Adelard of Bath: Original Works and Translations

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Abstract

In the 12th century, a large number of European scholars have travelled to the East in order to learn and ultimately bring back with them new scientific knowledge. Translators played the major role. Among those translators is Adelard of Bath whom this study aims to investigate his original works along with the works he translated from Arabic into Latin. The study will follow his travels from his hometown of Bath to France where he studied, and finally to the East where he learned from the Arabs. It will also briefly highlight the situation of education during the so-called Dark Ages in Europe. Moreover, Adelard's original works before and after travelling are examined in order to see to what extent Adelard was influenced by the Arabs. Adelard's translated books into English are used as primary resources for this research, in addition to other secondary references. As a result of conducting this research, it can be seen that the thought of Arabs have prevailed in Adelard's works as he stressed the importance of the methodology followed by them. Adelard has contributed to forming a cusp between the Islamic Civilization and the European Renaissance; and hence further studies need to be carried out about Adelard as well as his endeavors with East.

Keywords: Adelard of Bath; Arabic-Latin Translations; 12th Century Renaissance; Islamic civilization.

Introduction

The 12th century witnessed the revival of scientific knowledge through the Arabic-Latin translation movement. Had it not been for the Arabs and Muslims who preserved and developed the Greek knowledge, such renaissance would not have appeared or perhaps would have taken longer to occur. Similar to the Greek-Arabic translation that took place during Al-Ma'mun's reign(813-833), the Arabic-Latin translation started three centuries later. However, in the latter movement, prominent personalities from the Latin West took

over the task of translation. However, this time it was from Arabic into Latin.

The Western mind during the so-called Dark Ages was not in a state of deep darkness, rather, there were sciences taught in ecclesiastical schools, and they were also aware of the extent of the Arabs' scientific progress in the East. This awareness about the Arabs goes back to the crusades on one hand, and their trade relations on the other, as well as the proximity of Sicily and Andalusia and the fall of many eastern cities under Norman rule. In light of that, this research is concerned with the personality and the works of the English philosopher, Adelard of Bath, who was not a crusader but a seeker of knowledge who travelled from one place to another for the sake of learning.

The significance of the study lies in shedding light on Adelard from an eastern point of view due to the scarcity of studies in the Arab world dealing with the Latin West. In the case of western scholars and orientalists, they have delved deeply into the achievements of the Islamic civilization; they investigated many of the Arab and Muslim writings that were mainly used to establish a new scientific curriculum in Europe. Thus, the Arab and Islamic world shall have a footprint in studying those who transferred this heritage to the Western world and their contributions that represented an extension of the scientific knowledge from the Islamic civilization. The research not only focuses on Adelard's personality and his cultural participation through his works, but also provides the reader with a background on western education in the middle ages with reference to the role of the crusades in this paradigm shift. It also intends to highlight some manifestations of tolerance and cultural exchange between the East and the West at the time.

The research aims to highlight the works composed by Adelard before his travels to the East,[*] the translated works from Arabic into Latin attributed to him, and the works that he composed after learning from the Arabs.[**] The study also points out the stages of translation in the West and the whereabouts of education in the Latin West, especially France. Furthermore, western translators who were born in Italy are more recognized today than those who came from farther places like England and that is mainly due to their proximity to the translation centers represented in Sicily and Andalusia. Additionally,

[*] The research takes into account the word East, which denotes all that is east of England, provided that the geographical place is filled with the eastern heritage, as was the case in Sicily and Andalusia at that time, as well as the eastern regions under Norman rule.

[**] The term Arab refers in this article to all works prepared in Arabic regardless of the religion of their authors.

translators like Gerard of Cremona are far more acknowledged due to his tremendous translation when compared to Adelard, and also due to his involvement with the Toledo school of translation. Nevertheless, figures like Gerbert of Aurillac and Adelard are some of the pioneers of the individual translation movement that resulted from their pure interest and passion for science, and their belief in the necessity of translating the literature that greatly benefited them, as it contained information that the Latin West did not know before. Yet, Adelard for example, is scarcely mentioned in books-especially ones composed in Arabic- that involve topics about translation of Arab sciences, European renaissance and scientific exchange between the East and the West. Therefore, this study aims to tackle the research questions as follows:

- How and what was the educational environment like in the Latin west? What kind of literature and sciences were taught in the ecclesiastical schools?
- Why did Adelard pursue his education in France and not England, and why did he head to the East afterwards?
- What are the works that he composed before and after travelling to the East, and those that he translated from Arabic into Latin?

The first section deals with the conditions of education in the Latin West and the role of the works of the Roman scholars whom the bishops and ecclesiastical schools relied on in the twelfth century. As for the second section, it casts light on Adelard's books before his study period in the East with an explanation of one of his books. The third section highlights Adelard's translations from Arabic in addition to exploring one of the translations which is the astronomical tables of al-Khawarizmi, also known as *Zij al-Khawarizmi*, as well as a work by Euclid translated into Arabic from Greek. The fourth section examines Adelard's works that he authored after being influenced by the Arabs and their methodology, especially his work on the astrolabe.

Literature Review

The prominent figure of Adelard of Bath was first extensively studied by Charles Haskins, a history professor at Harvard University, who highlighted in his research the works by Adelard and pointed out the need to examine his works in order to extrapolate facts about Adelard's biography (Haskins, 1911). Bruce Dickey, in his PhD dissertation, examined Adelard's unexamined manuscripts and sifted his treatise *On the Astrolabe* (Dickey, 1983). It is noticed that this study neglected to an extent the influence of Arab thought on the scientific formation of Adelard, thus, we aim to show throughout this research how Adelard's thought before traveling to the East was, and to what extent it changed after that. A few years later, Louise

Cochrane, published a biography about the twelfth century scholar in 1994 titled as *Adelard of Bath: The First English Scientist* where she stressed on his influence on the scientific thought in Europe (Cochrane, 1994). Following that, Charles Burnett (1998), a professor of the history of Islamic influences in Europe, translated three works of Adelard into English which are *On the Same and Different*, *Questions on Natural Science*, and *On Birds*. Moreover, Lyons (2009) in his *The House of Wisdom: How the Arabs Transformed Western Civilization*, primarily focused on Adelard's life, including his travels to the east, and his works. Erceylan (2017), in his master's thesis, underlines the role of France in qualifying the Latin translators between the tenth and twelfth centuries and making them personalities who contributed greatly to the translation activities in Toledo. This study is distinguished by its comprehensiveness and indexing of the Latin translators, however, it did not focus on translators in terms of their country of origin, but rather their place of study. Undeniably, most of the translators in terms of their study seat are almost the same, as the majority studied in France because it was the best study center at the time. Nonetheless, this research investigates Adelard as an English Latin translator. Another perspective on Adelard was presented by Al-Wreikat (2018) where she demonstrated how the inductive scientific method conducted by the Arabs influenced the English philosopher. In fact, the majority of Latin translators followed the mentioned method and were a reason behind the modern European Renaissance. In light of that, Murrell studied the role of the Latin translators and translation in the medieval eastern Mediterranean during the crusades (Murrell, 2018). His research showed that cities which were known for carrying out scientific activities were not limited to Andalusia and Italy.

Although there have been studies concerned with Adelard of Bath in terms of his life and his works, not as much research was done regarding him especially in the current Arab Islamic world. Therefore, it is essential for Arabs to take part in occidental studies as it shapes the missing piece in the chain of transmission of knowledge.

1. Education in the Latin West

The roman civilization was built upon the remnants of the Greek civilization in the first century AD, as it inherited from them the culture and knowledge. With the advent of the Christianity, education underwent complete submission to the Church as a result of the expansion of its influence and the strength of its authority (Crump and Jacob, 1962, p.255). The Church approved the teaching of the seven liberal arts provided that it is based on Christian foundations, since it was previously taught in pagan schools before Christianity. These arts, with the conversion of the Western Latin society to

Christianity, became necessary for the understanding of the Bible (Ashour, 2009, p.120). Martianus Capella (d. 428 AD), is considered to be the first to define the seven liberal arts accordingly; grammar, rhetoric, logic, arithmetic, geometry, astronomy and music. He was followed by Boethius (d. 524 AD) who divided them into *Trivium* which includes grammar, rhetoric, logic, and *Quadrivium* which includes the remaining arts (Painter, 1953, p.466). Then appeared Cassiodorus (d. 585 AD), who took interest in pagan education and preserved the classic Latin heritage of science and philosophy, as well as endorsing the seven liberal arts divided by Boethius (Stahl, 1971, p.8). In spite of this, philosophy was considered a pagan thought that posed a threat to the religious beliefs prevailing at the time, hence the clergymen and bishops did not give it enough attention. This view on philosophy is evidenced by the closure of the philosophical school or sophistic school in Athens by the Roman Emperor Justinian I (d. 565 AD) (Russel, 2004, p.358). Nevertheless, it turned out that the Emperor did not literally order the closure of that school. Rather, he prohibited the teaching of philosophy in Athens and specifically the interpretation of laws (Hällström, 1994, p.145). Thus, it can be understood that philosophy was a form of a free thinking that intimidated men of religious or political positions.

When it comes to schools in the Latin West, they relied on the books of the aforementioned scholars who included Greek knowledge in their books. As for libraries, only a few were found in ecclesiastical schools at the time of Charlemagne (Evans, 2002, p.77). While the library of the Benedictine Monastery contained a little more than a hundred books (Mitz, 2014, p.234), the library in the house of the Abbasid Caliph ʻAdud al-Dawla was very large and of importance to the extent that required the presence of an agent, a treasurer and a supervisor (Al-Maqdisi, 1991, p.449).[1] Moreover, Andalusia alone housed nearly seventy public libraries full of books (Durant, 1988, p.307). Despite this vast difference, it is fair to see that the middle ages in the Latin West were not in complete darkness. In fact, there were regions from which the light of science sprang from, yet it does not stand to be compared with the distinguished innovations of the Greeks and the brilliant achievements of Muslims.

Paganism prevailed in the Anglo-Saxon England since the middle of the fifth century, but with the ascension of Pope Gregory I (d. 604 CE) to the papacy, many English converted to Christianity as a result of the success of the mission of the Benedictine Augustine of Canterbury (d. 604 AD) (Abdulqawi, 1996, p.25-26). Following that, the era witnessed an educational movement in the cathedral schools of

[1]Al-Maqdisi. (1991). Ahsan Al-Taqāsīm fi Maʻrifat Al-Aqālīm. Beirut: Dar Sadir.

Reims, Laon and Chartres, which in turn attracted many teachers and students. There were grammar schools that provided the churches with people who could read and write, as the knowledge of reading Greek books was limited to the aristocrats (Daiber, 20120, p.202). Up until the sixth century, these schools provided elementary education, but soon enough they turned into a place for preparing clergymen. Thus, education in Europe had become associated with monasteries and ecclesiastical schools that were devoted primarily to train scribes until the eleventh and twelfth century (Painter, 1953, p.467).

The Carolingian Renaissance in the eighth century sparked interest in science and knowledge, but it had a religious character and motivation that sought to correct the frequent errors in the scriptures. It was also born out of the interest of Charlemagne and his grandson, Charles the Bald, in science. Among the scholars who were used by Charlemagne in this educational movement was the English philosopher Alcuin (d. 804 AD). He became the supervisor of several ecclesiastical schools, the most prominent of which is the school of Tours (Ashour, 2009, p.123), which Adelard will join after two centuries. Ecclesiastical schools resumed the same educational approach, and no scholar from England seemed to show interest in Arabic sciences. In France, however, Gerbert of Aurillac, who is considered to be one of the first students of the Arabs, introduced Arabic numerals to the West (Daiber, 2012, p.200). Yet, he did not have students succeeding him to spread the sciences he gleaned from the East. The Western society had to wait two more centuries for the Arabic numerals to come again at the hands of other scholars such as Adelard. However, he was not acknowledged the way Leonardo Fibonacci (d. 1250 AD) when he re-introduced Arabic numerals to the Western world.

The year 1066 AD witnessed the Norman invasion, which was characterized by the entry of William the Conqueror (d. 1087 AD), who defeated the last king of the Anglo-Saxons in the Battle of Hastings. His son William II (d. 1100 AD) succeeded him and his era witnessed the birth of Adelard of Bath in 1080 AD. Six years after the birth of Adelard, as a child, he saw his town deeply troubled by the uprising that had wanted the royal throne to Robert's brother, William, not to his son, yet that did not happen to become (Lyons, 2009, p.29). On that note, the mentioned political situations were one of the reasons for Adelard's many travels. William II was succeeded by his brother Henry I, the reign in which Adelard had grown up, and then the rule passed to his grandson Henry II, to whom Adelard dedicated his book *On the Astrolabe*

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2. Adelard's works before his journey to the East

Adelard of Bath was the son of Fastrad, one of the city's men who had good connections with the bishops and among whom was the Bishop of Bath, John de Villula from Tours, France (Mantas, 2014, p.198). He supervised the teaching of Adelard in Bath Abbey, a Benedictine monastery. However, given that the best form education was at that time in French schools, Bishop John advised Adelard to study at the cathedral school in Tours. Adelard set out for France before the year 1100 AD, that is, before turning twenty years old, and spent the period of learning in Tours and teaching in Laon until the year 1109 AD, which marks the beginning of Adelard's journey to the East.

Adelard was not a monk, as reported in some references (Dawdi, 2012, p.200). This confusion was explained by Haskins saying that the monk may have been Adelard of Blandinium who lived a century before Adelard (Haskins, 1924, p.34). Adelard, in fact, was a citizen of the city of Bath who followed the conventional way of education until he decided to leave to the East for the sake of knowledge. Among the several subjects that Adelard studied, astronomy triggered his enthusiasm the most. He was interested both in its mathematical and metaphysical aspect which was represented by astrology. Moreover, Adelard is said to have been good at playing the harp (Haskins, 1924, p.22), hence it can be seen that Adelard was interested in the Quadrivium more than the Trivium.

Adelard seized the opportunity of being in France to explore more cities, especially those that were known to be hubs of sciences. Hence, Adelard was going back and forth on Sicily (Haskins, 1924, p.33), which had an Arab spirit and culture. During the year she spent roaming in Italy, he prepared his book *On the Same and Different*, under the influence of the Platonic philosophy. He followed the style of writing similar to that of Martianus Cappella and Boethius, and the sciences they were concerned with (Haskins, 1924, p.36). Adelard's book is based on a dialectical dialogue between the uncle and the nephew, as this writing style was prevalent in the Western Middle Ages, where the uncle is most often a priest or a bishop while the nephew is the student who asks questions (Barrow, 2015, p.117). Nonetheless, the character of the nephew may be a metaphor and a rhetorical picture that does not really exist. In the case of Adelard, there was no mention that he had any siblings let alone nephews.

In the introduction of the On the Same and Different, Adelard expressed his admiration for the writings of the ancients and their intellectual and scientific contributions. He compared the output of his intellectual contemporaries with the ancients and stated his

dissatisfaction with the scientific situation of his time. Therefore, he decided to break his silence and pour in his thoughts and ideas.

Philosophy is thought to be the comprehensive branch of science that encompasses the seven liberal arts (Hockey, 2014, p.17). Adelard built his philosophical dialogue on two different personalities; one of them is *Philosophia*, who represented science and knowledge, and the other is *Philocosmia* who represented the pleasures of life including lust and fame. The first was characterized by the accompaniment of seven maids, while the other had five. As for the seven maids, they were the seven liberal arts, whereas the other five were wealth, power, honor, fame, and lust.

Philocosmia begins the debate by asking Adelard why he is seeking erroneous fallacies, that is, his pursuit of knowledge. She believes that he is expending a great effort to reach a truth that will go unheeded when confronted with the barrage of questions and doubts described by Philocosmia as "thorns sprouting in the mind" (Adelard of Bath, 1998a, p.7). Then she goes to describe all her servant and begins with wealth and its advantages. Following that, she criticized philosophers like Plato and Aristotle and wondered how human beings can follow those who disagree on the tangible and the intangible.[*] Philocosmia continued, and went on to describe her other maids, until her speech ended and moved to Philosophia, who came with arguments against every claim. She explained that Plato and Aristotle, despite their differences, they are similar in that they seek the same thing; reaching the truth. While Plato starts from the metaphysical aspect, Aristotle, his student, starts from the tangible, and here she indicates that they meet on the same path because of the existence of a strong and interconnected relationship between the whole and the part, between the complex and the simple (Adelard of Bath, 1998a, p.21).

Adelard's inclusion of the philosophy of Plato and Aristotle is an example of his broad knowledge and the kind of philosophical ideas that were available to students of the ecclesiastical schools. These opinions were expressed through him and his peers to gradually develop and lead to the emergence of natural philosophy and transcendental philosophy that touches the principle of mysticism and asceticism in Islam.

The five maids of Philocosmia are faced with seven beautiful women on whom civilizations were built. The first of them is

[*] Philocosmia claimed that philosophy without wealth wanders around seeking a livelihood as the philosophers themselves do not find solace in each other, so the philosopher takes a stand against the other. She also claims that they do not understand anything; Plato, for example, proceeds from the senses first, while Aristotle opposes him in this and starts from the metaphysical world.

Grammar that enables an individual to speak and provides him with the weapon of writing and reading. Then comes *Rhetoric* in which the speech is summed up eloquently and the speaker chooses the right choice of words. After Rhetoric comes *Logic* who leads one to reach the truth, in this way Logic represents a basic pillar for the rest of the other arts as it guides them to the rightness and the way to reach it, which is what we today call scientific or logical thinking.

The mentioned three arts and the necessary foundation for the remaining four such as arithmetic, which paves the way for the rest of the Quadrivium, and is the source of the similarity and difference between them; as all of them use numbers, but each in its own way. Music, one of the Quadriviums, represents the universal language that everyone understands and loves. It is based on the existence of a relationship between the harmony of rhythms and the proportionality of the length of the strings, as proved by the Pythagorean theorem, where he extracted the science and composition of melodies and included them under numerical proportions (Ibn Abi 'Usaybi'a, 1965, p.62)[2]. Adelard goes to indicate that the souls have known the melodies before they enter the bodies, thus, melodies sound very familiar in some cases. Moreover, the harmony of the rhythms is closely related to that of numbers, as they connect between the language of the heart and that of the mind and arithmetic.

Following music, Philosophia moves to the last two types of arts, namely *Geometry* and *Astronomy*, where the first deals with measuring inanimate objects, and the second deals with measuring orbits. Adelard demonstrated the importance of geometry because of its practicality in measuring castles and the depth of wells, as well as explaining the proportion between the angles and triangles. On that note, he explained that Astronomy draws the shape of the universe in circles and orbits, and in stars and galaxies. He also believes that what happens in the upper world affects the underworld and this shows his tendency to explain astronomical phenomena from an astrological point of view, hence being more like Plato who wears the metaphysical specs when viewing the world. Philosophia described her maiden Astronomy as the carrier of the astrolabe, which means that Adelard was aware of this tool that the Greeks initially invented and was then developed by the Muslims incomparably. Gerbert of Aurillac, perhaps, was the reason for Adelard's inspiration to look into the Arab sciences, which he will pursue later in his life. Rather, this is what he said on the tongue of a philosopher to his nephew: "For what French studies are ignorant of, those across the Alps will unlock; what

[2] Ibn Abi 'Usaybi'a (1965). 'Uyûn Al-'Anbā' fī Tabaqāt Al-Attibbā'. Nizar Rida (ed.), Beirut: Dar Maktabat Al-Haya.

you will not learn amongst the Latins, eloquent Greece will teach you" (Adelard of Bath, 1998a, p.71). It seems that Adelard was aware that the prevailing education in France - his place of study - was not at the level of education that matches what is behind the Alps and perhaps he intended Italy, as he followed his speech by mentioning his visit to the Italian city of Salerno in Magne Graecia, which is the Greek-speaking region at the time. Adelard concluded his book by answering his nephew's question, as he wanted him at the beginning of the book to tell him the reason behind his travels and ideas, saying: "Now, dearest nephew, I have sufficiently explained to you the cause of my winding journey to teachers in different regions, so that I might both lift from myself the burden of your unjust accusation, and urge the passion for the same studies on you, so that when others display their riches in many ways, we may simply set forth knowledge. Good-bye, and judge for yourself whether I have disputed rightly" (Adelard of Bath et al., 1998a, p.73).

Adelard has other books he composed before his trip to the East, including a book on the abacus *Regulae Abaci* and another one on birds *On Birds.* After completing his studies in Tours, he started teaching in Laon, and he recalled that during that period he visited Italy. It is perhaps in this period when Adelard wrote his book *On the Same and Different* because it was devoid of any reference to the features of Eastern Arab sciences and it only mentioned Italy, which was his doorway to Sicily. Consequently, Sicily represented the first eastern stop in which Adelard landed in 1109 AD, and from here began his career in seeking knowledge at the hands of the Arabs or what he called *Studia Arabum*. This transitional phase marked a turning point in his scientific life and his historical role in contributing to shaping the 12th century Renaissance.

3. Adelard's journey to the East

Given the proximity of Andalusia to Sicily, there is a great possibility favoring Adelard's visit to it, especially since it was known to have the largest translation center and the best libraries. However, there remains a debate about whether or not Adelard reached Andalusia (Mantas, 2014, p.206). Nevertheless, since Adelard translated the revised version of the astronomical tables of al-Khawarizmi by Abu Al-Qasim Maslama Al-Majriti who was an Andalusian astronomer (Lyons, 2009, p.118), it is perhaps an evidence that proves Adelard's visit to Andalusia. Although it is possible that the book could have been sent to Adelard through another person, however Adelard did not mention anything of that sort. On the other hand he did not mention that he went to Andalusia either. Nonetheless, since Andalusia is close to Italy and is a center for scientific knowledge in addition to him translating the Andalusian-

revised version of zij al-Khawarizmi, it perhaps sounds reasonable for Adelard to visit it.

Andalusia was not the only region that researchers questioned, but what is called today the Levant as well, as most of them assumed that Adelard had not traveled to those distant countries, and here Murrell explains in his thesis the reason for this assumption (Murrell, 2018, p.206). First, the assumption that the Levant under the Frankish rule was a fundamentally separate society with social structures that prevented any meaningful cultural exchange, be it scientific or otherwise. Second, the assumption that Western scholars did not travel to the Levant for seeking knowledge, because they had already found it in closer areas like Spain and Italy. It is noteworthy to mention that the period of Adelard's travels to the east coincided with the crusades, and hence crusaders did reach such places. However, being crusaders whom hearts could have been filled with blinding hatred and greed, they would not spare any attention to any kind of intellectual manifestation. Nonetheless, Adelard in the first place was not a Crusader, he was a person who preferred travelling from one place to another, and that was seen in the areas he visited in the European regions before setting foot in the East. Additionally, many scholars emerged in the Levant, such as Theodore of Antioch, Gerard of Nazareth, and Aimery of Limoges, which shows that the Levant at the time did not lack scholars nor was it in isolation from intellectual interactions.

There are some who doubt his seven-year journey and see it as a product of his imagination and a linguistic tool of suspense that he used in his book *Questions on Natural Sciences* (*Questiones Naturales*). Yet, if the journey was not real then why would he limit it to seven years only? And how can we justify what he said about the earthquake he witnessed and felt while being on the Mamistra Bridge - in Antioch today- in 1114 AD? Why did he take himself as a defender of the Arabs?[*]

These questions lead us to the believe that Adelard set off from Sicily to Andalusia due to its geographical proximity, and it seems that he sailed after Andalusia to Jerusalem as this was mentioned in some studies that tried to trace the course of Adelaide's journey (Stiefel, 1972, p.127). He did not mention any place in North Africa, thus it is possible that some have misplaced Egypt when they placed it in his journey as in BilQasim and BinDawma (2012, p.27). Adelard moved from Jerusalem to Antioch, that is where he witnessed the

[*] "Therefore, I shall defend the case of the Arabs, not my own." Adelard of Bath et al, 1998b, p.91.

earthquake. Another hypothesis is that Adelard visited Andalusia at the end of his journey on his way to his hometown.

The version of the astronomical tables by Al-Khawarizmi that Adelard translated, was later taken care of by Henry Suter and translated into English by the Historian Neugebauer (Dauben and Scriba, 2002, p.533), which is he version being used for this research. Al-Khawarizmi dealt with various astronomical topics; he began by introducing the Arab year - that is, the Hijri year - where he explained that his days begin on the first Muharram of the first year of the Hijra. Adelard explained that Al- Khawarizmi takes *Arin* region as a reference point because it is located in the heart of the world and in the middle of it, and in fact, Arin is nothing but a distortion of the spelling of the Indian city of Azgin (Nallino, 1911, p.155). However, today it means equinox, and it is a point in the earth where the poles are equal in height and the distance between East and West (Al-Jurjani, 1983, p.17)[3]. As for the meridian - a hypothetical line dividing the land into two halves - which was mentioned in the astronomical tables, it was in relation to the city of Cordoba, where Maslama was when he was revising the book. Since this book contains astronomical information and mathematical calculations, there is no doubt that Adelard spent much of his life to understand it, and this was facilitated to him because of the education he received in the ecclesiastical schools.

As in its Arabic version, zij Al-Khwarizmi consists of 37 chapters. In the first chapter, following the explanation of the Hijri year, the Roman year was explained as well. Then, the author explains the titles of the columns and clarifies how to define the leap year and the division of circles, the orbits of the planets and celestial bodies. He also went on to show the places of the planets, the sun, and the moon, as well as the northern and southern nodes, the points of apogee and perigee. It is striking that the West did not have anything equivalent to these terms, as the Arabic word *eluag* and *elheca* were used with some alteration (Khuwarizmi, Suter, and Neugebauer, 1962, p.19). Thanks to translation, the West was able later to use the terminology of the Greeks from which the Arabs derived their terms meaning apogee and perigee. The zij contained many uses of the trigonometric geometry, which were far more complex than the geometry of Pythagoras and Boethius that Adelard learned. Consequently, the translation of this book constituted a new reference for the Church, as this copy was kept in ecclesiastical schools in France.

Witchcraft was a predominant belief in the Middle Ages, as it was believed to be the cause of the death and resurrection of the great,

[3] Al-Jurjānī, A.M. (1983). Al-Ta'rīfāt. Beirut: Dar Al-Kutub Al-Ilmiyya.

and other superstitions and delusions. Hence, it was not surprising to see Adelard interested in translating a work by Abu Ma'shar al-Balkhi, whose name is Latinized as Albumasar, entitled as *Isagoge Minor*. This work was then translated into English with the title *(The Abbreviation of the Introduction to Astrology: Together With the Medieval Latin Translation of Adelard of Bath (Islamic Philosophy, Theology, & Science)) (English, Arabic, Latin and Arabic Edition)* by a team of translators, headed by Charles Burnett. The book contains seven chapters where the first chapter deals with the nature and connotations of the zodiac, and the second deals with the conditions of the planets in relation to the sun, while the third focuses on the phases of the planets, and the fourth deals with the "goodness" of the planets; it was thought that some planets were good and some were evil (Aakhus, 2012, p.155). The fifth chapter deals with the conditions of the planets and their connotations. The sixth deals with the Arabic parts which are points related to the constellations and are believed to have an effect on humans, and the final chapter deals with the topic of the seven days and the planets (Fernini, 1998, p.288).

Adelard translated the articles of amulets known as *Liber Prestigorum* by Thabit ibn Qurra al-Harrani (d. 901 AD) which contained explanations on how to prepare amulets and draw them according to specific asterisks in order to achieve the desired effect on the individual (Thorndike, 1923, p.665). Charles Burnett thinks that it is likely that these articles were translated in Antioch by Adelard (Burnett and Bohak, 2012, p.180), which thereby influenced Western knowledge of astrology.

Adelard's translations were not limited to Arabic works only, but he also translated *Euclid's Elements* in geometry, which Al-Hajjaj bin Yusuf bin Matar translated to Arabic. There were three versions of the book where the first one was a literal translation and the second was an abbreviation of the book (Busard and Folkerts, 1992, p.16). The third version, however, was a special edition, as indicated by Roger Bacon, in which Adelard presented geometrical proofs in a comprehensive and detailed manner (Clagett, 1953, p.19).

The debate over the attribution of these three translations to Adelard continued, and it became clear that there is a possibility favoring his translation of the first copy, while the second was collected under his supervision. It is noted that the study carried out by Elior (2018) compared the versions of the first volume of the translated book - which is a total of 13 volumes - and contrasted between the version of Al-Hajjaj and the copy of Ishaq bin Hunayn reviewed by Al-Harrani as well as a copy of a Jewish translator known as Rabbi Jacob. Due to the lack of Al-Hajjaj's copy, questions persist about Adelard's translations of the volumes of Euclid's Elements.

However, what Al-Nadim mentioned indicates that what Al-Harrani reviewed is that which was transmitted by Al-Hajjaj, as well as by Ishaq bin Hunayn (Al-Nadim, 1997, p.32).[4]In addition, Adelard mentioned his translation of this book in his book *On the Astrolabe* which he completed in 1149 AD. In short, Adelard translated Euclid's Elements and is considered the first person to enter this work in Europe in addition to supervising some of his contemporaries works who contributed to the translation process. As a matter of fact, as soon as Adelard translated this book, many translators of that era took part in translating different versions of it. Among them is Petrus Alphonsi, Robert of Chester, and many others. This book represents a turning point in the history of Western education, as the emergence of this text in England led to a renewal of concepts of geometry and Europe in general as it relied on it in its curricula later on and built its buildings on its basis (Seqyu, 2013, p.15).

Some believe that translation from Arabic has taken three stages, the first was in the tenth century initiated by Gerbert of Aurillac, the second from the twelfth to the fourteenth century and finally the third phase, which extended from the fifteenth to the seventeenth century (Iqbal, 2009, p.130). Perhaps this division of the stages of translation does not do justice to the seeds of the Modern European Renaissance in the twelfth century, as allocating an entire era to one individual does not do justice to those who worked individually after the tenth century. In the thirteenth to the fifteenth centuries, translation took a vastly different course, as those centuries witnessed the emergence of European universities that were based on the sciences of Muslims, and were the fruits of individual translation movements that sparked the chain of translation in the twelfth century. As for the sixteenth and seventeenth centuries, it was the time of the Modern European Renaissance which arose as a result of the scientific outcome that had become in the possession of the West, after being preserved and developed unimaginably by the Muslims and Arabs.

Adelard took it upon himself to translate some of the works of the Arabs that had attracted his interest in a way that he deemed necessary to transfer them to England. Because translation was not prevalent at the time, we did not see many translations by Adelard, as the translation revolution had not yet developed. In light of this, translation took different stages, starting individually at the hands of individuals who were fascinated by the works of the Arabs, and then gradually increased by the fifteenth century and all the way to the twentieth century. For example, the book of Ingenious Devices by Banu Musa was not translated until 1979 by the Orientalist Donald

[4] Al-Nadīm, M. I. (1997). Al-Fihrist. Beirut: Dar Al-Marifa.

Hill. Adelard did not make his Latin books to be forgotten in the libraries of the monasteries, but included them in his later books which he compiled on the basis of his translations as shall be clarified in the coming section.

4. Adelard's works after his return from the East

After traveling to the East, Adelard prepared his work titled as *Questions on Nature* in which he mentioned glimpses of the trip and the places he visited, such as Antioch and Tarsus. He also followed the approach of his previous book; he built the dialogue on a series of questions. However, in this book Adelard deviated from the liberal arts and focused on physics, which in turn includes many mathematical and astronomical topics. Through the dialogue, Adelard emphasized on the importance of using reason and logic to think rather than blindly following the teachings of the religious authorities. Consequently, this change in Western thought for Adelard and those who followed his approach, formed a basis for establishing universities and scientific curricula in Europe that relied on reason and logic. Adelard mentioned that he learned from his Arab maters that an individual shall take his own mind as his leader (Adelard of bath, 1998b, p.91). Al-Wreikat further explained Adelard's saying that by arguing that Adelard was referring to the experimental doctrine based on observation and experience in addition to measurement and induction, as most scholars of Islamic civilization followed this approach to correct and prove the theories of the Greeks. Moreover, she suggests that Adelard intended to break free from the chains of the church that limited him and students in general, to specific sciences (Al-Wreikat, 2018, p.119).

For his other book, which was the result of his works with Astronomical tables and writings in astrology, in addition to his geometrical knowledge that he gained, he composed his *On the Astrolabe* (*De opere astrolapsus*). However, because it was not available in English for the researcher, a doctoral thesis prepared by Bruce Dickey (1983) as well as other secondary references were relied on to understand the content of this work.

There is a close relationship between zij al-Khwarizmi and Adelard's manuscript on the astrolabe, as the former was the source and basis for it and a supplement to the information it contained. The importance of this manuscript lies in it being as one of the first works in the West that provided wonderful geometrical models of planetary motion despite some errors in the calculations that may be due to Adelard's tendency to interpret astronomical events from a cosmic perspective, not from the accurate mathematical calculations. Moreover, Adelard might have faced some difficulties in transmitting some words from Arabic or even understanding them correctly.

Additionally, he perhaps attempted to simplify some concepts as the book was a dedication to Henry II, who was not eighteen at the time. Henry II wished to know what the Arabs knew about the planetarium, orbits, stars, and their motions hence he asked Adelard to prepare such book for him. To this end, the first part of the book is devoted to explaining the coordinates, models and basic concepts of astronomy. He also took the approach of explanation that links astronomy and cosmology, which became in line with mathematical astronomy at the time. The first part was concluded by presenting the planetarium as a model for the world that puts all of the celestial bodies in one's hands. The book was also similar to a computer that predicts some astronomical phenomena like solar and lunar eclipses. As for the astrolabe, the remainder of the book is devoted to it, explaining how it works and its different purposes. For example, he explained how to find the location of the moon through the astrolabe, with the necessity of referring to the translated zij, as it contains the necessary coordinates to be used for the astrolabe.

Adelard also included the geographical aspect related to astronomy. Unlike Ptolemy, who divided the world into seven regions, Adelard took Arin region as the starting point that divides the world into two halves. In this case, the observer can calculate what he sees in the sky from the azimuth to the horizon with respect to the first region, Arin. Following so, the second region is a degree away from the first region, and the third is two degrees away from the first region and so on. In total, Adelard mentioned the existence of ninety regions only on the globe, meaning that he thought there are 45 latitudes only in the upper half of the earth, and another 45 on the lower half. However, today we know that there are 180 latitudes in total were 90 are in the upper hemisphere and 90 in the lower one. Yet, Adelard's description and calculation of regions differs from the Latin tradition that follows the Ptolemaic school in the matter of regions. In fact, even some Muslim astronomers, such as al-Farghani, follow the same school (Al-Farghani, 1669, Chp.8)[5]. Having said this, it becomes clear that Adelard being a Latin translator shaped an important part of the chain of scientific transmission that started with the ancients, Indians, passing through the Greeks and Arabs, leading eventually to the Modern European Renaissance.

Conclusion and Recommendations

Ultimately, Adelard was an example of the objective, tolerant character who sought knowledge and set out to the Arab world out of

[5] Al-Farghāni.(1669).Fi'l Haraka Al-Samāwiyya wa Jawami' 'Ilm Al-Nujûm. Jacobi Golil (trans.), Amsterdam: Johannem Jansonivm à Waasberge and Viduam Elizei Weyerstraet.

love of learning, not hatred, nor to be one of the crusaders. Thanks to the education he received in the French ecclesiastical schools, he was prepared to absorb the sciences of the Arabs. In fact, he authored various works before learning in the East. Adelard's translations and works influenced the libraries of ecclesiastical schools, which many Latin translators after him, have come across. They continued on the translation movement from Eastern languages, specifically Arabic, and thus played a major role in the transfer of knowledge and science from the Arab world to the Western world. Moreover, Adelard's manuscript on the astrolabe helped astronomers in Bath to know the celestial coordinates needed for making calendars, harvests, and other matters. Throughout the various books, he significantly expanded the scope of the seven traditional liberal arts, introducing physics, a little bit of biology and even meteorology, and his translations and books were kept in Chartres. His translation of Euclid's Elements also contributed to building European architecture and shaping the mathematics of the modern era. Adelard inspired many of his contemporaries to follow his approach and translate the sciences of the Arabs and Greeks. He influenced Daniel of Morley, who was familiar with his book *Questions on Nature* and his other book *On the Astrolabe*, and included some of his own views in his writings. Furthermore, Adelard played a great role in influencing many philosophers of later centuries, such as Roger of Bacon, Robert Grosseteste, and others. From a panoramic perspective, the twelfth century renaissance was the last intellectual meeting point between the Arabs and the westerns. When the presence of the formers dimmed, the presence of the latter's shone and continued until the First World War.

Adelard of Bath did not receive much attention in the Arab world perhaps due to limited number of the works he translated when compared to Gerard of Cremona for example. However, his translations were substantial proofs of his efforts and effectiveness in linking the Islamic civilization to Europe, which consequently was a reason behind the modern European renaissance. Moreover, in his works, Adelard did not mention the name of any Arab character he met. Rather, he called them his masters, and this requires more research on Adelard, especially in the writings of Arabs who were in the East at the time of Adelard, perhaps one of them mentioned it. Additionally, it is recommended to conduct more studies about his contributions and even translate his works into Arabic, and trace his influences on the philosophers in the following centuries. By studying the personalities like Adelard and their contributions, one can see the scientific exchanges between East and West and how both worlds were interconnected at that time.

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أديلارد الباثي: مؤلفاته والأعمال التي ترجمها

ملخص البحث

قصد الكثير من العلماء الأوروبيين الشرق خلال القرن الثاني عشر، وذلك رغبة في التعلم على أيدي العرب فضلاً عن ترجمة أعمالهم إلى اللاتينية. ومن بين أولئك المترجمين برزت شخصية المترجم اللاتيني أديلارد الباثي والذي يهدف البحث إلى دراسة أعماله الأصلية وتلك التي ترجمها من العربية إلى اللاتينية. تتتبع الدراسة رحلته العلمية بدءاً من مسقط رأسه مدينة باث الإنكليزية ثم فرنسا حيث درس، وأخيراً إلى الشرق حيث تعلم من العرب. كما يشير البحث إلى مستوى التعليم أثناء المرحلة التي تُعرف بالعصور المظلمة في أوروبا. علاوة على ذلك، يوضح البحث مدى تأثر أديلارد بالعرب من خلال استقراء أعماله التي أعدها قبل تعلمه في الشرق وتلك التي أعدها بعد ذلك.

استند البحث على مؤلفات أديلارد المُترجمة إلى الإنكليزية كمصدر أساسي إضافة إلى المراجع الثانوية الأخرى كالدوريات والأطروحات وغيرها. وبعد البحث والتقصي، يُلاحظ بأن الفكر العربي بدا واضحا في مؤلفات أديلارد حيث أشار إليهم عدة مرات كما أكد على أهمية المنهجية التي يتبعها العرب. وعلى ضوء ذلك، فقد ساهم أديلارد في تكوين نقطة تلاق بين الحضارة الإسلامية والنهضة الأوروبية، لذلك فإن إجراء المزيد من الدراسات حول شخصيته ستبرز مدى التفاعل بين الشرق والغرب من خلال المترجمين كأديلارد.

الكلمات المفتاحية: أديلارد الباثي، الترجمة العربية–اللاتينية، نهضة القرن الثاني عشر.