de reconnaître la dette intellectuelle de l'Europe envers le monde arabo-islamique, en particulier dans les domaines de la médecine, de l'astronomie, des mathématiques, de la philosophie et de l'ingénierie. Cependant, la plupart des textes existants ne mettent pas assez en évidence les apports spécifiques de Cordoue et de Tolède, présentant Al-Andalus comme une entité monolithique plutôt que de reconnaître le rôle distinct de ces villes. L'objectif de cette étude est de pallier cette lacune en examinant l'influence particulière de ces centres dans le mouvement de traduction, les processus de transfert des savoirs et leurs conséquences à long terme sur le développement scientifique et culturel de l'Europe.

Située sur le Guadalquivir, Cordoue était l'une des villes les plus développées de l'Europe médiévale, rivalisant avec Bagdad et Le Caire en termes d'influence intellectuelle et culturelle. Sous Abd al-Rahman al-Nasir et Al-Hakam II, Cordoue est un centre d'apprentissage, avec une grande bibliothèque et un marché du livre florissant. Elle attira des chercheurs de différents milieux - musulmans, chrétiens et juifs - créant ainsi une ambiance d'échange de connaissances inédite. Plus tard, les madrasas et les centres de traduction de la ville ont joué un rôle essentiel dans la conservation et la transmission des œuvres scientifiques et philosophiques, ce qui a eu un impact sur les érudits européens. Cette tradition intellectuelle fut perpétuée par Tolède après sa reconquête chrétienne en 1085. À la différence d'autres villes conquises dont le niveau culturel déclina, Tolède demeura un centre d'apprentissage arabe grâce à des souverains tels que Alphonse VI qui encouragea l'étude et la traduction des œuvres arabes.

Le rôle de l'école des traducteurs de Tolède, sous la direction de Gérard de Crémone et Dominicus Gundissalinus, fut essentiel dans la diffusion des connaissances arabo-islamiques vers l'Eurasie latine. Ces traducteurs rendirent accessibles en latin des œuvres essentielles en médecine, en philosophie, en mathématiques et en astronomie, influençant directement les bases intellectuelles de la Renaissance européenne. Ainsi ces deux villes jouèrent un rôle déterminant dans les mouvements culturels entre la pensée islamique et la pensée européenne. Les établissements scolaires créés et les bibliothèques de Cordoue, au même titre que le mouvement de traduction de Tolède, assurèrent la sauvegarde et la transmission des œuvres représentatives d'un savoir qui aurait sans cela disparu. L'analyse engage ici la voie sur laquelle cet héritage culturel de l'intellect arabe a permis à l'Europe de sortir du Moyen Âge pour accéder aux Lumières.

S'il n'y avait eu la participation de Cordoue et de Tolède, plusieurs grandes œuvres des savoirs philosophiques ou scientifiques fondateurs n'auraient pas pu atteindre l'Europe, modifiant ainsi son devenir culturel. On comprend mieux l'interdépendance qui lie ces civilisations et l'héritage duré du savoir arabo-islamique face à ceux de l'adversaire dans le progressif et puissant cheminement vers l'érudition de l'Europe, quand Cordoue et Tolède se positionnent comme bénéfices premiers d'un transfert de savoirs fondateurs qui constitue l'assise des destinées humaines.

Mots-clés : Europe, Patrimoine arabe, Traduction, Transmission.

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Introduction

The Arab-Islamic scientific heritage had an impact on Europe and contributed to its scientific and cultural advancement, especially after the essence of Islamic scientific progress and prosperity was transferred and translated into Latin. Translation played a key role in the transfer of Islamic knowledge to Europe. We would not be exaggerating to say that, without the translation movement, Europe would have remained in the depths of darkness for centuries much longer. Hence, Europe owes its transformations and developments since the late Middle Ages and subsequent centuries to Islamic civilization. Furthermore, Al-Andalus played a significant role in transmitting various Arab sciences and knowledge to Western Europe through zones of cultural contact. Córdoba and Toledo were among the most important Andalusian cities that greatly contributed to the transfer of Arab-Islamic heritage to the European world.

This topic is fundamentally crucial to shed light on the intellectual and cultural roots that assisted Europe's renaissance. The attention to modes and mechanisms of knowledge transfer makes the study contribute to enriching new discourses regarding the entangled histories of civilizations and the common roots that eventually led humanity towards scientific advancement, across the globe. The study will provide very important insights into how cultural interchange helped promote innovations and development, which has much pertinence today as we continue to inhabit an interconnected planet.

There is much literature on the role of Arab-Islamic heritage, the contributions to Europe, and the history of its knowledge transfer; however, these studies did not pay the same attention to the special contributions of individual cities like Córdoba and Toledo. In the majority of works, mainly put as a generality, Al-Andalus is focused on the real inter-city contexts (and stories) of socio-cultural, political and intellectual practice while knowledge is ignored. In this context we situate Cordoba and Toledo as having evidenced this translation movement. In contrast, the limited scope of this study is to explore, specifically, the contributions of Córdoba and Toledo in the intellectual and cultural development of Europe during the medieval period.

Many studies have addressed the topic of translation and the transfer of Arab-Islamic heritage to Europe, but they have not focused on the contribution of Andalusian cities individually; rather, they discussed Al-Andalus' role in general. Among the studies and sources we relied on, which provided us with important information and insights, are the following key works: Nafḥ al-Ṭīb min Ghuṣn al-Andalus al-Raṭīb by Al-Maqrī Al-Tilimsānī, which contains letters from Minister Ibn Al-Khatib and includes descriptions of Andalusians and reports on their scholars, and Al-Dhakhīra fī Maḥāsin Ahl al-Jazīra by Ibn Bassām Al-Shantarīnī, which describes the regions and cities of Al-Andalus, including Córdoba and Toledo.

We also relied on valuable references that discussed the intellectual and cultural movement in Al-Andalus, such as *The Translation Movement from Arabic in the Middle Ages in Spain* by Charles Burnett, which highlights the achievements of Arabs in Al-Andalus and their civilizational impact on humanity in general and the West in particular. Among the Arab authors who wrote about the nature of cultural interaction in Al-Andalus and the Islamic influence on Christian Europe, we mention Fathi Ali Younes and his book *The Influence of Arabs and Muslims on European Civilization*, as well as Jalal Mazhar's The Achievements of Arabs on European Civilization. Another key reference is The History of Toledo in the Islamic Era: A Historical and Cultural Study (92-448 AH), a master's thesis in Islamic history submitted to the Department of Historical and Cultural Studies at the College of Sharia and Islamic Studies, Umm Al-Qura University, Makkah, Saudi Arabia, by Ibrahim bin Atiya Al-Sulami.

This study employs the descriptive and analytical method, which enables the analysis, interpretation, and comparison of historical phenomena. By examining primary and secondary sources, this method allows for a nuanced understanding of the subject and facilitates the derivation of conclusions that address the research questions.

In order to conduct this research, we attempt to answer the following general question: What was the role of Andalusian cities, namely Córdoba and Toledo, in transmitting translated Arab-Islamic heritage to Europe during the medieval period? From this general question, we developed two sub-questions:

• What was the role of Córdoba and Toledo in bringing translated Arab heritage to Europe?

• What were the fields of Arab sciences, which were shaped by European translations that helped Europe develop culture?

To answer these queries, the study seeks to fill the above research gap and add to an inclusive study of Córdoba's and Toledo's valuable but hitherto under-researched contributions to medieval translation movement.

The Arab-Islamic scientific heritage had an impact on Europe and contributed to its scientific and cultural advancement, especially after the essence of Islamic scientific progress and prosperity was transferred and translated into Latin. Translation played a key role in the transfer of Islamic knowledge to Europe. We would not be exaggerating to say that, without the translation movement, Europe would have remained in the depths of darkness for centuries longer. Hence, Europe owes its transformations and developments since the late Middle Ages and subsequent centuries to Islamic civilization. Furthermore, Al-Andalus played a significant role in transmitting various Arab sciences and knowledge to Western Europe through zones of cultural contact. Córdoba and Toledo were among the most important Andalusian cities that greatly contributed to the transfer of Arab-Islamic heritage to the European world.

1. Introduction to Andalusian Cities :

1.1.Córdoba

The city of Córdoba is situated on the Guadalquivir River in south Spain. It was established in the Roman times in 152 BCE. Its reputation spread in the time of the struggle between Carthage and Rome, and in the first century CE, the emperor's general Julius Caesar captured it after “The Battle of Munda” in 45 CE. It was subsequently made the capital of the Baetica province when Emperor Augustus divided Hispania Ulterior into the provinces of Lusitania and Baetica. Subsequently, it became one of the four judicial centers of southern Spain, along with Cádiz, Seville, and Astigica.

Córdoba remained under Byzantine control until the Visigoth King Leovigild finally succeeded in capturing it in 568 CE and established a bishopric there. From then on, Córdoba gradually lost its importance to Toledo, which had surpassed it since the late 7th century CE (Alyaseer, 2024b).

The renowned Islamic commander Tariq ibn Ziyad conquered it in 93 AH / 711 CE. Córdoba became one of the foremost centers of knowledge and culture in the world, rivaling the capitals of the Islamic caliphates in Baghdad, Damascus, and Cairo. It turned into a destination for scholars and researchers and was one of the key sources of enlightenment for Europe, fueling the Renaissance and progress for many decades.

By the 8th century CE, under Abd al-Rahman al-Nasir, the initial Umayyad caliph in al-Andalus, and subsequently his son Al-Hakam II, Córdoba had become a hub of scholarship and learning. It had enormous repositories of information and books in all fields; trade was found to be highly lucrative and visible. The city scholars attained a zenith of glory unlike in any of the other nodes of the Islamic state, to the extent that historians could hardly enumerate them due to sheer numbers.

The city of Córdoba experienced four distinct phases under Islamic rule, which lasted nearly four complete centuries. The first period was the Era of the Governors. After the Muslims conquered Córdoba and killed its king, "Roderic," al-Andalus became a Maghreb province under the Umayyads. It was then brought directly under the control of the Damascus Umayyad capital by the Caliph Umar ibn Abd al-Aziz. Córdoba was established as the administrative capital of the

Umayyads in al-Andalus and stayed under their control up to the fall of the Umayyad state in 750 CE, when it was overthrown by the Abbasids.

1.2.Toledo « Tulaytulah »

Tulaytulah (Toledo) is situated towards the south of Andalusia rather than the north. This is because the central part of Andalusia is marked by the Sierra de las Cabezas, and according to al-Idrisi, Toledo is located south of this mountain (Al-Idrisi, 1459 AH: 397). It can be said that it is in the central region of Andalusia, northeast of Córdoba, which was the capital of the Umayyad state in Andalusia, and southwest of the current Spanish capital, Madrid. This central location facilitated easy communication with other Andalusian cities and played a major role in political and cultural influences, benefiting Toledo in terms of mutual exchanges and economic prosperity, as well as in the flourishing of scientific activities (Al-Sulami, 2004: 143).

Toledo is one of the ancient cities in Spain, existing before the Romans invaded the Iberian Peninsula. Hence, it is an ancient Iberian city. It was captured by the Romans in 193 CE. Prior to the Islamic conquest of Andalusia, Toledo held the primary position in Gothic Spain, both politically and religiously.

The Muslims conquered it in the month of Rajab in the year 92 AH / 711 CE, led by Tariq ibn Ziyad, who came from the Maghreb to the Iberian Peninsula after the Muslims had completed the conquest of the Islamic Maghreb. The forces successfully crossed, and the Visigoths suffered several defeats before the two armies met, resulting in a major battle in which the Muslims crushed the Visigoth army. Tariq ibn Ziyad then quickly advanced towards the Visigoth capital, Toledo, and captured it (Jazeera, 2017). Scholars and biographers such as Abu al-Walid al-Azdi (d. 403 AH), author of the Tārīkh al-‘Ulamā’ bi al-Andalus, and Ibn Bashkuwāl, author of al-Silah fi Tārīkh A’immah al-Andalus, have documented numerous scholars from Toledo. These scholars included experts in Qur'anic recitation, hadith scholars, judges, jurists, and notable figures. Some traveled to the East for knowledge and spent many years there, while others never left their hometown. Additionally, some were appointed by the Umayyads to high positions in Andalusian cities due to their distinguished scholarly reputations.

2. The Role of the Two Cities in Transmitting Translated Arab-Islamic Heritage to Europe:

Islamic rule in Andalusia lasted for eight centuries, providing Spaniards and others with opportunities to learn from Muslims, both directly and indirectly. This long period enabled a significant cultural exchange between the conflicting worlds, impacting all of Europe (Al-Jalili, 1981: 193). Andalusia was one of the three principal channels where the synthesis between Arab-Islamic and European thought occurred. The first was southern Italy and Sicily, the second the Levant and Egypt, and the third Andalusia. It was an interface between the prosperous Arab-Islamic culture and emerging European mind, for it was on the fringe of the Islamic world and Europe. (Shahab Ahmad, 2009: 2) . In our research, we focused on Córdoba and Toledo, which were considered the most important centers of knowledge in Andalusia during the medieval period. These cities played a significant role in transmitting translated Arab heritage to the European world, contributing greatly to Europe's cultural revival and its emergence from the Dark Ages into enlightenment.

During the Umayyad Caliphate era in Córdoba (316–422 AH / 928–1030 CE), the city was the most prominent political center of Islam at that time and the most advanced in Europe, as noted by the renowned historian Ramón Menéndez Pidal (Shahab Ahmad, 2009: 2).

Andalusia had a beautiful flourishing of education, where great brains and intellectuals flourished in all spheres. Culture was better appreciated through the diffusion of schools of

education. Apart from private libraries and, most importantly, the grand library of Córdoba, there were seventy public libraries throughout Andalusia in the era of Caliph Al-Hakam II (350–366 AH / 960–976 CE), which are said to hold hundreds of thousands of books in a great number of branches of human knowledge.

At that time, Córdoba became a focal point for scholars and students from both the East and the West. One of the reasons for the scientific flourishing in Andalusia was its continuous intellectual and scientific connections with other major centers of Islamic learning such as Baghdad, Damascus, Cairo, and Fez. Scholars and students, and manuscripts and intellectual creeds, moved between these lands in a rich intercourse of ideas.

Córdoba's contribution to the dissemination of Arab heritage to Europe was complemented by its renowned library established during the time of Muhammad I (238–273 AH / 853–887 CE). It was still further expanded by Al-Hakam II, who had inherited three main collections: the palace library, which contained works collected by his predecessors; the library of his brother Muhammad, which he had inherited at his death; and his own library, which he had built up from a wide range of sources. Al-Hakam II continued to expand this collection, and it came to amount to some four hundred thousand volumes.

When the Umayyad Caliph Abd al-Rahman al-Nasir assumed power in Andalusia from 300–350 AH / 913–962 CE, he became renowned for his love of books. His reputation reached as far as Byzantine Emperor Constantine VII, who, in an effort to win the caliph’s favor while negotiating a treaty, gifted him a newly discovered book, *Dioscorides*. This copy was exceptional, written in golden letters and decorated with excellent pictures. Al-Nasir's passion for books led him to enrich the royal library with valuable books.

During this period, his two sons, princes Al-Hakam and Muhammad, began their studies with the assistance of instructors from within and outside the area. They were passionate book lovers and, in competition, outdid their father's library, competing for larger and better-organized collections. Upon the death of Muhammad, his books were added to his brother Al-Hakam's inheritance, and he continued to make additions to the collection.

Al-Hakam II ascended to the throne in 350 AH / 962 CE. His passion for libraries and books, and his significant interest in scientists and science, encouraged him to promote knowledge and education in Andalusia. He dedicated himself to building and expanding his own library, sending his men to all the Islamic civilization centers to search for rare books and manuscripts, paying the highest price to acquire them. They would befriend book traders in order to know what was going to be published, buying books directly from publishers or authors sometimes to be shipped to Andalusia before Baghdad, Mosul, Basra, or Egypt. Al-Hakam enjoyed immensely being the first to read new works and research.

As for the contents of the library - Al-Mustansir has a strong interest in rare and important books, often trying to track them down from various places. He would simply not be able to find a copy of Kitab al-Aghani (Book of Songs) anywhere, and eventually sent a request for it to the author, Abu al-Faraj al-Isfahani, eventually paying him a thousand dinars for it. Abu al-Faraj sent him a copy of the book before it was published in Baghdad. Al-Mustansir also commissioned a book on the genealogy of his Umayyad family from Abu al-Faraj and similarly reached out to other scholars such as Judge Abu Bakr al-Abhari, who was working on a commentary on Ibn Abd al-Hakam’s *Mukhtasar*.

Al-Mustansir also supported scholars like Muhammad ibn al-Qasim ibn Sha'ban in Egypt and Muhammad ibn Yusuf al-Warraq, who wrote a comprehensive book on the geography and kingdoms of Africa. He generously provided financial support for these scholars to complete their works and often lent them necessary resources. He also sent a copy of a book to the Egyptian scholar Abu Said Abdul Rahman ibn Yunus, who made use of it in his book *Tārīkh Miṣr wa al-Maghreb* (History of Egypt and the Maghreb), particularly for the Andalusian part. Furthermore,

foreign books were occasionally sent as gifts from European countries to the Muslim rulers (Alyaseer, 2024a).

The library also housed a translation and transmission center, which provided the library with works on foreign civilization and global thought. This center was responsible for translating major texts from other languages into Arabic. A distinguished group of translators, who were proficient in foreign languages, particularly Greek and Latin, worked in the translation department. Among them were Abdullah al-Siqili, Muhammad al-Nabati, Muhammad ibn Said, and Abdul Rahman ibn Ishaq ibn al-Haytham, among others. The majority of the translations were in the domain of sciences such as medicine, engineering, and astronomy.

The significance of Toledo as a conduit of cultural knowledge to Europe was clearest in evidence after its conquest by Alfonso VI of Castile near the end of the 5th century AH / 11th century CE, in 448 AH / 1056 CE. When Alfonso VI captured Toledo he made it the capital of the Kingdom of León and Castile. Before the Islamic conquest, Toledo had served as capital of the Visigoth Kingdom, but by the end of the 5th century AH / 11th century CE, it had become a center for Islamic culture, even after the Christian conquest of 448 AH / 1056 CE. So, the court of Alfonso VI had a rich Islamic cultural background.

With the fall of Toledo, a new era began in Europe for the transfer and translation of Muslim sciences. The doors were wide open for the entry of Arab and specifically Andalusian thought into European intellectual circles through translation—initially into Latin, the common language of science and communication in Europe. In Toledo and its surroundings, following the destruction of the palace through the war with the Muslims, Bishop Raymond of Toledo gathered scholars from various religions and commanded them to translate a wide range of Arabic and Islamic sciences. These translations were integrated into the curricula of Christian schools. Thus, Toledo became a major scientific center for several centuries, attracting scholars from northern Spain and throughout Europe.

The significant role that Toledo and Córdoba played in transferring Arabic-Islamic sciences to Europe can be understood through their attainment of a high level of civilization and knowledge during the Muslim period. Both cities reached peaks in science and learning, as evidenced by the numerous distinguished figures associated with Toledo and Córdoba in various fields of science, especially in the empirical sciences, as recorded in Andalusian historical and biographical texts (Al-Maqri, 1939: 441).

Many scholars lived in Toledo, disseminating their knowledge in mathematics and medicine. Among them was the renowned astronomer al-Zarqali (d. 485 AH / 1092 CE), whose work, the Zij al-Tolentino, was translated into Latin in the 6th century AH / 12th century CE. This translation became a cornerstone for European scholars in developing their calendars and almanacs. Al-Zarqali also invented a new type of astrolabe known as the safīḥa al-zarqāliyya, which allowed the drawing of the equatorial and zodiacal circles on the same surface. Dr. Abdul Azim notes that al-Zarqali is considered the greatest astronomer known to Europe before Johannes Kepler.

It can be said that there is no field of science in which the Andalusians did not excel, and Toledo and Córdoba had their share in each. Muslim scholars in these cities played a significant role in introducing the Spanish Christians and other Europeans—who flocked in large numbers to the Spanish courts of Toledo and Córdoba—to the manifestations of Islamic civilization and the Muslim achievements in various fields of knowledge. Fernández González notes in his memoirs that a large number of Muslim scholars lived in Toledo under Christian rule, who were given care and respect due to the Christians' need for their knowledge (Hassan & Clifford, 1948: 183).

During the 4th to 6th centuries AH / 12th to 13th centuries CE, the city of Toledo witnessed notable activity in the field of translation and the transfer of Islamic knowledge to Castile, under the patronage of Archbishop Raymond Martini (R. Martini), who was a chief advisor to the Kings of Castile between 525-546 AH / 1126-1151 CE. He established a translation bureau that included

scholars known historically as the Toledo translators' school, which translated many works on medicine, arithmetic, astronomy, mathematics, chemistry, and politics between the mid-12th century and the 13th century (Boudmah, 2019: 54).

Interest in the translation of Arab sciences and literature in Christian Spain reached its peak during the reign of Alfonso X. He personally supervised the direction of translation, editing, and summarizing work carried out by his assistants. He established a research institute in Murcia with the help of one of the Arab scholars (Boudmah, 2019: 54).

This scholarship, encouraged by King Alfonso X, was throughout Andalusia, as Christians were starting to set up schools to study Arabic sciences starting in Seville in 648 AH / 1255 CE, then on Majorca in 653 AH / 1255 CE, then in Barcelona in 658 AH / 1259 CE, and lastly in Valencia in 685 AH / 1281 CE. Some of these schools developed into universities, and their influence extended beyond Spain. By the time of the conference held in Vienna in 411 AH / 1311 CE, there was a focus on strengthening Arabic studies in Europe, leading to the establishment of chairs for the Arabic language at universities in Rome, Salamanca, Bologna, Montpellier, and other cities that excelled in embracing Arabic sciences (Boudmah, 2019: 13).

Initially, translation was primarily concerned with problems in rational sciences. In mathematics, the West owes its knowledge of numbers, including zero, to Islamic civilization. Gerbert of Aurillac was the first to adopt Arabic numerals and introduce them to Europe, subsequently authoring a book describing their use. Over time, Europe adopted Arabic numerals due to the work of Leonardo of Pisa, who died in 1240. He studied mathematics under an Arab teacher in North Africa and published a book explaining the Arabic numeral system in 1202. This marked the beginning of Europe's adoption of Arabic numerals and the start of European mathematics (Jalal, 1967: 11).

One of the most famous Arab mathematicians known in Europe, whose writings were translated into Latin, was Al-Khwarizmi. He gained fame in Europe as a result of his book Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala (Algebra) being translated by Robert of Chester into Latin in 1145. This work was still read in European universities and schools until the 16th century (Al-Samarra'i, 1986: 402)

In the field of astronomy and astrology, one of the most original and influential astronomers in Andalusia was the Toledo-based Ibn Ishaq Ibrahim ibn Yahya al-Nakkash, known as Al-Zarqali (d. 493 AH / 1100 CE). His astronomical theories and research methods significantly shaped the development of astronomy for over three centuries and had a profound impact on Latin Europe (Samso, 1999: 1342).

The Arabs also made a significant contribution in the field of geographical exploration. The idea that inspired Christopher Columbus, who discovered the American continent (1492-1493) was an idea found in Arabic writings, especially about astronomy and geography. If Columbus had faith in the roundness of the Earth, he would have never imagined reaching India by sailing west. Neither Spain nor Italy, in those days, had any such works explaining this idea except those of the Arabs (Maged, 1878: 288).

In the field of medicine, Arabic works dominated throughout the Middle Ages because Arabic medicine was far superior to the European medicine of the time, which was based on magic and superstition. Some Arabic names became well-known in their Latinized forms in this field, such as Ibn Sina (Avicenna), the author of *The Canon of Medicine*; Al-Razi (Rhazes); Ibn Masawayh; Musa; Ishaq ibn Hunayn; Abu al-Qasim al-Zahrawi (Albucasis); Ibn Rushd (Averroes); Ibn Zuhr (Avenzoar) (d. 470 AH / 1078 AD), and his son Abu al-Ala (d. 525 AH / 1131 AD), as well as his grandson Abu Marwan (d. 557 AH / 1161 AD). Most of the works of these physicians were translated into Latin in Spain (Burnett, 1999: 1466) .

Their books became famous in Europe for teaching medicine, as European schools relied on the works of Al-Razi for a long time. Additionally, Ibn Sina's "The Canon of Medicine" was a subject

of great interest and study in the West from the 13th to the 16th century. Al-Razi's "Al-Hawi" was one of nine books that made up the medical library of the Paris Medical College in 1395 A.D.. Surgery reached its highest point of development during Arab civilization with the work of Abu al-Qasim al-Zahrawi. His treatise, "Al-Tasrif liman 'ajaza 'an al-ta'leef," had a chapter on surgery that was translated into Latin in the 12th century A.D (Shahab Ahmad, 2009: 13).

In the field of chemistry, the works of Jabir ibn Hayyan were among the most renowned texts circulated in Europe up until the 18th century. Through these writings, Europe became acquainted with processes such as calcination, sublimation, distillation, and crystallization, as well as the preparation of many chemical substances like alum, arsenic oxide, and others. Al-Razi's works were also famous, particularly "The Secret of Secrets," which was translated into Latin by Gerard of Cremona (Shahab Ahmad, 2009).

When it came to philosophy, Europe showed no small interest in philosophical thought. The 6th and 7th centuries AH / 12th and 13th centuries AD saw the peak of philosophy in Andalusia and the rise of a school of philosophers, of which Ibn Bajja, Ibn Tufayl, and Ibn Rushd (the greatest of the Andalusian philosophers and the most influential in Western civilization) contributed significantly. The importance of Muslim Arabs is that due to them, Europe was able, in the 6th and 7th centuries AH / 12th and 13th centuries AD, to learn Aristotle and to take advantage of Plato's philosophy. The translators of Toledo had the job of translating the writings of the philosophers (A. a.-R. Badawi, 1979: 13).

Andalusian poetry had a vital impact on contemporary European poetry in southern Spain and southern France. The impact of muwashshah and zajal is noticeable and important. Muwashshah was first created by Muqaddam ibn Mu'afa al-Qabri (d. 299 AH / 912 AD), and other poets contributed to it following Muqaddam's time, namely Al-A'ma al-Tutili, Abu Bakr ibn al-Labbana, Lisan al-Din ibn al-Khatib, and others. These poets had to compose these muwashshahat since they lived in a society that was inclined towards the popular culture, which eventually gave birth to zajal, a genre made popular by Muhammad ibn Abdallah ibn Quzman (d. 554 AH / 1159 AD).(A. a.-R. Badawi, 1979: 13).

Arabic literature inspired the rise of narrative literature in Europe. We know that Pedro Alfonso translated Arabic tales (thirty stories to Latin) under the name Disciplina Clericalis. The work Kalila wa Dimna had a large impact on literary tradition in Europe when it was translated into Spanish under Alfonso the Wise's reign around 1250 CE. Additionally, some stories from One Thousand and One Nights made their way into Andalusia, including the tale of "The Slave Girl Tawaddud," which was translated into Spanish in the 13th century and later influenced prominent Spanish playwrights. As a result, One Thousand and One Nights occupied an important place in the history of Western literature. However, a complete translation of this book did not appear until the early 18th century, first in French and then in other European languages (Shahab Ahmad, 2009: 18).

The influence of Islamic Sufism on the development of European mysticism came through the translation of the works of the Sufi scholar Al-Ghazali. His books *The Incoherence of the Philosophers* (*Tahafut al-Falasifah*) and *The Human Soul* were translated during the 12th century, along with *The Intentions of the Philosophers* (*Maqasid al-Falasifah*) by Latin translators. Al-Ghazali's thought notably influenced the famous French philosopher Blaise Pascal, who is known for his famous argument, *Pascal's Wager*, which seeks to convince skeptics to believe in the afterlife. This argument was mentioned by Al-Ghazali in many of his works (Al-Ghazali, 1939: 365).

Ibn Arabi had a significant influence on the minds of Christian mystics and ascetics, as he called for the unity of religions and the oneness of existential truths. Among those influenced by him was the German mystic philosopher Meister Eckhart, who lived in the century following Ibn Arabi (the 13th century). Ibn Arabi also influenced the Italian poet Dante, who largely borrowed Islamic eschatological concepts, particularly those in the writings of Ibn Arabi, for his novel *The Divine Comedy* (A. Badawi, 1979: 49).

The influence of Islamic Sufism on European mysticism was confirmed by the Spanish historian Miguel Asín Palacios in research that indicated the influence of Andalusian Sufi Ibn Abbad al-Rundi (d. 792 AH / 1390 CE) on the ideas of the Spanish mystic John of the Cross. Al-Rundi was a follower of the Shadhili Sufi order and was renowned for his commentary on Ibn Ata' Allah al-Iskandari's book *Al-Hikam* (The Book of Wisdoms), titled *Ghayth al-Mawahib al-Ilmiyyah fi Sharh al-Hikam al-Ata'iyyah*. This book contains concise statements summarizing the essence of Sufism (Shacht, 1978: 276).

John of the Cross was notably influenced by a key idea in the commentary of Ibn Abbad al-Rundi, particularly the concept of *bast* (expansion) and *qabḍ* (contraction). Al-Shadhili, whom Ibn Abbad followed, likened these states to night and day. John of the Cross adopted this analogy when discussing the concept of the "dark night of the soul." He distinguished between two types of dark nights: the physical night, where the soul attempts to purify itself from desires while wandering in a metaphorical darkness, and the spiritual night, where, after struggling and introspection, a glimmer of divine light appears in the seeker's heart. This light leads them into a spiritual night that purifies the soul from ignorance, inspires piety, and cleanses it from sensory impurities. Despite Ibn Abbad's influence predating John by about two hundred years and the lack of direct written evidence, John of the Cross's ideas show clear parallels to those of Ibn Abbad.

It seems that John of the Cross's influence from Ibn Abbad likely resulted from the widespread dissemination of the Shadhili order in Egypt, Morocco, and especially in Al-Andalus during the 14th and 15th centuries. This influence persisted deeply among the Muslims who remained in Spain after the expulsion of the Arabs in 1492 CE (897 AH). John of the Cross would have encountered knowledge of the Shadhili path through these Muslims, who continued to uphold and transmit the teachings of the Shadhili order even after the Reconquista (A. Badawi, 1979: 25-26).

When Europe absorbed and studied Islamic sciences, particularly through universities that emerged later, such as the University of Paris and the University of Montpellier in the 11th century, and the University of Vienna and the University of Pisa in the 14th century, it is evident that these institutions were influenced by certain traditions of Arab universities, especially those in Al-Andalus. European universities borrowed aspects of Arab tradition, such as some of the practices of Arab schools, such as academy attire as a characteristic dress for professors and academic degree awarding (similar to teaching licenses). Additionally, Islamic tradition was adopted in the appointment of assistants and submitting them to learning under established great professors. Some take it a notch higher, suggesting even the word "bachelor" may have originated from the bending of the Arabs' use of the term *ḥaqq al-riwāya*, referring to being right to lecture following others' approval (Burnett, 1999: 1457-1458).

3. The Arab Influence on European Terminology

Prominent scholars, writers, and poets would visit the palaces of caliphs and princes in Al-Andalus, and they turned them into lively forums and centers of scholarship, literature, and art. The renowned Arab authors and poets of Al-Andalus were the ones who made literary life richer, which resulted in spreading the Arabic language, Arabic culture, and Islamic traditions to Europe. Consequently, Arabic terms became richly embedded in Spanish, Catalan, and French languages (Al-Hamawi, 1990: 52).

Here is a table of some Islamic terms that were used in their Arabic forms by the inhabitants of Al-Andalus and then transferred to Europe:

Table n° 1: Islamic terms (source: (González Palencia, 1955: 57))

The word in Arabic	Its terminology in Al-Andalus and Europe
الله	Alah
القرآن	Alcoran
حديث	Hadith
الإسلام	Alislam
رب	Rab
الفتوى	Alfatea
رمضان	Ramadan
السنة	Alsonna
السلام عليك	Al-salamalec
سورة	Saurate
مؤذن	Muezzin
بركة	Baraka
الجن	Djiun
الحرام	Haramu
زكاة	Zekkat
هجرة	Hegira
طلسم	Talisema

The Arabs left their mark in various aspects of life in Al-Andalus. In administration, we find words in European languages with their Arabic terms and origins, as illustrated in the following table:

Table n° 2: Administrative terms (source : (Hikmat Najib, 1977: 112))

The word in Arabic	Its terminology in Al-Andalus and Europe
الخليفة	Calif
الأمير	Emir
الوزير	Visir
الوالي	Vali
رئيس	Reis
القاضي	Alcaede
المحتسب	Almotocie
المشرف	Almojarife
الحاجب	Alhaque
صاحب المدينة	Falmedina
صاحب السوق	Fabasouquae
ديوان	Diuan
ولاية	Vilaget

Table n° 3: Military terms (source : (Hikmat Najib, 1977: 112)

The word in Arabic	Its terminology in Al-Andalus and Europe
القائد	Alcaide
الدليل	Aldalil
القارة	A. Igurdde
العرض	Alarde،
الرباط	Rabate
نفير	Anafir
الفارس	Alfaroz
الدرقة	Aldorgu
البارود	Baroud

طرادة	Tarffe
جيش	Djech
غزوة	Rozzia
مرابط	Marabout

The grand architectural structures in Al-Andalus were significantly influenced by Arabic style. The Mosque of Córdoba, which was built in the 2nd century AH / 8th century CE, and some buildings in Toledo are considered examples of the early period of Arabic architecture in Al-Andalus. Furthermore, the city of Madinat al-Zahra, erected by Abd al-Rahman al-Nasir some eight kilometers northwest of Córdoba on the foothills of Mount al-'Arus, keeps its Arabic name in Spanish up to the present day. There, he built his famous palace, the Alhambra. This period showcased the grandeur of Arab engineering, as well as their skills in decoration, engraving, and sculpture (Al-Abadi, 1972: 414).

Anyone examining the Arabic buildings in Toledo and Córdoba can see the extent of Arab cultural influence on the civilizations that succeeded them. The old city of Toledo still has its towers, fortifications, and gates, all of which reflect its Arab origins. Many Arabic terms or names were used in architecture in Al-Andalus and Europe, as illustrated in the following table:

Table n° 4: Terms in the Field of Architecture (source: ((Shacht & Bosworth, 1978: 136))

The word in Arabic	Its terminology in Al-Andalus and Europe
البناء	Albaenie
الحوز	Alhoz
السطحية (السطح)	Azatea
القبة (غرفة النوم)	Aleobe
الطوب	Adube
القصر	Alcosar
المسجد	Mezquito
المنبر	Minbar
المنارة	Minaret
المحراب	Mihrab

The flourishing of commercial activity in Al-Andalus, particularly in Córdoba and Toledo, led to increased trade connections between the East and the West, and between Al-Andalus and Europe. This resulted in the incorporation of many Arabic terms, names of products, commercial goods, measures, weights, and currencies used in trade into the French language and other European languages, as illustrated in the following table:

Table n° 5: Commercial Terms (source : (Shacht & Bosworth, 1978: 136))

The word in Arabic	Its terminology in Al-Andalus and Europe
السوق	Souk
ميناء	Cabar
فنار	Fanal
سمسار	Cemcal
دكان	Adoquino
الديوان	Aduoma
مخزن	Magozzia
المخاطرة	Moatra
التعريفة	Tarifa
المناداة (المزايدة)	Almoneda
الدينار	Dinar

الدرهم	Adorme
السكة	Ceea
القنطار	Kantar
القيراط	Corat
مثقال	Molacal
العشور	Achour
أردب	Ardib
القفيز	Abis
المد	Almud
الرطل	Arratel
الربعة	Arraba

In addition, writing in most of the sciences that passed from the Arabs to Europe, particularly in mathematics, relies on Arabic symbols and letters. In addition, the modern European numerals had their origin with the Arabs and are also referred to as Arabic numerals. Some examples include those listed below in the table:

Table n° 6: Mathematical Terms (source : (Shacht & Bosworth, 1978: 137)

The word in Arabic	Its terminology in Al-Andalus and Europe
الجبر	Algebra
الخوارزمي	Algursime
المقابلة	Almohabel
الصفر	Cipher

European astronomical lexicon aims at containing many words of Arabic origin, and therefore aims at paying a huge debt of gratitude to the Arab astronomical studies. Since many of these names have persisted to the present day, some of the astronomical names are listed in the following table:

Table n° 7: Astronomical Terms (source : (Hikmat Najib, 1977: 231)

The word in Arabic	Its terminology in Al-Andalus and Europe
الجبهة	Algieba
عرش الجوزاء	Arsh
بنات نعش	Benatnasch
السرطان	Cancer
الكلب الأكبر	CamisMa,or
الكلب الأصغر	Camis Minor
ذنب الجدي	Deneb Eldolphinas
ذنب العقاب	Deneb Elokab
دنب الكب	Daneb Elkab
النصل	Elnasl
التنين	Etanin
فم الحوت	Famu Lhout
رأس الأسد	Res Al Asad
رأس الثعبان	Res toban
سعد الملك	Saod Al Melik
سعد السعود	Saod Saoud
العذراء	Virgo

الطائر	Altair
قرن الثور	Tauri[1]
الجنب	Algenib
الفكة	Alphacca

In the field of chemistry in European languages, there are terms that reflect the contributions of Arabs to this science among Westerners. Some of these chemical terms include the following:

Table n° 8: Terms in the Field of Chemistry (source: (Hikmat Najib, 1977: 231))

The word in Arabic	Its terminology in Al-Andalus and Europe
الكيمياء	Alchemy
الكحل	Alcuhal
زرنيخ	Arsenic
بورق	Barax
الأكسير	Elixir
قرمز	Kermes
كبريت	Kibruit
الأنبيق	Linbick
نفط	Naphta
عطر	Attar
زئبق	Assoguc
قطران	Caudran
بنج	Bang
سموم	Simouim.

The Arabs introduced some new plants and various irrigation methods into Al-Andalus and Europe. The most important plants introduced by the Arabs, which appeared in the dialects of Córdoba, Toledo, and throughout Al-Andalus, as well as in Sicily and Western Europe, retain names that reveal their Arabic origins. Examples of these plants are listed in the following table:

Table n° 9: Terms in Botany and Agriculture (source: (Maged, 1878: 285-286))

The word in Arabic	Its terminology in Al-Andalus and Europe
الريحان	Arroyon
الخزامة	Alhuzema
النارنج	Naronga
الزعفران	Azafran
ليمون	Liom
البرقوق	Albericaguo
القطن	Coton
باذنجان	Berenjena
الرز	Riz
السكر	Sugra
القهوة	Café
السقاية	Aceqiua
الناعورة	Naria
السد	Azud
البركة	Alburca

Europeans became acquainted with many Arabic musical instrument names in their languages and used them with their Arabic terms. Arabs also introduced some Eastern crafts to Al-Andalus, which were then transmitted to Europe, especially carpet weaving and certain types of fabrics known by their Arabic names. Some examples include the following:

Table n° 10: Terms in Music and Fabrics (source: (Maged, 1878: 285-286))

The word in Arabic	Its terminology in Al-Andalus and Europe
القانون	Kanoan
الطبل	Timbal
النقارة	Naker
القيثارة	Cuitar
الرباب	Rebee
العود	Luth[86.[
العتابي	Tabby
الخميل	Camiel
موهير	Mohair

Many names of animals, birds, and fish were also transferred to Europe with their Arabic terms. Some of these names are still used in European languages today. Examples of these animals are listed in the following table:

Table n° 11: Terms for Animal Names (source: (Jalal, 1967: 42))

The word in Arabic	Its terminology in Al-Andalus and Europe
الحصان	Alizan
الغزال	Algaasele
الطير	Altair
الكلب	Cleb
الدب	Dub
الزرافة	Cirafo
الصقر	Sakre
الغول	A gol
اليربوع	Grbo
ببغاء	Papge
وحيد القرن	Aboukorn[96[

From the above tables and realization of Arabic words spread in Al-Andalus and Europe, it is evident that the Arab-Islamic heritage has influenced all aspects of scientific, political, social, economic, and religious life. This heritage spread politically, culturally, and militarily across Southern and Western Europe, where the Arabs established centers of their civilization. Notable translators in these hubs played a key role in translating significant aspects of the Arab-Islamic heritage into their languages. Toledo, Córdoba, and other Al-Andalus cities were renowned for being translation centers from Arabic.

Here we can see that the Arabic language reached all the corners of the Iberian Peninsula, disrupting the arguments of linguistic purists who mistakenly think that these lands were free from Islamic influence. The penetration of Arabism into the vernacular languages of the northern Christian kingdoms is a testament to the huge influence of Islamic culture throughout the peninsula in the 19th century. With the context provided by the Latin sources of the High Middle Ages, we see how transformations which arose from Low Latin eventually generated the Romance vernacular

languages, both on the Iberian Peninsula, and the rest of western Europe. According to research these languages, which are brought together here as "Ibero-Romance" share the same linguistic shape as the so-called "Southern Romance dialect" or "Romandalusian" purported to exist out of Islamic space (Corriente, 1999).

The term "Mozarabic" was applied heretofore to the Christians of Andalusia and to their language, said to be a form of "Spanish" inflected with terms of Arabic. This process of linguistic development reflects a fundamental fact about contemporary Spain: the multiformity of Iberian tongues and dialects. In line with this, the influence of the Arabic language can be discerned not only in Castilian but likewise in Galician, Catalan, Portuguese, Astur-Leonese, and Aragonese.

Conclusion:

The research came to conclude that Arab-Islamic scientific heritage had a strong influence on Europe's scientific and cultural advancement via a translation movement that transferred the essence of Islamic sciences to Latin – this contributed significantly to Europe's emergence from the Dark Ages and the emergence of the Renaissance. Al-Andalus played an important role in the transfer of knowledge, with the cities of Córdoba and Toledo being identified as key sites that directly routed the transfers of the Arab-Islamic heritage to Europe, and we regarded as beacons of knowledge and culture in the Middle Ages.

The research found evidence that the Muslim rule of Al-Andalus lasted for nearly eight centuries, allowing for cultural exchanges between the Islamic civilization and the European civilizations, and making Al-Andalus a significant point of intellectual exchange between these two worlds. Additionally, the research established that the cities of Córdoba and Toledo were not only political or religious centers, but played an important scientific and cultural role. They hosted scholars and researchers, and produced works and translations that contributed to Arab sciences being transferred to Europe.

The research established that the translation movement within Córdoba and Toledo cities was among the most important mechanisms aiding in the transmission of Arab sciences in different fields including medicine, philosophy, mathematics, and astronomy. These translations are what facilitated the rise and formation of European culture in medieval and modern times. The research also stressed the importance of studying the contributions of individual Andalusian cities rather than analysing Al-Andalus as a single cohesive whole, which helped further articulate how intercultural history could be conceived.

The research determined that the cities of Córdoba and Toledo were central and indispensable to transmitting the Arab-Islamic scientific heritage to Europe in the Middle Ages. They emerged as lively scientific and cultural cities that initiated a spark that would ignite the European Renaissance. These two cities put themselves in a position to fully leverage their geographical situation and the long period of Islamic domination in Al-Andalus to generate a large-scale translation and transfer of knowledge in multiple fields, including medicine, philosophy, mathematics, and astronomy, which contributed to the formation of European culture and opened new avenues for scientific development.

Additionally, the research revealed that the cultural exchange, dialogue, and interaction between European and Islamic civilizations in Al-Andalus were more than a simple flow of knowledge and information, and were more as an interaction between civilizations that produced mutual civilizational growth. This indicates the historical civilization interconnectedness, and that understanding these interactions can provide guidance for contemporary methods of intercultural dialogue.

As a consequence, the study concludes that a large part of Europe's advances in science and culture from the late Middle Ages onward originated from Islamic civilization, especially Al-Andalus. Córdoba and Toledo acted as important bridges for the continuity of knowledge and science that eventually generated the European Renaissance. This study emphasizes the role of

civilian interconnectivity, and cultural transfer, and shows the necessary work for humanity to engage with many cultures and civilizations - a responsibility which is even more pressing in our modern interconnected world.

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