

T.C.
İBN HALDUN ÜNİVERSİTESİ
MEDENİYETLER İTTİFAKI ENSTİTÜSÜ
MEDENİYET ARAŞTIRMALARI ANABİLİM DALI

YÜKSEK LİSANS TEZİ

ARABIC INTO LATIN: 10th - 12th CENTURIES
TRANSLATIONS IN EUROPE

EVREN ERCEYLAN

140401003

TEZ DANIŞMANI

PROF. DR. ALPARSLAN AÇIKGENÇ

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Enstitü Anabilim Dalı: Medeniyet Araştırmaları

Enstitü Bilim Dalı: Medeniyet Araştırmaları

Bu tez 06/06/2017 tarihinde aşağıdaki jüri tarafından Oybirliği ile kabul edilmiştir.

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BEYAN

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Evren Erceylan

ÖZET

AVRUPA'DA 10. – 12. YÜZYILLARDA

ARAPÇA'DAN LATİNCEYE ÇEVİRİLER

İslam bilim ve düşüncesinin Batı üzerindeki etkilerini inceleyen araştırmalar arasında, on ve on ikinci yüzyıllarda İspanya'da Arapçadan Latinceye yapılan çeviriler hakkındaki çalışmalar önemli bir yer tutmaktadır. Çevirilerin yoğun olarak yapıldığı dönem, Müslümanların egemenliğinde bulunan İspanya'nın Hristiyanlar tarafından ele geçirilmesi ile eş zamanlı olarak vuku bulmuştur. Böylelikle, onbirinci ve onikinci yüzyıllarda Endülüs'te yapılan çeviriler bu alandaki incelemelerin odak noktası olmuştur. Çeviriler üzerine yapılan çalışmaların Reconquista sonrası Endülüs'e odaklanmaları, İslam biliminin Batı'ya aktarılmasını siyasi, strateji ve askeri bir olay ile ilişkilendirilmesi sonucunu doğurmaktadır. Ancak, halihazırdaki İspanya merkezli akademik söylem, çeviri süreci ve buna bağlı olarak İslam bilim ve düşüncesinin Batı'ya etkisi hakkındaki anlayışımızı daraltmaktadır. Çeviriler, birinci yüzyıldan beri süregelmekte olan Batı bilim sürecinin bir parçası teşkil etmektedir ve Batı bilimi onuncu yüzyılda duraklamada olmasına rağmen çevirilere imkan sağlayan dinamikler o dönemde Batı dünyasında mevcuttu. Ancak bu dinamikler, İber Yarımadası'ndan ziyade Pirene Dağları'nın diğer tarafı olan Fransa'da etkili olmuştur. Onuncu yüzyılda, İspanya'nın kuzeydoğusunda ortaya çıkan ilk çeviriler Fransa'da bilgi faaliyetlerini canlandırmıştır ve onbirinci ve onikinci yüzyıllarda yapılan çeviriler için uygun zemini hazırlamıştır. Fransa'nın yazılı çevirilerdeki payının az olmasına karşın Fransa topraklarından gelen aktörler Toledo'da yapılan çevirileri etkilemiştir. Ayrıca, burada yapılan faaliyetler, asimilasyonu onikinci yüzyıldan sonra ağırlıklı olarak Fransa'da yapılan büyük bir bilgi kazanımına sebep olmuştur. Bu tezde, 10. ve 12. yüzyıllar arasında Fransa'nın çevirilere katkısı incelenecektir. Bu vesile ile bu dönemde yapılan çevirilerin Batı bilim süreci içinde konumlandırılması amaçlanmaktadır.

Anahtar Kelimeler: Çeviri, Arapça, Fransa, İslam Bilim Geleneği, Batı Bilim Geleneği

ABSTRACT

ARABIC INTO LATIN:

10th – 12th CENTURIES TRANSLATIONS IN EUROPE

The bulk of studies on the transmission of Islamic science to the West focuses on the preponderance of the translations between the tenth and twelfth centuries in Spain. The trigger of the translations is usually presented as the Reconquista of Toledo in 1085. However, this Hispano-centric narrative distorts our understanding of the translation process. It associates the transmission of Islamic learning to a political, strategic and military event although the translations were a part of the Western scientific process that was already ongoing since the first century. By the tenth century, the Western scientific tradition was in a standstill but the dynamics that led to the translations were already active, not in the Iberian Peninsula but beyond the Pyrenees. The initial translations that emerged in the tenth century in the north eastern Spain stimulated the knowledge activities in France and prepared the suitable ground for further translations. Even though France contributed very weakly to the literal translations, the actors from France were very influential on the translation activities in Toledo. These activities ended up by an immense acquisition of knowledge which circulated to France to be assimilated. This thesis explores the contribution of France in the translations between the tenth and twelfth centuries. By this way, this study aims to posit the translations of this period within the Western scientific process.

Keywords: Translation, Arabic, France, Islamic scientific tradition, Western scientific tradition

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INTRODUCTION

The academic literature concerning the translations from Arabic to Latin in the medieval ages points out the Iberian Peninsula as the main channel through which the Islamic science¹ passed to Western Europe (Haskins, 1924; Kunitzsch, 1995/1996). Taken in consideration of the voluminous translations made during the twelfth and thirteenth centuries in Spain, the scholars have good cause for this assumption. The Iberian Peninsula had been the host of the intellectual centers of the Islamic Civilization. Since the Muslims conquered Spain in the eighth century, they prevailed over the Hispano-Christian community until the eleventh century. Their supremacy was not only political but also they were culturally preponderant. Indeed, al-Andalus was the extension of the Islamic Civilization in the West. Before the Arabic science reached to Spain, it had been developing in the cultural centres of Islamic lands since the time of the Prophet Muhammad (PBUH). Muslim scholars who were incited to seek knowledge by the Qur'an and the Prophet undertook scientific activities in a very early stage of the Islamic Civilization. The Islamic sciences such as *ʿIlm al-Kalām*, *Uṣūl al-fiqh*, *Ḥadīth* were the fruits of this initial period. Afterwards, the Muslims' encounter with the science of the Greeks and Hindus led to accelerate their achievements in a variety of fields such as mathematics, astronomy, chemistry, physics, technology, geography, and medicine. The Islamic scientific culture spread through the intellectual centers of the lands conquered by the Muslims, from Spain and Maghrib to Central Asia. In these lands of Islamic Civilization, Arabic became the scientific language. As stated by G. Sarton,

“From the second half of the eighth to the end of the eleventh century, Arabic was the scientific, the progressive language of mankind. During that period, anyone

¹ Islamic science is a conception that is frequently used in this work. Therefore, it is important to clarify how the term is used in this thesis. By Islamic science is meant the scientific and philosophical tradition which emerged and developed within the Islamic Civilization. It encompasses: firstly, the scientific achievements that the Islamic Civilization accomplished before the translations from Greek, Syriac, Persian into Arabic began; secondly, the disciplines which are peculiar to the Islamic Civilization (such as *ʿIlm al-Kalām*, *Uṣūl al-fiqh*, *Ḥadīth*); thirdly, the scientific and philosophical accumulation that the Islamic Civilization had absorbed via translations from preceding cultures and civilizations such as Greek, Hellenistic, Babylonian, Persian and Indian etc., and finally, the contribution of the Islamic Civilization's contribution to the accumulation of preceding civilizations. The language of Islamic science is Arabic. Furthermore, the peoples who lived in the conquered lands by Muslims contributed to the science produced in Arabic language. Therefore, the terms “Arabic science”, “Arabic learning” and “Islamic science” will be used indifferently in this thesis for the science and philosophy englobed by the Islamic Civilization.

wishing to be well informed, up-to-date, had to study Arabic (a large number of non-Arabic speaking people did so), even as now anyone who wants to follow the intellectual advance must begin by mastering one of the great Western languages.”²

The Islamic science arrived to Spain by the second half of the ninth century. The Muslims of Spain, firstly, imported science from the Eastern Islamic lands. Secondly, they highly esteemed the scientific activities, especially in their cultural centers such as Toledo and Cordoba. Thus, when the Christians took over the Andalusian cities that were donated by the cultural, intellectual and scientific accumulation of the Islamic Civilization, they became inherently its inheritors. By the Reconquista, the Christians did not only acquire the intellectual centers of Muslims, but also the Arabic scientific oeuvres. Thence, they undertook an immense task of translations. Subsequently, the bulk of translations were made in Spain during the twelfth and thirteenth centuries.

The modern scholars tend generally to evaluate the translations as a natural outcome of the Reconquista (Alverny, 1994; Hasse 2006) and to focus on the role of Spain in the transmission process of Islamic science. The inclination to concentrate on the role of Spain, most notably of Toledo in the transmission Islamic science to the Western world during the twelfth and thirteenth centuries has been apparent since the Western scholars shew interest in this field. Even though, other centers of translations in Italy and Sicily are acknowledged, Spain remains as a field of attraction among the modern scholars, most notably in regard to the translations from Arabic to Latin³.

Per contra, the emphasis on the role of Spain in the transmission of Arabic science misleads our understanding of the translation phenomenon. That is to say, this kind of interpretation leads us to conceive the translations as a knowledge transfer from one culture to another, subsequent to political, military and geographical circumstances of the eleventh and twelfth centuries. Nonetheless, the discovery of the Ripoll manuscript and its publication by Millas Vallicrosa during the 1930's opened the way for an alternative narrative. The aforementioned manuscript was a collection of treatises based on the use and the construction of the astrolabe. It belonged to the tenth century and already contained the earliest clues of Islamic science. The

² Sarton, George. *Introduction to the History of Science*. Vol. 1. Carnegie Institution of Washington, 1927, p.17.

³ The translations in Italy and Sicily were preponderantly from Greek to Latin.

disclosure of the manuscript written under Islamic science influence which originated in the southern edges of the Pyrenees in the tenth century carries the germs to challenge the Hispano centric accounts. Firstly, the manuscript bears the date of tenth century i.e. almost two centuries before the big movement of translations in Toledo. Secondly, this manuscript which appeared on the northeastern edge of the Iberian Peninsula passed beyond the Pyrenees and circulated rapidly to the cultural centers of Europe through France during the eleventh century. The Ripoll manuscript revealed to us that the Islamic learning appeared on the scene in the northeast of the Iberian Peninsula by the tenth century, a century before the Reconquista and one and a half century before the translations concentrated in Toledo.

Moreover, the first translations which had been made in the Ripoll Monastery passed to the north of the Pyrenees and circulated among the monasteries in France. Hundreds of compilations based on the initial translations were composed. These compilations diffused the Islamic science among the cultural centers and produced its impact thereby. More precisely, the Frankish knowledge seekers worked toughly on the Islamic knowledge that they met very recently. The emergence of the first translations and the persistent interest of scholars in France towards these bits of Islamic science points out the existence of some other dynamics behind the translations. These dynamics became apparent not in Spain, but in France. In other words, the first translations were not accidental, ephemeral or spontaneous, nor a result of a specific event or circumstances. On the contrary, there were some dynamics that led to transmission of Islamic science. They were already active in the tenth century and not in the core of Spain, but beyond the Pyrenees i.e. in France. For this reason, it seems crucial to us to turn the spotlight from Spain to France. Thus, in this thesis, I intend to make an inquiry on the translations of Islamic scientific works, from Arabic to Latin in France⁴ during the tenth, eleventh and twelfth centuries.

⁴ It is necessary here to clarify exactly what is meant by France. In this thesis, I deal mostly with the period between the tenth and twelfth century. At this time, France was politically attached to the Holy Roman Empire (962 – 1806). Since, it was under the reign of the Holy Roman Empire, it was also attached to the Catholic Church. Alongside, the Cluny order which was established in Burgundy, France was very influential in the ecclesiastical, cultural and political fields. Furthermore, there were many intellectual centres on the lands of France such as Liège, Gorze, Chartres, Paris, Orléans, Rheims, Aurillac etc. Geographically, I connote the territory between the north of the Pyrenees (southern boundary) and Liège (northern boundary - including Liège region which belongs to the territory of Belgium today).

The studies on the translations illustrate us that the share of France was very meagre when it is compared to Spain, Italy and Sicily. That must have been the just cause that the explorations in the field have not treated specifically France to date. Indeed, it would have been more relevant to make an interpretation of translations over France. As a matter of fact, the literal translations from Arabic to Latin was poor in France but it does not denote that the contribution of France was negligible. A much more systematic approach to translations would help us to have a deeper insight on the impact of the translations in the Western world. This systematic approach requires a broader perspective. The translations that provide the transmission of intellectual elements from one culture to another occur in three embedded phases⁵: firstly, the receiving culture gets acquainted with the borrowing culture and recognizes the intellectual elements that it lacks (acquaintance phase); secondly the receiving culture transmits the knowledge into its own language (literal translation phase) and finally, the receiving culture grasps the translated knowledge and assimilates it accordingly to its own intellectual tradition (assimilation phase). Such a holistic approach would include inherently France in the inquiry of the impact of Islamic science on the Western tradition. Before the concentration of the translations in Toledo, the lands of France had already been the host of the first Islamic science infiltrations (acquaintance phase). Furthermore, when the translations took place intensively in the middle Spain, their repercussions passed immediately to the north of the Pyrenees and challenged the intellectual centers such as Chartres and Paris (assimilation phase). Although France participated weakly to the literal translations, its part in the acquaintance and assimilation phases was predominant. For this reason, this thesis seeks to make a reading of the translations over France from a holistic perspective in order to develop a better understanding of the acquaintance and assimilation aspects. The studies to date emphasized the literal aspects since they focus on the translations of middle Spain and disregard the other aspects. The inquiry of translations from the perspective of France will help us to better understand the acquaintance and assimilation phases and consequently, the process of translations in its entirety. A holistic analysis will not

⁵ Lindberg, David C. *The Beginnings of Western Science*. University of Chicago Press, 1992.

only improve our comprehension of the translations, but also provide us a deeper insight of their impact in the Western scientific and philosophical tradition⁶.

Moreover, until the eleventh century, Europe was in the Dark Ages. The epithet of Dark Ages was invented by the Italian humanist scholars in the fourteenth and fifteenth centuries. According to them, this was a dark middle period between the achievements of antiquity and the enlightenment of their own age.⁷ This account of the Western history of science is due to the Western narrative that the Western tradition took its origins from the Greek tradition and there was an organic continuity between the Greek and Western traditions.⁸ Therefore, the darkness connoted for the Westerners the interruption of their link with the Greek tradition. The legend that the Western civilization⁹ took its roots from the Greek Civilization retains still among the modern scholars. However, a more substantial explanation to the Western tradition can be found in Alparslan Açıkgenç's epistemology of science. In his approach, he highlights that there cannot be a discontinuity in a scientific process. According to his epistemology of science, a scientific process¹⁰ rises from its own civilization and it is continuous only within the context of its civilization. Therefore, it cannot jump from one civilization to another. In the context of the Western tradition, Açıkgenç explains,

⁶ In this thesis, the Western scientific tradition refers to scientific tradition that was developed in the West under the influence of Islamic scientific tradition, based on the Christian culture and arose out of the ruins of the Greco-Roman Civilization (as defined by Alparslan Açıkgenç).

⁷ Lindberg, *The Beginnings of Western Science*. p.183

⁸ Açıkgenç, A. "The Impact of the Islamic Scientific Tradition on the West". In unpublished book, p. 8.

⁹ In the frame of this thesis, I refer to the "Western Civilization" in the period between the tenth and twelfth centuries. Therefore, it can be described as the civilization among the Occidental Christians in the Western Europe.

¹⁰ The scientific process, in the system of Açıkgenç, denotes the progressive stages that explain the formation of a scientific tradition within a specific civilization. It starts by the emergence of a worldview that may lead to the pursuit of knowledge activities in a society. Thus, the scientific process begins before the emergence of science and concerns both the scientific and philosophical spheres. In the frame of the thesis, hereafter, I will use the term "scientific process" by referring to its connotations in Açıkgenç's system i.e. including both the scientific and philosophical activities. For further details, Açıkgenç, A. *Islamic Scientific Tradition in History*. Sg. Buloh, Selangor: Penerbit IKIM, 2014.

“there seems to be thus a missing link concerning the rise of Western scientific tradition; a link between the previous thought and the medieval period, which is truly Western. Our claim is that the missing link is the Islamic civilization and more particularly Islamic scientific tradition.”¹¹

Açıkgenç points out that it was the Islamic scientific tradition that ensured the link of Western tradition to the preceding traditions. More precisely, the Western tradition was connected to the accumulation of the preceding translations via the translations from Arabic to Latin that started in the tenth century and achieved its zeal during the twelfth century.

This is because the Western scholars accord special attention to this period. It is considered as a transition period (R. Taton, 1964 and D.C. Lindberg, 1992) or even as a renaissance (C. H. Haskins, 1924). Moreover, some scholars posit the beginnings of the modern Western science and philosophy in this peculiar times of European history. The reception of the Islamic science is reckoned among the factors contributing to the awakening of Europe from its Dark Ages. Despite, the translations are acknowledged as a crucial phenomenon in the cultural, intellectual and scientific spheres, their role on the Western scientific and philosophical tradition is still a controversial issue. On one side, there is an approach which interprets the Islamic Civilization merely as an intermediary. The translators of Baghdad had translated the scientific and philosophical oeuvres of preceding civilizations into Arabic. These Arabic translations carried the cultural, intellectual and scientific accumulation of human history to the Western world. The Islamic Civilization did not contribute to the development of the science and philosophy that it had inherited. It only acted as a transmitter. On other side, the contribution of the Islamic scientists and philosophers is acknowledged. Moreover, their impact on their Western counterparts is accepted. According to this approach, the Western scientific and philosophical triumph is a result the transmission of Greco-Arabic science that poured out from the Arabic vessels¹². Even though, the way how the Islamic science and philosophy influenced the Western

¹¹ Açıkgenç, *The Impact of the Islamic Scientific Tradition on the West*, p. 8.

¹² Sarton, *Introduction to the History of Science*. Vol. 2, p.2.

tradition has been still the subject of intense debate, the translations are acknowledged as an inseparable part of the Western scientific tradition. As it is stated by H. Gibb,

“the real problem for investigation, is not what the Renaissance may owe to the Arabic-Islamic culture, but in which directions and to what extent materials derived from the Islamic culture contributed to the intellectual revival of the period extending from 1050 to 1300 or so, sometimes called the ‘Little Renaissance’.”¹³

Any attempt to inquiry in which directions and to what extent the Islamic tradition influenced the Western science and philosophy should go back to the medieval history and identify what was meant by Western science and thought during these ages. From the eighth to eleventh century, the Muslims in Spain, Italy and Sicily were the sovereign power in political, military, economical and also intellectual fields. Thus, there was no room for the Western tradition on the lands of Iberian and Italian Peninsulas. If anyone looks for the Western civilization in the medieval times, more particularly for its science and philosophy, it is necessary to investigate the non-Muslims lands of Europe i.e. the northern of the Pyrenees which was France.

During the eighth century, the Christian part of Europe was under the rule of the Frankish Kingdom that included some parts of Germany, most of France, Belgium and Holland. It was during the reign of Charlemagne (747 – 814), the emperor of the Holy Roman Empire when the Western Europe re-achieved a centralized government after the disappearance of the Roman Empire. In order to ensure the centralization, Charlemagne strengthened the state, the Church and also the education system (Carolingian Renaissance). He compelled the establishment of schools in every monastery and cathedral. These localities turned into intellectual centers such as Tours, Fulda, Reichenau, St. Gall, Lorsch, Fleury, Saint-Riquier, Corbie, Metz, Cambrai, Rheims, Auxerre, and Chartres. The clergy in these schools of monastery and cathedrals perpetuated the seven liberal arts i.e. the lectures were merely the repetitions of Boethius, Cassiodorus, Martianus Capella, Pliny, Isidore and Venerable Bede. Charlemagne’s Carolingian Renaissance ensured some small improvements, but it did not suffice to animate Western Civilization’s intellectual activities. Thus, the Western

¹³ Gibb, Hamilton. “The Influence of Islamic Culture on Medieval Europe.” *John Rylands Library Bulletin* 38, no. 1 (1955): p.88.

cultural sphere was stagnated when it came to the edge of its scientific and philosophical revival.

At this juncture, the translations stepped in the Western scientific process. Once the translations intervened, the Western scientific process and the translations entwined. In other words, first the translations activated the Western scientific process. Thereafter, the translations and the Western scientific process moved up together. Primarily, the holistic approach (including the acquaintance, literal and assimilation phases) will help us to explore the context in which the translations were launched and the dynamics of Western scientific tradition that led to the reception of Islamic science. Our exploration will be based on France. Firstly, France (as explained above) was part of the Western civilization. It was under the rule of the Holy Roman Empire and attached to the Catholic Roman Church. Secondly, it was situated in the vicinity of the Muslim Spain. The relations between the northern part of the Iberian Peninsula and the southern France had been always very close and the situation did not change even after the Muslim conquests.¹⁴ Beyond the commercial, social and cultural relations, Christians and Muslims got acquainted through diplomatic exchanges between the Holy Roman Empire and Caliphate. The cleric scholars, especially from France traveled to Muslim Spain and visited the intellectual centers of the Islamic Civilization. Therefore, France was already in closer touch with the Islamic Civilization since the Muslims achieved to their boundaries. As a result, France became inherently receptive of impact from its Muslim neighbors. Thus, it was not surprising that the earliest translations that were made in the tenth century in the northeastern Spain spread quickly to the monasteries of France and produced its effects thereby. Also, the holistic approach will improve our comprehension of how the knowledge tradition was activated and the Western scientific process was cultivated by the translations. For this aspect, the inquiry of the assimilation phase of the translations in France will contribute to our understanding. Before the translations were intensified in Toledo in the second half of the twelfth century, a small network of translators was already active in the first half of the same century. Among this translators, Hermann of Carinthia made the first

¹⁴ For further details, see Thompson, James Westfall. "The Introduction of Arabic Science into Lorraine in the Tenth Century." *Isis* 12, no. 2 (1929): 184–93.

tentative to assimilate the Islamic science. Moreover, thanks to his firm contacts with the School of Chartres, he infused the Islamic learning to the masters and pupils in France. France's role in the assimilation process was not restricted by Hermann and his entourage. The translations made in Spain would reach very quickly to the learning centers of France, such as Chartres and Paris where the Western scientific process would be challenged radically by the thirteenth century.

Indeed, the modern Western scholars had been discussing the role of the Islamic science and philosophy on the Western science and philosophy since the nineteenth century. On the scientific aspect, the bibliographical works of Johann G. Wenrich (1842) and Ferdinand Wüstenfeld (1877) were the first presentations of Islamic science reception in the Western world. Their attempts were pursued by Pierre-Maurice-Marie Duhem (1913), Charles H. Haskins (in the 1920's), George Sarton (1924), Lynn Thorndike (1929), Millas Vallicrosa (second quarter of the twentieth century). In regard to the philosophical sphere, Ernest Renan (1823 – 1892) was a pioneer by his works on Ibn Rushd. Afterwards, the Church involved in the researches in this field because by the eighteenth century, the ecclesiastical organization was already strained by the Enlightenment and the Industrial Revolution. Moreover, the Christian thought was weakened by positivism in the nineteenth century. Therefore, the Church made a declaration (*Encyclique Aeterni Patris*) in 1879. By this declaration, the Church aimed to define the Catholic principles to determine its position against the modern thought and called for the establishment of a new philosophical current. This *Encyclique* incited the inquiries of the Medieval Christian thought which betrayed the influence of Islamic thought on the Christian thought.¹⁵ Therefore, the interest in the Islamic influence on Western philosophy spread to the academic sphere. Louquet (1904), François Picavet (1906), Maurice de Wulf, (1909), Clement Baeumker (1916) and Etienne Gilson (1920's) were among the first scholars who worked to figure out the influence of Islamic philosophy on Western thought. The studies on the translations were extended during the second half of the twentieth century. Vernet Ginés, Marie-Thérèse d'Alverny, Richard Lemay, Marshall Clagett,

¹⁵ Karlığa, Bekir. *İslam Düşüncesi'nin Batı Düşüncesi'ne Etkileri*. İstanbul: Litera Yayıncılık, 2014, p. 65-66.

Charles Burnett, Hubertus L.L. Busard, Menso Folkerts, Paul Kunitzsch and Ricard Lorch contributed to the investigations in the field.

The studies on the translations during the nineteenth century were digging the medieval manuscripts to find out a story about Western scientific progress.¹⁶ The researches during the first half of the twentieth century were mostly concentrated on the translations, translators, their locations and dates.¹⁷ The most relevant work of this kind was C. H. Haskins' *Studies in the History of Medieval Science* (1924). Haskins attempted to place the translations and their translators in a historical background. He equalized the medieval history of history of science to the history of translations. Even, he argued that the translators had been the initiators of the twelfth century renaissance. Since his work was published, many achievements have been recorded in the field. However, his book still holds key as it opened the way for many scholars after him. In regard to the second half of the twentieth century, the scholars (H. Busard, M. Folkerts, P. Kunitzsch and R. Lorch) are much more preoccupied by the manuscripts both in Latin and Arabic. They study very carefully the manuscript tradition (that may one oeuvre that was copied or even changed or revised from one manuscript to another along a manuscript tradition). The analyze of a manuscript tradition requires usually a comparison between the original and the translation. This laborious task of the modern scholars provide us many insights about the ability of a translator, translation methods and vocabulary.¹⁸ This kind of works are useful to understand the literal part of the translations that carried the potential to grasp the scientific context of the era. However, most of these studies are very technical and peculiar to its scientific discipline. Thus, they represent the picture only partially, disconnected from its context. Apart from the inquiries of the manuscripts, some modern scholars (E. Grant, D. C. Lindberg) focus on the content of the texts to interpret the transmission of Islamic science and its transformation within the Western process (concentrated on the assimilation phase of the translations). Moreover, some recent researches deal with the

¹⁶ Brentjes, Sonja, Alexander Fidora, and Matthias M. Tischler. "Towards A New Approach to Medieval Cross-Cultural Exchanges." *Journal of Transcultural Medieval Studies* 1, no. 1 (2014), p. 10.

¹⁷ Ibid.

¹⁸ The vocabulary is a sensible issue. The earliest translators made transliterations of Arabic technical terms as they did not have equivalent terms in Latin. As the translations furthered, the transliterations lessened and attempts to invent Latin terms and replace the Arabic vocabulary with the Latin became much more current.

social context in which the translations took place. These studies accentuate the social entourage of the translators such as their patrons, their affiliation to the ecclesiastical organization, their Mozarabic and Jewish associates etc.

Together the modern studies provide important insights into the different aspects of the translations. The investigations on the manuscripts give us more indications about the literal aspect of translations rather than the acquaintance and assimilation phases while the works on the contents report more for the assimilation. Finally, the studies on the social context reflect us how the Christians translator/scholar received the Islamic science through their contacts with the Muslims and also the Jewish, how the translated oeuvres circulated among the scholars. Even if this kind of studies is instructive for all the three aspects of the translations, it contributes much more to the acquaintance phase. Consequently, the recent works on the translations are one-sided i.e. emphasize only one aspect. On the other side, the oeuvres written on the history of science give usually an account of the transmission of Arabic science into the Western sphere (G. Sarton, R. Taton, D. Lindberg). Besides, there are some academic articles (R. Lemay, M.T. d'Alverny) which draw the general outline. These works display the context, the works of translators and their absorption by the scholars. Therefore, they attempt to reflect the general picture of the translations and posit it appropriately in the Western history of science. However, they remain weak to display the interconnection between the translations and the scientific process, therefore it cannot present us the place of the translations in the Western scientific tradition. Utilizing the approach of scientific process as developed by Açıkgenç, this thesis attempts firstly to encompass all the aspects of the translations by the holistic approach¹⁹. In this way, it will help us to place the translations adequately into the Western scientific process. This will be the originality of this study. Consequently, it will contribute to our understanding of the transmission of Islamic science to the Western tradition.

As discussed above, in order to have a better understanding of the influence of Islamic science on the Western science, it is necessary to posit the translations in the

¹⁹ Açıkgenç, *Scientific Tradition in History*, Chapter 1.

Western scientific process and extend the Hispano centric narrative on the translations from Arabic to Latin. Since France (the non-Muslim lands of Europe which located nearby the Muslim Spain) was the cradle of the Western Civilization during the Islamic sovereignty in Europe and host of the Western scientific dynamics (intellectual centers, schools of monastery and cathedral), I will intent to explore the translations of the tenth, eleventh and twelfth century from Arabic to Latin in France. Thus, this thesis aims to argue that the translations are part of Western scientific process. Depending on this primary aim, secondly, it seeks to assess how France contributed to these translations, respectively to the transmission of Islamic science to the West. As explained above, France was much more effective in the acquaintance and assimilation phases of the translations but also contributed to the literal translations.

The first chapter is concerned with the acquaintance phase. It unravels how the Christian scholars became aware of the Islamic science through diplomatic exchanges and direct learning from the Andalusian masters during the tenth century. Furthermore, it presents the first translations that occurred in the tenth century in the northeastern of Spain. Also, it elucidates the role of France in the development of the astronomical corpus based on the translations. Finally, it attempts to draw the path of knowledge activities of the tenth and eleventh centuries in the Christian West and display how the Islamic science began to spread within the Western scientific tradition through this path.

The second chapter intents to explain how the Western scientific tradition was prepared for the intense period of translations (second half of the twelfth century in Toledo). It focuses on the group of Toulouse translators who contributed to the literal translations between the scarce translations of the tenth century and the dense translations of the second half of the twelfth century. Additionally, the Western scholars of France created a demand for the translations that stimulated the activities in Toledo. Thus, the second chapter discusses also how France was influential on Toledan translators. Finally, it portrays very briefly the works of Hispano translators since the impingement was not unilateral i.e. the translations passed quickly to the northern Pyrenees and influenced the knowledge activities in France.

The third chapter attempts to evaluate the translations of tenth, eleventh and twelfth centuries from Arabic to Latin within the Western scientific process. This evaluation is based on the theory, model and method developed by Alparslan Açıkgenç. According to Açıkgenç, the Western scientific tradition had been already donated by a suitable worldview for the pursuit of scientific and philosophical activities. However, it was deprived from the required intellectual dynamism that would lead him to accumulate knowledge and pass to the scientific era until the twelfth century i.e. the Western scientific tradition encountered the Islamic tradition. Açıkgenç argues that the Western knowledge tradition was stimulated by the translations from Arabic to Latin. In the third chapter, I will intent to analyze the translations in the framework of Western scientific tradition. Açıkgenç places the translations between the tenth and twelfth century within the disciplinary stage of the Western scientific process. This stage, according to Açıkgenç's model, is related to the organization of the knowledge accumulation that occurs during the stage of problems. During the stage of problems, the scholars worked on and gathered around some specific questions. Their works on these questions result by an accumulation of knowledge which is not ordered. Thus, during the disciplinary phase, the scholars tend to organize the body of knowledge by methods. In this stage, they begin to pursue knowledge activities by the methods. As a result, the spheres of questions are delimited. Based on the spheres of questions, the accumulated knowledge is classified and organized within the aggregations. Once for each question, an aggregation is defined and delimited, it turns into a discipline. When the discipline emerges, the science emerges also. By the crystallization of the science, its subjects and scientific problems which enter in its sphere are defined. During this stage, the scholars become aware that each aggregation of knowledge constitutes an entity. This awareness leads to the formation of the scientific consciousness. This scientific consciousness is the trigger for the transition from the knowledge tradition to the scientific tradition. According to Açıkgenç's system, the three initial phases of a scientific process (worldview stage, the stage of problems and the disciplinary stage) are not scientific phases. These stages belong to the pre-scientific era. The sciences only emerge within the naming stage that is the first step in the scientific era. The scope of this study is the translations between the tenth and twelfth centuries from Arabic to Latin. It coincides with the disciplinary

stage of the Western scientific tradition. Therefore, this thesis deals with the pre-scientific era. The third chapter evaluates the translations in terms of the peculiarities of this disciplinary stage.

I. TRANSLATIONS OF THE TENTH AND ELEVENTH CENTURIES IN FRANCE

The most striking period of the translations from Arabic to Latin was apparently the twelfth century. The task of translators who were active in the northern Spain in the first half of the twelfth century was accelerated by the translators who gathered around Toledo. The Toledan translators undertook an immense work of translations during the second half of the twelfth century. Therefore, the narrative of translations emphasizes the role of Toledo in the transmission of Arabic science to the West and the Reconquista arises as the trigger of the translations. Thus, the translations are associated by a political, military and strategic breakthrough of European Christians over Muslims of Spain. But the story is not so simplistic. First of all, the initial tentative of translations had already appeared in a small monastery of northeastern Spain around the 970's i.e. one and half century before the big flow of translations. Secondly, these translations were small bits of Islamic science but they produced a big influence in Europe, especially in France among the Christian scholars. Thus, these initial translations cannot be taken as an accidental, ephemeral or spontaneous enthusiasm. Rather the persistent pursuit of Frankish scholars points out the existence of other dynamics underlying the translations. Thus, the objective of this chapter is to discuss that the first translations were not a result of the political context of the Iberian Peninsula but they were rather a part of Western scientific process. In other words, the initial translations were not haphazardly, in contrary, they came out of the Christian scientific interest, curiosity and need of knowledge i.e. the translations were an outcome of the Christian scholars' ambition for sake of knowledge. Thus, they were intentional, conscious and purposeful. At this juncture, the question to ask is how the Christian scholars were gravitated towards the Arabic science i.e. how they became aware of the science of their hostile neighbors (acquaintance phase of translations). Christians and Muslims lived together in Europe since the beginning of the eighth century. Since then, they established close relations, sometimes as enemies, sometimes as two neighbors. Therefore, the cultural interaction was already in place. However, the Christians got acquainted with the Arabic science in a particular way. They established diplomatic and cultural relations with the Andalusian Muslims. So that

they became aware that they could satisfy their need for knowledge from the Muslims. The second section of this chapter intends to explore how the scientific interest of the Christian scholars met with the initial infiltrations of Islamic science. The initial translations gave birth to an astronomical corpus who occupied the cleric savants of the monasteries in France. The second section deals with its repercussion on the infusion of Islamic science in the Christian West.

1.1. Acquaintance with the Islamic Science

1.1.1. Historical Context

The Iberian Peninsula was one of the point of junction between Islamic and Western cultures in Europe during the High Middle Ages. The Muslims conquered the Iberian Peninsula in 711. Afterwards, the Andalusian Umayyad Emirate was established in 756. The Great Mosque of Cordoba was built in 786 and became a cultural diffusion center. However, the cultural and most notably the scientific interest in Muslim Spain arose only later, around the middle of ninth century. The scientific activities in Andalusia took off during the reign of Abd al-Rahmān II (the Fourth Umayyad Emir of Cordoba from 821 – 852). He was the first to introduce the Baghdad's sciences in Spain. Indeed, the Arabic sciences in Spain developed between 850 and 1031 (until the fall of caliphate of Cordoba) following upon the sciences in Muslim Orient. In other words, the Arabic oeuvres imported from Orient constituted the basis of Hispano-Arab scientific development. This process can be called as the “easternization of Andalusian science”.²⁰ Starting from the second half of the ninth century the scientists in Al-Andalusia pursued activities in the fields of mathematics, astrology, astronomy, medicine, botany, agriculture and pharmacology. In respect to the tenth century, Maslama Abu al-Qasim al-Qurtubi al-Majriti (950-1007) in the fields of mathematic and astronomy and Abū al-Qāsim Khalaf ibn al-‘Abbās al-Zahrāwī (936–1013) in medicine were the most outstanding scientists.²¹ Especially,

²⁰ Vernet, Juan, and Julio Samsó. “The Development of Arabic Science in Andalusia.” *Encyclopedia of the History of Arabic Science*. London: Routledge, 2005, p. 246. Also see George F. Hourani, “The Early Growth of Secular Sciences in Andalusia”, *Studia Islamica*, 32(1970), pp. 143-156.

²¹ Paul Kunitzsch, “Les Relations Scientifiques Entre l’Occident et Le Monde Arabe À L’Epoque de Gerbert,” in *Actes Du Colloque d’Aurillac* (Gerbert L’Européen, Aurillac: Société des Lettres, Sciences et Arts “La Haute-Auvergne,” 1996), 193–203, p. 195.

the works of Maslama influenced not only his pupils but also his counterparts in the Christian Latin West. On the Christian side of Europe, by the end of the tenth century, the monastic scholars began to familiarize with astronomical knowledge that had been alien for them hitherto. They became aware of works of Muslim scientists i.e. they acquainted with the astrolabe, some principal theories of astronomy and astrology, the abacus in liaison with the Hindu-Arabic numerals.²² The cleric savants of the Christian world in the neighborhood of Muslim Spain got inspired from the works of Maslama and his students.²³

Maslama's works were among the first Arabic learning that the Christian savants grasped. He was born in 950 in Madrid and died in 1007 in Cordoba. He intensively worked in mathematics and astronomy. One of his most outstanding contribution is his work on Ptolemy's Planisphere. The original Planisphere was written by Ptolemy during the second century A.D in Ancient Greek. It was the first treatise displaying the celestial sphere on a plane diagram by the help of stereographic projection based on mathematical calculations. Planisphere was translated in Arabic (*Tastīh basīt al-kura*)²⁴ by an unknown translator probably within the translation movement from Greek to Arabic held in Baghdad between eighth century and tenth century. Since its original Greek version is lost, it is thanks to this Arabic translation that this oeuvre was transmitted to Middle Ages and even today. Maslama redacted notes and supplemented additional material to the Arabic version of Planisphere (*Talīq 'alā Batlamīyūs fī Tastīh basīt al-kura*). In addition to his tasks related to the astrolabe, he made a star table in 978. Subsequently, soon after Maslama's works, the early Latin

²² Ibid., p. 195.

²³ Paul Kunitzsch (1996) and Charles Burnett in "King Ptolemy and Alchandreus the Philosopher: The Earliest Texts on the Astrolabe and Arabic Astrology at Fleury, Micy and Chartres," in *Arabic into Latin in the Middle Ages: The Translators and Their Intellectual and Social Context*, New edition (Farnham, Surrey, England; Burlington, VT: Routledge, 2009)

²⁴ In this study, I made my best to put the Arabic names of the oeuvres translated in Latin. The Western academic literature gives usually only the Latin and English title of the Arabic oeuvre translated. If the oeuvre was originally Greek and translated to Arabic, the Greek name is also sometimes mentioned but the Arabic name is often omitted. Most of the time, I had difficulties to detect the Arabic name of the Latin translation. The inconvenience of this omission is the fact that it breaks the continuity and the traceability of the path that the oeuvre circulated among different civilizations and centuries. I admit that the translators of medieval ages were not systematic, rigorous and methodological in their translations to show openly their source of translations and it renders difficult to detect the Arabic original or version. But even though the Arabic title is known, the scholars in this field do not pay attention to this point. Nonetheless, I appreciate very much the works of Fuat Sezgin and George Sarton who did not hesitate to give the Arabic names besides the English or Latin title. I benefited very much from their work in this thesis where I attempt to care not to break the chain of knowledge.

astronomical corpus appeared in the vicinity of al-Andalusia (to be discussed furtherly in this chapter).

1.1.2. Diplomatic and Cultural Relations between Latin West and Muslim Al-Andalusia

Starting from the beginning of the eighth century, Muslims and Christians became cohabitants of Europe i.e. on one side, the small Christian kingdoms of northern Spain and on the other side the Islamic emirates that would evolve into caliphates in the second quarter of tenth century. The geographical proximity affiliated the Muslim and Christian residents of Western Europe, most often in a hostile manner. As a result, they began to establish diplomatic relations in order to handle issues such as Muslim incursions to the south of France, attacks of *ghāzīs* or *mujāhidīn* (Islamic frontier warriors)²⁵ etc. In other words, the exchange of ambassadors was targeted for political, military and strategical purposes. However, the embassy between the Muslims and Christians enhanced unavoidably the cultural acquaintanceship. Even though, diplomatic relations were not designed in sake of knowledge, they became beneficial to Christian ambassadors to witness the Muslim culture within its all aspects i.e. science, arts, architecture, living etc. Especially, the diplomatic visits became means for Christian emissaries to draw inspirations from Arabic science. Through diplomacy, the influence of Islamic scientific culture started to penetrate into the Christian minds. This diplomatic channel induced the Christians not literally i.e. not by the means of written Arabic oeuvres translated into their own language. In other words, first the Christians beheld Arabic science in the hands of Muslims and grasped the first hints directly from Arabic/Mozarab scholars. Thus, the face-to-face learning of Arabic science meanwhile the diplomatic visits opened the gate for Arabic science to enter in the Latin West culture. This apprenticeship occurred simultaneously the first literally translations or even preceded the verbal entrance. The embassy of John of Gorze is the most illustrative examples.

²⁵ Named as pirates by Western scholars

1.1.2.1. John of Gorze (c.900-974)

John of Gorze is among the first figures in the medieval ages who acted as a channel between Muslim and Christian cultures in Al-Andalus. His reputation is due to his emissary mission that he accomplished in Cordoba in 953, under the reign of the Umayyad caliph Abd-er-Rahman III. To better understand his role as cultural agency, his achievements in the Abbey of Gorze are of central importance. Before he was appointed to Gorze, he traveled to Italy. His journey was very beneficial to him in several aspects. John extended up his trajectory up to the south of Italy where Greek culture was very influential at that time. Therein he acquired some Greek oeuvres such as Aristotle's Categories and Porphyry's *Isagogia* and brought them to Gorze.²⁶ After his return, John with five other clerics was appointed to reform the monastery of Gorze in 933. While Arcdeacon Einfold of Toul to whom John met in Monte Cassino became the new bishop of the abbey, John took in charge the spiritual revival. He set up the sacred part of the reform on the literal interpretation of the Benedictine rule.²⁷ However, John's role in the Gorzean reform was not only limited to the holy renovation, he was also influential on the scholarly activities of the monastery. In the field of learning, John was surrounded by clerics savants. Most importantly, John's companion during his travel to Italy, Deacon Bernacer who had a well-reputation on computus²⁸ was among the reformers of Gorze. Around John and Bernacer, a group of clerics and nuns gathered at Gorze in order to pursue their studies both on religious and secular topics.²⁹ The computus was among their main area of interest. By the time, the scholarly activities of the abbey furthered the study of computus and tended toward practical monastic astronomies.

Meanwhile, the Emperor Otto I and the Caliph 'Abd al-Rahmān III were exchanging embassies in order to deal the issue of Fraxinetum's Muslims.³⁰ Otto I was

²⁶ Westfall Thompson, loc.cit., p.190.

²⁷ J. M. B. Porter, "John of Gorze," *Holy People of the World: A Cross-Cultural Encyclopedia* (ABC-CLIO, 2004), p 439.

²⁸ McCluskey, Stephen C. *Astronomies and Cultures in Early Medieval Europe*. Cambridge University Press, 2000, p. 170.

²⁹ Ibid, p.169

³⁰ Fraxinetum is described by Mohammad Ballan as an Islamic frontier state in Provence, southern France that was populated largely by ghāzīs or mujāhidīn (Islamic frontier warriors) from al-Andalus. The Muslims of Fraxinetum,

taking responsible ‘Abd al-Rahmān for Fraxinetum’s Muslims attacks on his lands. So, the Umayyad caliph sent his ambassadors to Otto with a letter. The Emperor perceived caliph’s letter as degradation of Christianity. Therefore, he detained the caliph’s representatives and released them only after three years. Afterwards, Otto decided to reciprocate ‘Abd al-Rahmān’s act by an equivalent gest. Thus, he sent John of Gorze to Cordoba as ambassador by the year 953/954. Naturally, John was carrying a letter destined for the caliph, this time insulting the religion of Islam.³¹ The submission of the letter to the caliph would provoke devastative damages to the relations between empire and dynasty. Such a deterioration would probably put in peril the Andalusian Christians living under Muslim sovereignty. Therefore, John was not immediately received to ‘Abd al-Rahmān’s Court. He was kept waiting for three years before he presented himself before the caliph. Meanwhile, he received delegations from the Christians of Al-Andalus. They tried to convince him not to submit the letter. As representative of the Christian faith, John criticized his coreligionists for subordinating to the Muslim rule. After the unsuccessful attempts of the Christians delegators, other mediators intervened. Hasdei Ibn Shaprūt, leader of the Jewish community and court official was among them. Finally, John accepted to accomplish his mission by a revised letter. Consequently, ‘Abd al-Rahmān’s welcomed him kindly and soon after the audience John returned to Gorze. After his return he was appointed as the abbot of Gorze in 967.

In its official frame, John’s embassy had two aspects; on one side, politically, he represented the emperor, on the other side, doctrinally, he acted in the name of Christian faith. However, the outcome of John’s visit exceeded its formal margins as it was the case in the Gorzean reform i.e. beyond the spiritual renovation of the abbey, John had furthered his duty in scholarly activities. Similarly, besides his ceremonious

described by the traditional view as “pirates” or “robbers”, led attacks to Italy and other parts of France as well. When they attacked the Upper Rhone valley, the Emperor Otto I was annoyed.

³¹ Our knowledge of John of Gorze depends mostly on the biography written after his death by his pupil John of St-Arnulf, succeeded John of Gorze as abbot. The accounts of the hagiographer who was also cleric are eulogistic rather than clean and spare. Originally entitled as *Vita Johannis Gorzensis*, the biography of John was translated in French by Michel Parisse in 1999. The French version of his life story is neither available in Turkey nor accessible via internet. So, I referred to the book of Ann Rosemary Christys (1999) as secondary source. John of St-Arnulf presented John of Gorze as a hero of Christian faith i.e. John accepted this emissary duty as a result of his desire for martyrdom. When John arrived in Cordoba, he was aware of his eventual destiny i.e. if he presented the letter to emir of the Muslims in Spain, he would be surely sentenced to death. For further details, see Christys, Ann Rosemary, *Christians in Al-Andalus 711-1000*, London and New York: Routledge, 2012.

task in Cordoba, John took the opportunity for intellectual acquaintance. During his stay, he was accompanied mainly by two persons.³² Firstly, Hasdei Ibn Shaprūt. Besides his role at the court he was also known as a physician, scholar and court official. He knew both Latin and Arabic. Secondly, Recemund, known as bishop of Elvira.³³ He was a civil servant in Cordoba, in ‘Abd al-Rahmān’s court. Recemund consulted John in his problematic relation with the caliph. Throughout these negotiations, ‘Abd al-Rahmān sent Recemund as ambassador to Otto I. Recemund took this opportunity to visit the abbey of Gorze. It is known that he spent the autumn and winter of 955/956 in Gorze.³⁴ This stay must have been beneficial in terms of learning. On one side, Gorze which since the reform became the intellectual center of Lorraine, thus relatively active in sake of knowledge; on the other side, Recemund, not only a diplomatic but also scholar brought up in Muslim Spain i.e. he would contribute as co-writer with ‘Arib Ibn Sa’d al-Katīb al-Qurtubī to the compilation of the Calendar of Cordoba³⁵ (*Kitāb al-anwā’* in Arabic, *Liber anoe* in Latin) in around 960.

The sources of John of Gorze do not provide information on how much he was influenced from the Arabic science and what kind of knowledge he acquired during his stay in Cordoba. It seems to us almost impossible that a learned man such as John did not benefit from Arabic learning. Taken in consideration his scholar friends, especially Hasdei Ibn Shaprūt and Recemund, he must have learnt from Arabic science, most notably astronomy. There are not clues that prove that John has brought written sources from Cordoba to Gorze. The catalogues of Gorze library did not show any evidence for Arabic manuscripts.³⁶ But I think that the possibility that John brought some sources from Cordoba to Gorze should not be dismissed as he did so when he returned from Italy. Although literal proofs are not available within the scarce sources on John’s achievements, we can assume John among the first channels that carried Arabic science influence in the Christian West. His function as carrier may not

³² Westfall Thompson, loc.cit., p.190.

³³ Recemund at the time when he met John in Cordoba was not yet the abbot of Elvira. He was appointed to Elvira only after his diplomatic travel to Germany.

³⁴ McClusky (2000) and Christys (1999).

³⁵ The Calendar of Cordoba is not within the scope of my thesis because it is not a translation. This is an oeuvre co-produced by the two secretaries of the caliph, Recemund and ‘Arib Ibn Sa’d. It was composed in dedication to al-Hakam II al-Hakam II (961-76).

³⁶ McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p. 171.

be in the form of script, however the possibility that he took advantage of learning in place is not negligible.

1.1.2.2. Gerbert of Aurillac (945/950 – 1003)

Gerbert of Aurillac is a well-known scholar of the second half of the tenth century in Europe. He gained his reputation thanks to his expertise in quadrivium, most notably in arithmetic and astronomy. He owes his fame not only to his advanced knowledge in arithmetic and astronomy. But also, later he would become pope in 999. He was born around in 945 – 950 in Aurillac, France. He started his education in the monastery of Aurillac. During his journey on pilgrimage, Borell, the count of Barcelona had visited the monastery of Aurillac in 967. The abbot of Aurillac had entrusted Gerbert to the count to take him in Spain and thereby advance in his studies. After Gerbert left his hometown, he studied first *mathesis*³⁷ with Atto, abbot of Vich. Afterwards, Gerbert went to Spain and stayed there between 967 – 970. During his stay, he spent some time in the Moorish schools which were already famous, especially in the field of mathematics.³⁸ He studied in Barcelona and also under Arabic teachers at Seville and Cordoba. In 971, Borell and Atto took Gerbert with them on a mission to Rome. Thereby, he attracted the attention of Pope John XIII and Emperor Otto I. Afterwards, Otto I recommended Gerbert to Adalbero, bishop of Rheims who appointed him to Rheims as an instructor. So, he went back to his homeland i.e. to France. Gerbert kept teaching at Rheims between 991 and 998. In the year of 998, he was appointed as archbishop of Ravenna. Finally, he was elected to the papacy in 999 and adopted the name Sylvester. He remained pope until his death in 1003.

Gerbert's curriculum at Rheims covered both trivium and quadrivium. In his teaching of logic, grammar and rhetoric, he followed Porphyry, Aristotle, Cicero, Virgil, Statius, Terence, Juvenal, Persius, Horace and Lucan.³⁹ In his lessons, he

³⁷ M. Zuccato explains *mathesis* as a term used in ambiguity i.e. it was used often to denote mathematics, or even quadrivium in a broader sense. However, it was also used as astronomy and even astrology. For further details, see Zuccato, Marco. "Arabic Singing Girls, the Pope, and the Astrolabe: Arabic Science in Tenth-Century Latin Europe." *Viator* 45 (2014), p. 107 - 108.

³⁸ Kitchin, William P. H. "A Pope-Philosopher of the Tenth Century: Sylvester II (Gerbert of Aurillac)." *The Catholic Historical Review* 8, no. 1 (1922), p.46.

³⁹ Zuccato, Arabic Singing Girls, p. 107.

referred to Boethius to further his explanations. That is to say that he was firmly attached to the Roman classics in trivium. The teaching of quadrivium until the time of Gerbert was based on the readings of Roman classics. Most notably, astronomy was taught in monasteries through the oeuvres of Pliny, Martianus, Capella, Macrobius or Calcidius.⁴⁰ Besides, it is known that Gerbert mastered very well the Roman classics and he drew on them in his teaching of trivium. On the other side, his teaching in quadrivium demonstrates a completely different feature. Contrarily to trivium, Gerbert chose a practical way to instruct his pupils in quadrivium. He taught his students geometry, arithmetic and astronomy by the help of instruments. In geometry, Gerbert built and used an abacus to teach his students mathematical calculations as division and multiplication. In astronomy, he served from four different instruments: one hemisphere, one armillary sphere and two globes displaying stars and constellations. Moreover, his teaching was not restraint behind the doors of the monasteries, but also he pursued his practical instruction outside, under the sky by observation of the stars. Thus, Gerbert's way of teaching can be described as unorthodox in quadrivium⁴¹, most notably in geometry and astronomy.

His outrageous way of teaching in quadrivium should have an alien source. Most obviously, he began to absorb the Arabic science during his stay in Spain. However, his first Arabic sources were not certainly the first translations because they did not appear in the Catalonia before the end of the tenth century. Since Gerbert left from the region in 970, it is impossible that he encountered firstly Arabic science via translations. Surely, later on, he got acquainted with the translations i.e. he sent a letter to Lupitus in 984 to ask him translations of the texts on astrolabe. If we take in consideration that he began to teach at Rheims by 984, how could he be able to integrate in his teachings the instruments that were poorly mastered in Europe at that time? The traces of Gerbert's practical astronomy teaching can be seen in Dunāsh Ibn Tamīm al-Qarawī⁴² (890-955/956). He was a Jewish scholar who worked at the Fatimid Court in Qayrawan, Tunisia. He studied in several fields such as philosophy,

⁴⁰ Ibid., p. 113.

⁴¹ *The Historia Francorum* written by Richer, Gerbert's pupil and dedicated to him gives us crucial insights about Gerbert's teaching at Reims. For further details, see Zuccato (2014).

⁴² For further details, Zuccato, Marco, "Gerbert of Aurillac and a Tenth-Century Jewish Channel for the Transmission of Arabic Science to the West." *Speculum* 80, no. 3 (2005).

Arabic grammar, astronomy, physics and natural sciences. Among his books, the Book on Operations with an Astronomical Instrument called the Armillary Sphere is of overriding importance. This book describes largely the use of astronomical instruments such as astrolabe and armillary sphere. Dunāsh, in this book, acknowledges that the use and the construction of the astrolabe are very difficult to understand, so that people are reluctant to work with them. Therefore, he “*defended the use of spherical instruments, such as the armillary sphere, as an aid in understanding the geometry of the astrolabe and acquiring a solid background in spherical astronomy.*”⁴³ It is supposed that Gerbert learnt indirectly the celestial instruments and the way of teaching them as described by Dunāsh. How did Gerbert reach to his book? In one of his books, Dunāsh, affirms that he sent to Abū Yūsuf Hāsday ben Ishāq ben Shaprūt his astronomical work including the construction of celestial spheres, astronomy based on mathematics and astrology. Abū Yūsuf Hāsday ben Ishāq ben Shaprūt (915 – 970) was also a Jewish scholar in al-Andalus. He studied in astronomy, medicine and physic. He worked at the court of ‘Abd al-Rahmān III and al-Hakam II. Also, he was an ambassador who acted in behalf the Andalusian caliphate. It is assumed that Gerbert’s network was indirectly connected to Abū Yūsuf Hāsday. When Abū Yūsuf Hāsday returned from a diplomatic mission to Cordoba, he returned with Gotmar, the ambassador of Count of Sunyer. Laterly, Gotmar became bishop of Gerona where he probably met Miro Bonfill, Count of Gerona and a friend of Gerbert, and also Atto, previous bishop of Gerona and master of Gerbert. So, Gerbert’s through his relations were indirectly connected to Abū Yūsuf Hāsday. The significance of his relations is related to the fact that Abū Yūsuf Hāsday is identified with Joseph Sapiens.⁴⁴ Joseph is known as an author of a mathematical book. Gerbert sent a letter to his friend, Miro Bonfill in 984 and asked information about this book. Most probably, Gerbert became aware of this book thanks to his network. If the assumption is correct that Abū Yūsuf Hāsday ben Ishāq ben Shaprūt and Joseph Sapiens were the same person, it denotes that Abū Yūsuf Hasday ben Ishāq ben Shaprūt might have brought some other books from Cordoba to Catalonia, including the astronomical book of Dunāsh, sent to Abū Yūsuf Hasday. By this way, Gerbert

⁴³ Ibid., p.757.

⁴⁴ Ibid., p.754.

might have acquired Dunāsh book or through his relations, he might have learnt enough from its content that he managed to integrate it in his curriculum.

Finally, Gerbert began to get inspired from Arabic science during his sojourn in Spain between 967 – 970. Probably, he furthered his knowledge in Arabic astronomy and its instruments through his relational network before he became bishop of Rheims in 981. Meanwhile, he kept on studying the Arabic science of stars circulating in Spain. In 984, he wrote three letters asking for scientific books on astronomy and mathematics. Among these letters, he asked to Lupitus known as the first translator and compiler of the astronomical corpus, the translations of the texts related to the astrolabe. Gerbert's name is usually associated to the astronomical corpus. Even, one of its treatises, *De Utilitatibus astrolabii* (on the use of the astrolabe) was ascribed to him. However, many contemporary scholars⁴⁵ do not agree anymore with this attribution. His contribution to the composition of the astronomical corpus as an author or compiler still remains contentious. Even though contemporary scholars concluded that Gerbert did not contribute to the composition of the astronomical corpus, it is evident that he is among the leading figures who played a crucial role in the diffusion of Arabic science in Latin West. He did not only absorb the knowledge of Arabic astronomy via his relations but also he radiated it through his teachings at Rheims. His reputation spread quickly within Europe and he attracted many students from different parts of Europe. Fulbert of Chartres was among his most well-known students. In turn his students also contributed to the advancement of astronomical studies and diffusion of Arabic science through Europe.

Diplomatic and cultural relations (the visit of Gerbert to the Moorish schools) contributed strongly to the mutual recognition between the Muslims and Christians. The Christian clerics such as John of Gorze and Gerbert of Aurillac witnessed the scientific advancements of the Muslim world during their stay in Spain. These learned-men must have got acquainted with the Arabic science and transferred some knowledge to their culture. This transfer might not have been in form of written sources (if there had been, we do not have its historical evidence). However, it is

⁴⁵ See P. Kunitzsch for further details, Kunitzsch, 1996. <http://www.mgh-bibliothek.de/dokumente/a/a149739.pdf>.

evident that the diplomatic and cultural visits ensured the first knowledge transfer and laid the ground for translations. Therefore, these contacts can be evaluated as the preparatory (acquaintance) phase of translations. It is relevant to remind that both John and Gerbert were from France and both of them were learned men. Thus, the scientific achievements that they witnessed in the Muslim Spain must have impressed and inspired them. Also, they must have grasped some learning that they brought back to their native land i.e. France. As both of them were masters in monasteries, they had students and must have passed their knowledge and inspiration of Arabic science to them. By this way, even before the literal translations the Islamic science began to occupy the minds of Christian scholars. Thus, the mental, psychological and intellectual ground for translations within the Christian West was gradually prepared.

1.2. Translations in the Tenth and Eleventh Centuries in France

The first traces of translations appeared at the end of tenth century in the north of Iberian Peninsula. These translations were integrated into two corpuses which issued in the Catalan region. Indeed, the existence of these compilations displays us the existence of the dynamics which led to the transmission of Arabic science and the activation of the pursuit of knowledge. Firstly, there was already a suitable ground among the Christian scholars for the pursuit of knowledge but it was not productive at that time. When the cleric savants met with the translations, they shew interest in them and established the corpus based on them. This section presents us how the savants in the monasteries of France compiled these corpuses and integrated the Arabic science in their knowledge activities. Among the two corpuses, the early one was mainly in the field of astrology while the second was a collection of astronomical treatises. In this section, I provide a brief account of the astrological compilation as it was less relevant than the astronomical corpus. However, the astrological corpus gives us indications that support my evaluations on the astronomical corpus. The two compilations provide crucial insights into the role of Arabic science in the Western history of science. To be more explicit, the two corpus followed the same trajectory i.e. both of them emerged in the abbey of Ripoll, composed under Arabic science

inspiration - even including translations from Arabic and giving place to Arabic scientific terms - circulated through the same monasteries/center of learning in France (such as Fleury, Chartres etc.), revised and re-elaborated around the same scientific community and diffused to Europe through the same path, starting from France to England and Germany. Thus, a deeper analysis of the course through which evolved these two oeuvres will help us to gain wider understanding on the Western scientific process and the Arabic impact on it. Furthermore, the influence of the astronomical corpus did not only expand in territory i.e. it did not only travel in space from northern Spain to France and then to Germany and England. But also, it traveled through time. Although it appeared in tenth century, its evolution did not cease for centuries. In the frame of this thesis, I prefer to place it within the first period of translations of tenth and eleventh centuries in France. However, its impact extends over centuries and different parts of Europe.

1.2.1. Astronomical Corpus (Early Collection⁴⁶/Old Corpus⁴⁷)

We find the first traces of the Arabic science in the Christian Western world in the astronomical corpus. This astronomical corpus is a collection of treatises related to the astrolabe. Indeed, it is the oldest text in Medieval Europe related to the astrolabe.⁴⁸ In other words, the astrolabe is introduced to the Latin West world through this corpus. The treatises explain mainly the description of the instrument, its use and its construction. The earliest germ of the corpus appeared in the Catalan region, in the northern part of Iberian Peninsula during the last two decades of the tenth century. It is vitally important to understand the geopolitical position of northern Iberian Peninsula. Muslims conquered the region in 718 and dominated thereby for about a century. Catalan forces managed to take back the district in 801. As from the ninth

⁴⁶ The labelling of the astronomical compilation is taken from Burnett, "King Ptolemy and Alchandreus the Philosopher, p 329–45. In the context of this thesis, I will refer to this term.

⁴⁷ Labelling used by P. Kunitzsch in "On the Authenticity of the Treatise on the Composition and Use of the Astrolabe Ascribed to Messahalla." *In Stars and Numbers: Astronomy and Mathematics in the Medieval Arab and Western Worlds*, 42–62. Ashgate, 2004.

⁴⁸ Kunitzsch, Paul. "Al-Khwārizmī as a Source for the Sententia Astrolabii." *In The Arabs and the Stars: Texts and Traditions on the Fixed Stars and Their Influence in Medieval Europe*, 227–36. Northampton: Routledge, 1989, p.227.

century, the Catalonian Christians survived in the vicinity of al-Andalusia for centuries, without subordinating to Muslim rule. In other words, Muslims and Christians lived as neighbors in the southern Pyrenees. Therefore, this region became naturally a gateway for Arabic science to penetrate into Latin West World and spread to the north of the Pyrenees. A small abbey therein initiated the first translations from Arabic to Latin on the astrolabe. The first translations from Arabic to Latin were made in the Monastery of Ripoll⁴⁹. These first attempts to bring the Arabic knowledge of astrolabe in the Christian world were only partial translations from Arabic oeuvres. However, these fragmentary translations established the main source for the astronomical corpus. That is to say, they took part in the Early Collection of astronomical treatises and constituted its basis. Even though there are still discussions on its composition date, it is certain that it was not available before the works of Maslama had been introduced in Spain. Thus, it came out at the end of tenth century or beginning of the eleventh century.⁵⁰ It seems that the works of Maslama on the astrolabe became known not only in the Muslim Andalusia but also among the Christians neighbors in the Catalan region. Once the monks at Ripoll acquired somehow the works of Maslama and also an Arabic astrolabe, they endeavored to introduce this instrument to their colleagues in Western Europe. Therefore, the first corpus on the astrolabe based on the Arabic sources and instruments that emerged around in Latin West by the 1000's.

The texts produced in the small abbey of Ripoll were only the first germs of the astronomical corpus. Once the collection appeared here, it passed quickly over the Pyrenees, towards the lands of France. It is known that it reached to the Lorraine region, the north of France, to Germany and England before the end of the eleventh century. The treatises included in the corpus circulated all along centuries among the Christian scholars. As they circulated in the hands of Latin cleric scholars in different abbeys of Europe, the content of the corpus evolved. Therefore, based on the primitive scripts, the Western scholars produced other texts related to the astrolabe. A study made in 1973 has shown that around two hundred manuscripts that are directly or

⁴⁹ Kunitzsch, *Les Relations Scientifiques*.

⁵⁰ There are several assumptions about its composition date. C. Burnett places the oeuvre at the end of tenth century while P. Kunitzsch puts in the eleventh century.

indirectly related to the basic treatises on the astrolabe survived.⁵¹ So the corpus came down to our ages through numerous manuscripts dating from the late tenth century to the sixteenth century.⁵²

Furthermore, once the germs of the corpus emerged in northern Spain, its evolution continued in the different monasteries of France. Its manuscripts in Fleury, Micy and Chartres etc. depict us that each monastery made its own contribution on its content. Its initial version appeared in Ripoll and it developed as it moved along its path towards the north Europe. Additionally, other translations that were made during the twelfth and thirteenth centuries kept on feeding the corpus.⁵³ So, different scholars and translators at various locations in Spain, France, Germany, England and Italy contributed to its composition. Consequently, different scholars and translators dispersed in Europe were partly responsible of its composition and its content evolved along the period between the tenth and sixteenth centuries, so that it became dispersed in time and space.

Despite its scattering feature, studies on different manuscripts since the beginning of the twentieth century tended to illuminate the first astronomical oeuvres written under Arabic influence.⁵⁴ These studies indicate us that the astronomical corpus should be considered as a family of corpus. It was born in the northern Spain at the end of the tenth century. At its beginning stage, it included mainly three treatises: *De mensura astrolapsus*, on the construction of the astrolabe; *Sententie astrolabii*, on the use of the astrolabe; *De orologio secundum alchoram*, on the celestial/solid sphere.⁵⁵ It can be described as the initial version which was firstly established in Ripoll. Afterwards, it matured in the other monasteries of France. Most of the treatises on the

⁵¹ Kunitzsch, On the Authenticity of the Treatise, p. 42.

⁵² Kunitzsch, Remarks Regarding the Terminology, p.57.

⁵³ P. Kunitzsch re-groups the astronomical corpus: firstly, he holds the primitive version that appeared in the northeastern Spain. Among the first treatises, the “*Sententie astrolabii*” is the central text. The translations of John Hispalensis who is a Toledan translator also contributed to its content among other translators and scholars who worked on it. In the second line, he places the translations of Plato Tiburtinus around the middle of the twelfth century. Finally, the Castilian contributions in King Alonso X’s time from the thirteenth century.

⁵⁴ The works of Millàs Villacrosa instruct us on the content of the manuscripts. The Spanish scholar edited the *Sententie* in 1931 based on an analyze of six manuscripts of the Old Corpus. The results of his inquiry are published in Vallicrosa’s book “*Assaig d’història de les idees físiques i matemàtiques a la Catalunya medieval*” (unfortunately not translated in English). Nicolaus Bubnov, Paul Kunitzsch, Arno Borst and Charles Burnett are among other scholars who provide us knowledge from original scripts.

⁵⁵ Burnett, *King Ptolemy and Alchandreus the Philosopher*, p. 329–45

astrolabe were built on the basis of *Sententie*. The works of Gerbert of Aurillac, Fulbert of Chartres, Hermann of Reichneau and Walcher of Malvern are derived from it.⁵⁶ It was mostly by the means of *Sententie* that the Arabic science influence radiates to the outmost of European continent. Moreover, P. Kunitzsch elucidates that the astronomical treatises up to the sixteenth century is directly or indirectly related to *Sententie*.⁵⁷ This initial version was like a tree body. It takes its roots from Arabic sources and astrolabe. This main body flourished its branches that reached to various cultural centers of Europe during centuries. Each branch bears its fruits when its season comes. Within the second generation, there are two main treatises: *De Compositione astrolabii* (on the construction of the astrolabe) and *De Operatione uel utilitate astrolabii* (on the use of the astrolabe). These two treatises appeared later, in the twelfth century. So it is convenient to describe the family of corpus like a tree since it passed from generation to generation, having the same germs, blooming by fruits very similar but not exactly the same.

I intend to describe here below the emergence and diffusion of the astronomical corpus in two separate sections i.e. its composition and its diffusion. However, it is noteworthy to precise that the composition and the diffusion phases of the corpus cannot be distinguished chronologically since it was formed as it radiated. Hence, its composition and spread are interlinked. Nonetheless, the aim of my study is to place the translation movement within the Western scientific process. The Arabic science entered in the Western world by the means of this corpus. What is more important it carried and also injected the Arabic scientific influence within the European knowledge tradition. Hence, my aim to refer to such a distinction is to emphasize on the role of translations in the scientific sphere⁵⁸ of Medieval Europe. For this reason, it is not inconvenient within the frame of this study to separate artificially the composition and diffusion phases.

⁵⁶ Kunitzsch, Al-Khwārizmī as a Source, p.233.

⁵⁷ Kunitzsch, Remarks Regarding The Terminology, p.233.

⁵⁸ The Western scientific tradition is not in its scientific era yet in the tenth and eleventh century. It can be evaluated as pre-scientific era according to Alparslan Açıkgenç's methodology of scientific process. However, the term "scientific" is mentioned here as it will contribute to Western scientific process even though in the context of the astronomical corpus it is still in the preparatory phase.

1.2.1.1. Translation and Compilation Phases of the Early Collection and Its Content

The astrolabe was the main topic of study in Muslim Spain during the second half of the tenth century. Maslama and his pupils are among the most popular scholars who worked on this field in al-Andalus. Maslama and his students had in their possession Arabic astrolabe and also some Arabic sources that came from Orient such as al-Khwārizmi's tables, al-Battāni's work and the Arabic translations of Ptolemy's *Planisphaerium* and *Almagest*.⁵⁹ Ibn al-Samḥ (d.1035), Ibn al-Ṣaffār (d.1035) and Ibn Bargūth (d.1052) were among his most important students. Therefore, we can assume that Maslama and his school was active from the second half of the ninth century up to the second half of the eleventh century. Their works were very influential not only in the Muslim part of Europe, but also on its Christian part. Towards the end of the tenth century, their works passed somehow⁶⁰ to the hands of Christians cleric savants.

Henceforth, the monks at Ripoll Monastery began to compose a Latin work by the help of Arabic sources at their disposal. Modern studies on the primitive Latin treatises reflect us to some extent how it was composed.⁶¹ Most probably, the clerics of Ripoll acquired Arabic texts related to the astrolabe in a way. They translated their Arabic sources not in their entirety, but they made some partial translations and integrated these translated fragments within their Latin texts.⁶² These translations are ascribed to an archdeacon from Barcelona. Although there are discussions on the identity of the person, Lupitus/Sunifred seems to be the translator and compiler. Lupitus and other translators/compilers following him did not mention openly their Arabic sources i.e. they did not put in their Latin treatises the same of the original Arabic oeuvres and their authors. Furthermore, they did not separate the quotations

⁵⁹ Kunitzsch, On the Authenticity of the Treatise, p. 55.

⁶⁰ It is still not clarified how the clerics of Catalonia acquired the Arabic texts on astrolabe and the instrument.

⁶¹ Kunitzsch, Paul. "La Table Des Climats Dans Le Corpus Des Plus Anciennes Textes Latins Sur l'Astrolabe." In *Stars and Numbers: Astronomy and Mathematics in the Medieval Arab and Western Worlds*, 391–99. Ashgate, 2004, p. 392 and "Traces of a Tenth-Century Spanish-Arabic Astrolabe." *Zeitschrift Für Geschichte Der Arabisch Islamischen Wissenschaften* 12 (1998), p.114

⁶² M. Villacrosa identified that the manuscripts that were composed only by translations were named *De mensura astrolapsus* and *Sententie astrolabii* while the texts containing the translations associated with their Latin explanations were called *De mensura astrolabii* and *De utilitatibus astrolabii*. For further details, see Juste, David. *Les Alchandreana primitifs: étude sur les plus anciens traités astrologiques latins d'origine arabe (Xe siècle)*. BRILL, 2007, p. 1.

from their own contributions or literal interpretations on translations. However, only modern studies that inquiry the manuscripts of the corpus reveal to us on which Arabic sources the translations depend on. Firstly, *Sententie astrolabii* includes one paragraph translated from a treatise of ‘Al-Khwārizmī on the use of the astrolabe.⁶³ The study of P. Kunitzsch on *Sententie* provides us interesting results. He identified in *Sententie* a section which is a direct translation from the Arabic treatise on the use of the astrolabe written (*Kitāb al-`amal bi`lasṭurlābāt*).⁶⁴ When he furthered his analyze through different manuscripts, he achieved to reveal that some manuscripts contain direct translations from al-Khwārizmī’s work while in others, “*the Latin is apparently based on the Arabic but does not follow it literally.*”⁶⁵ In other words, it means that some manuscripts of the same *Sententie* were made of direct translations although others were reformulated texts based on the Arabic originals. It means that the same *Sententie* has manuscripts which are not uniform⁶⁶ i.e. there are different versions of it.

The *Sententie* is composed of three parts: an introduction, a description of the astrolabe and its parts and finally, a description of its use. Each part reflects us a little bit of the composition methodology. Indeed, it reflects the lack of methodology rather than its existence. The introductory chapter is the own wording of the translator/compiler i.e. author’s prologue. One of the manuscripts contain a prologue written most probably by Lupitus. It reflects the ecclesiastic attitude toward astronomy i.e. astronomy is a mean to perceive the invisible Divine by the help of the contemplation of celestial spheres, to calculate the exact date of the Easter and time to pray by night and day.⁶⁷ That is to say the interest of astronomy was for sacred purposes rather than scientific. Even though, this part does not show any Arabic traces, the author confirmed that he was inspired from Arabic sources. Nonetheless, he did

⁶³ Kunitzsch, Paul. “Al-Khwārizmī as a Source for the *Sententie Astrolabii*.” *In The Arabs and the Stars: Texts and Traditions on the Fixed Stars and Their Influence in Medieval Europe*, 227–36. Northampton: Routledge, 1989. Kunitzsch compared several versions of the *Sententie* and al-Khwārizmī’s treatise on the astrolabe, its Arabic version. He put them aside and compared line by line their contents.

⁶⁴ Zuccato, *Arabic Singing Girls*, p. 99.

⁶⁵ Kunitzsch, *Al-Khwārizmī as a Source*, p. 228

⁶⁶ As the text evolved it is not possible to give a stable picture of its content. It circulated between different scholars who changed the text without identifying the changes that they made. Moreover, the contemporary scholars who worked on the different manuscripts do not give always the indication of the manuscripts that they used as primary source. They mention very rarely the exact name of the manuscript. However, most of the time they refer to generalizations such as “a manuscript of tenth century” or “a manuscript found in the library...”.

⁶⁷ McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p.175.

not mention any of his Arabic authors, nor his original sources. The second section is related to the description of the instrument. It includes twenty-five Arabic technical terms of the astrolabe and also Arabic names of four zodiacal signs. Kunitzsch assumes that this part is not a direct translation but it was written by someone who had an astrolabe with an Arabic text about the instrument. In the redaction of the document, the author was accompanied by another person who knew Arabic and the tool. In respect to the third part, it describes the use of the astrolabe. It contains directly translated portions of al-Khwārizmī's treatise. However, the Latin text includes large paragraphs explaining the translated lines from Arabic. The compiler of *Sententie* did not make any effort to distinguish what is his own wording, what is translation and what is his interpretation upon the raw translations. Furthermore, he did not even mention the name of al-Khwārizmī. It waited until the twentieth century to detect its Arabic author and source.

Similarly, two pieces of *Sententie* are the primitive translations from the beginnings of Chapters 2 and 3 of Ptolemy's *Planisphaerium*.⁶⁸ Indeed, the Arabic version of *Planisphaerium* was not translated in its entirety before the twelfth century. Therefore, the existence of fragments translated in Latin depicts us that the Christian cleric savants had already the Arabic version of *Planisphaerium* by the end of tenth century. It is worthy to remind that the Arabic version is the only means as the original Greek is lost. Secondly, it also proves that the monks of northeastern Spain were somehow in contact with Maslama since he worked and commented on *Planisphaerium*.⁶⁹ Again it is a discovery of twentieth century as the translators/compliers did not deem necessary to cite their Arabic sources and authors. Consequently, the Latin scholars of the tenth century who worked on the translation and compilation of the corpus had some Arabic texts at their disposal. They translated only some parts of their sources and integrated them directly or by literal explanations within their text. Therefore, these texts are crude Latin renderings⁷⁰ of Arabic astrolabe's treatises.

⁶⁸ Kunitzsch, Paul. "Fragments of Ptolemy's *Planisphaerium* in an Early Latin Translation." In *Stars and Numbers: Astronomy and Mathematics in the Medieval Arab and Western Worlds*, New edition edition., 97–101. Burlington, Vt: Routledge, 2004, p. 98.

⁶⁹ *Ibid*, p. 98

⁷⁰ Burnett, King Ptolemy and Alchandreus the Philosopher, p.330

In the composition of the corpus, the Latin clerics also used an Arabic astrolabe and served from native speakers of Arabic.⁷¹ Some compilations of the old corpus contain some parts related to the table of seven climes.⁷² In these compilations, the exact numerical information related to each clime is given i.e. the clime, its latitude, the length of its longest day. The data takes place with its original in Arabic, its Latin transliteration and also its Latin translation. The values of climes latitude are exactly the same as the values that Ptolemy gave in his *Almagest*. However, *Almagest* was only translated in the twelfth century. So, it was impossible for the Latin scholars of tenth century to benefit from *Almagest* for these values. Moreover, the Arabic treatises on the astrolabe do not include directly information on the seven climes. According to P. Kunitzsch, it is the proof that the first translators/compilers of the corpus had already an Arabic astrolabe at their disposal in the tenth century. Even though the Arabic texts do not describe directly the seven climes, the Arabic astrolabes depicted the latitudes for them. It reveals that the monks who were interested in the astrolabe had an Arabic astrolabe. As they believed that the seven climes were necessary to construct an astrolabe, they wanted to add this information in their texts. Most probably, a native Arabic speaker who knew the instrument accompanied them in their task of writing. Hence, we can assume that the initial version of the corpus was established through three main means; the Arabic texts, the Arabic instruments and the help of a native Arab speaker.⁷³

The first generation of the astronomical corpus is mainly concentrated on the *Sententie* and other versions which are produced dependently. This corpus emerged towards the end of the tenth century but pursued its reputation up to the sixteenth century. In respect to the second generation, it is convenient to account *De Compositione Astrolabii* (on the construction of the astrolabe) and *De Operatione Uel Utilitate Astrolabii* (on the use of the astrolabe). These Latin texts on the astrolabe

⁷¹ Kunitzsch, *Traces of a Tenth-Century Spanish-Arabic Astrolabe*, p.114.

⁷² The seven climes are the seven bands parallel to the equator. The tradition to divide the earth into climatic zones started by Aristotle. It is Ptolemy who reduced this division to seven climes. He treated these seven climes in his oeuvre *Almagest*.

⁷³ The first texts on the astrolabe that emerged under Arabic influence in the West were written by the help of the astrolabe that the Latin clerics had in possession. The mention of seven climes makes proof of it. This interesting point was discussed by Kunitzsch in "La Table Des Climats Dans Le Corpus Des Plus Anciennes Textes Latins Sur l'Astrolabe." In *Stars and Numbers: Astronomy and Mathematics in the Medieval Arab and Western Worlds*, 391–99. Ashgate, 2004.

were ascribed to Māshā'allāh ibn Atharī (d.815). Māshā'allāh was among the important astronomer of the eighth and ninth centuries during the reign of al-Manṣūr and al-Ma'mūn. He has some works on astrology which refer also to astronomical issues.⁷⁴ However, among his works, there are any treatises about the astrolabe. So, the original works on which the Latin texts depend are wrongly attributed to him. Recent studies on the manuscripts achieve to illuminate this misunderstanding. *De compositione* is a thirteenth century text. It starts by an introduction which is a direct translation from Arabic treatise on the construction of the astrolabe, probably by Abū Ishāq Ibrāhīm ibn Yaḥyā al-Naqqāsh al-Tujībī al-Zarqālī.⁷⁵ The following chapters describe in details the construction of the instrument. It is another level in the apprentice regarding to the astrolabe. Beyond the description of the tool and its use, its construction requires much more technical information. So treatises on the construction appear within the second generation of the corpus rather than the earliest texts. *De Compositione* is also floating in its content i.e. it was not compiled by one author, additions were made at different times by different persons which cannot be identified. The texts do not mention openly their sources are not well-defined within the texts. In respect to *De operatione*, its main source is the translation of Ibn al-Saffār's treatise on the use of the astrolabe by Johannes Hispalensis (one of the leading translator of the twelfth century). Upon this source, different versions of *De operatione* were produced i.e. "*modified in several ways; simplified and concentrated in certain instances, and augmented by some additional chapters. The (western) author of this fabrication, or compilation, is not known.*"⁷⁶

The general features of the first and second generation can be summarized as following: firstly, the Latin texts are mainly based on Arabic sources on the astrolabe. There are three kinds of means: Arabic texts, Arabic astrolabes and companionship of a native Arabic speaker. The Latin texts do not cite their sources openly. In case of *Sententie*, the contemporary researchers have just identified some of them i.e. the Arabic version of Ptolemy's Planisphere and al-Khwārizmī's treatise. Both of these Arabic sources were studied by Maslama. So we can assume that the first generation

⁷⁴ Belenkiy, Ari. "Māshā'allāh Ibn Atharī (Sāriya)." *Biographical Encyclopedia of Astronomers*. Springer Science & Business Media, September 18, 2007, p. 740-741

⁷⁵ Kunitzsch, On the Authenticity of the Treatise, p. 44.

⁷⁶ *Ibid.* p. 54.

of the astronomical corpus was composed under Maslama's influence. The works of Maslama became influential by the end of the tenth century. In respect to *De operatione*, the Arabic origin has been recently identified as Ibn al-Ṣaffār's who died in 1035. His works had been translated to Latin by the eleventh century. So we can assume that the translators or/and compilers of the first Latin treatises on the astrolabe were following closely the works on the astrolabe in Muslim Spain, most notably in Maslama's school i.e. the works of Maslama and Ibn al-Ṣaffār's are translated to Latin just after they appeared in Muslim Andalusia. Their works became immediately influential among the monasteries in the north and south of the Pyrenees although they have been buried deep inside the past as their names were dismissed among the Latin pages of the astronomical corpus. Secondly, the Arabic texts were partially translated into Latin and these fragments were integrated in the Latin texts without any quotation. Upon these translated morsels, the translators and/or compilers commented to the extent that the translations mixed up with the Latin commentaries. Subsequently, translations and Latin explanations became undistinguishable. Thirdly, the Latin texts were modified, revised and flourished in the hands of different compilers at different times. Nonetheless, neither the names of compilers, nor the dates of compilation were designated among the texts. Therefore, the astronomical corpus became scattered in time and in space with a nearly anonymous feature. On the other side, what is apparent about the first astronomical corpus of the medieval Europe, it was composed under Arabic science influence and it introduced the astrolabe to the Western scientific world.

The influence of Arabic astronomy can be traced through the manuscripts and the astronomical instruments of which the astrolabe is obviously the most important. The traces of Arabic science within the manuscripts and instruments can be followed by two means. The first means are the star names and technical terms: Many star names and technical terms related to the astrolabe are from Arabic origin. Arabic stars names that are placed on the astrolabe entered inherently in the treatises written on the astrolabe since the tenth century. Since many treatises were based mainly on the astrolabe describing the instrument itself, its use and construction, the technical terms of its parts and features also penetrated into the astronomical literature. The Arabic star names and technical terms in the astronomical treatises were integrated with their

transliterated form into Latin. Paul Kunitzsch observed more than sixty Arabic technical terms⁷⁷ related to the astrolabe which have been transferred to Western astronomical terminology. Some of them acceded into the Latin world through the astronomical corpus which began to establish since the tenth century in northeastern Spain and evolved in different regions of Europe up to the sixteenth century. In other words, the astronomical corpus is the earliest channel for Arabic terms to go into Christian knowledge tradition. The terms from Arabic origin are very significant to grasp the Arabic impact on Westerners' seek for knowledge. Firstly, they are the most apparent clues of Arabic science in the western astronomy. They are apparent as it is relatively easy to recognize their Arabic roots. Therefore, they are obvious means through which the Arabic impact can be traced. Additionally, many terms around the astrolabe are derived from Arabic. Firstly, they were Latinized and then passed to modern scientific terminology. They are still in use in modern scientific era such as zenith⁷⁸, azimuth⁷⁹ and nadir⁸⁰. The use of Arabic terms shows us that until that time in western knowledge tradition the concepts and facts were not in question so that the translators were not able to find the Latin equivalent for the Arabic terms. So they were not in position to translate as there were no Latin words to cover the concepts behind the terms. So they couldn't translate the terms but they transliterated. Furthermore, even their Arabic was not good enough for a correct transliteration. For example; *cabid* is an Arabic term used for every part of the astrolabe's spider.⁸¹ This term was transliterated to Latin as *vacabid*. The compilers of the astrolabe did not manage to distinguish the conjunction word "wa" and took it as one word. So the term passed to Latin as *vacabid*. Moreover, some of these concepts that were non-available in the Latin world existed not only in the Arabic scientific tradition but also in the Greek heritage. Even for these, the Christians were not at the level to include in their research. Secondly, some of these terms did not even exist in the Greek tradition i.e. so invented

⁷⁷ Kunitzsch, Remarks Regarding the Terminology, p.57.

⁷⁸ Point on the celestial sphere directly overhead an observer and 90° from the horizon. This is known as the astronomical zenith. Because the Earth is not a sphere, the geocentric zenith is defined as a line joining the center of the Earth to the observer.

⁷⁹ Angular distance of an object measured westwards around the horizon from due north at 0°, through due east at 90°, due south at 180° and so on. An object's azimuth is determined by the vertical circle (meridian) running through it. Azimuth is one of the two coordinates in the horizontal (or horizon) coordinate system, the other being altitude.

⁸⁰ Point on the celestial sphere directly below the observer and 180° from the zenith

⁸¹ Kunitzsch, Remarks Regarding the Terminology, p.59.

by the Islamic scientific tradition. In contrast to the conviction that the Islamic tradition is only a bridge between Ancient scientific traditions and western tradition, it makes proof of the contribution of Arabic scholars. The second means is less apparent. The scientific knowledge around the astrolabe was transferred to the West by the help of the instrument itself and the translations of Arabic treatises on astrolabe. During the first period of translations that I prefer to delimit by the tenth and eleventh centuries, the Arabic oeuvres were partially translated. These partial translations were integrated in the treatises composed by cleric scholars. It denotes that the knowledge related to the astrolabe was transferred to Latin literature in bits and pieces. This partial transfer was not systematic and organized. Therefore, the only way to follow the path of knowledge that circulated from Islamic science to west is to compare the manuscripts. Modern scholars put usually aside the Arabic and Latin texts in order to draw the trajectory of knowledge; which information came, from which source and when and how. In most of the cases it is a line by line comparison. So the second means is less apparent and requires a deep inquiry within the manuscripts.

The astronomical corpus is the first channel through which the Arabic terms penetrated into western scientific tradition. It contributed significantly to the terminology related the astrolabe and also astronomy in general. Firstly, the terminology became current among the first scholars in this field such as Gerbert of Aurillac, Fulbert of Chartres, Hermann of Reichneau, Walcher of Malvern and Adelard of Bath.

The Western scientific tradition took over the names of sciences from Aristotle likewise did the Islamic tradition. Around the astrolabe, we observe that the Western scholars also inherited scientific concepts and terms. But this time, they were not only inheritors of Greek scientific accumulation but also of Islamic scientific accumulation as well. The terms of Arabic origin which are still in use make proof of this fact. In order to better grasp the role of Arabic science in the Western scientific process, the path of the terms is noteworthy to be inquired. As concluded by Paul Kunitzsch,

“like the star names, also the technical terms of Arabic origin are of great importance for the historical study of the astrolabe. It is, however, a methodical duty, not just to pick out single words and to explain them at best knowledge from some possible Arabic word, in an isolated way. They have, moreover, to be traced back, step by step, from one text to its next

predecessor and so on, until the file is complete and the last origin reached. Only this method guarantees the correct interpretation of the term itself, and its correct understanding in every new context, in the process of its historical development.”⁸²

Such a method could only reflect dimensions of Islamic science’s influence on the Western tradition.

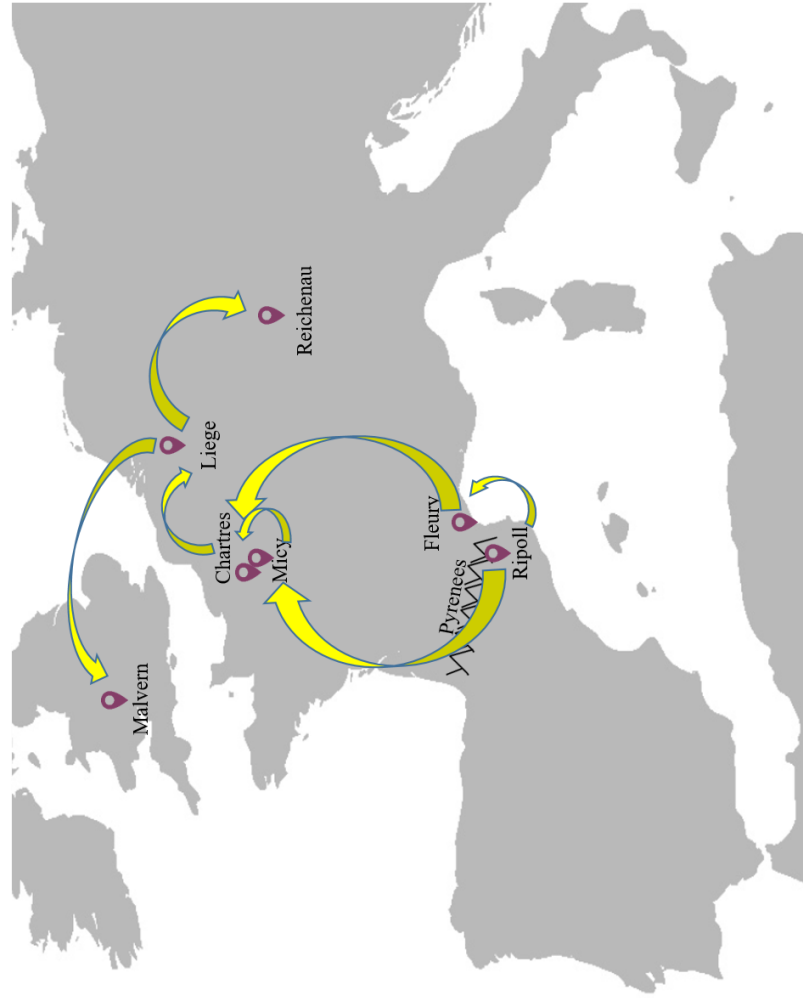
1.2.1.2. Diffusion phase of the astronomical corpus

Besides its ecclesiastic role, the monastery of Ripoll was an important center of learning. It was not only situated in the junction point of the Islamic and Christian cultures but also the channel through which intellectual elements passed from Iberian Peninsula firstly to France and then, to other parts of Europe afterwards (Map 1⁸³). Since, it was situated in the *strata francisca* i.e. on the intellectual avenue that connected the both sides of the Pyrenees.

⁸² Ibid., p.59-60.

⁸³ https://commons.wikimedia.org/wiki/File:Roman_Empire_map-2.gif

Map 1 The Circulation of the Astronomical and Astrological Corpora and the Path of Arabic Science Diffusion



1.2.1.2.1. Fleury and Micy

Fleury and Micy can be evaluated as the first centers of learning where the corpus was effective on the development of astronomical studies in Christian Europe. The copies of the compilation were found both in Fleury⁸⁴ and Micy. The abbey of Fleury was among the most reputable schools of France in the late tenth century. This monastery owned one copy of the corpus which was prepared in the circle around Constantin of Fleury. Constantin is among the key figures who played major role in the diffusion of the oeuvre. Correspondingly, he contributed to the development of Fleury and Micy as important centers of Arabic astronomy and arithmetic learning in the tenth and eleventh century. Constantin acquired his interest and knowledge of the astrolabe in Fleury, from his master Abbo of Fleury. Abbo of Fleury was skilled in mathematics and had the *Preceptum canonis Ptolomei*. He was also interested in astronomy and astrology. Moreover, *Liber Alchandreii philosophiei*, which is the earliest manuscript of another corpus compiled using Arabic sources on astrology includes one of his works. Abbo of Fleury was schoolmaster in Fleury 975 – 986, abbot of Fleury 988 – 1004. Constantine was in Fleury when Abbo was abbot. Bern of Prüm - would become master of another compiler of the astronomical corpus, Hermann of Reichneau – was attracted to Fleury by Abbo. Constantin and Bern had been in Fleury at the same time which coincides with the corpus' compilation date. The corpus emerged from this circle in 995.

Constantin's role in the diffusion of the corpus in France is not limited only by Fleury. Constantin educated in Fleury was appointed as dean of St – Mesmin de Micy in 988. He was abbot in the same monastery also from 1011 up to his death in 1020. The copy of the corpus found in Micy was done by Constantin. Moreover, Constantin had relations with other savants of this time interested in astronomy. Among them, Gerbert of Aurillac was an intimate friend. Gerbert sent him his principal mathematical works including the letter describing the construction of the celestial sphere (*Epistola de sphaera*). Also, Stabilis who is supposed to be the same as Constantin or under the

⁸⁴ C. Burnett discusses that the corpus was compiled first in Fleury in an early date and then reached to Ripoll. For further details, see; Burnett, King Ptolemy and Alchandreus the Philosopher, p.332

supervision of Constantin composed the oldest manuscript of Gerbert's collection of letters and other writings in Micy. Thus, Constantin is a key figure who contributed to the development of astronomical study in Micy in the late tenth century and eleventh century.

1.2.1.2.2. Chartres

The corpus continued its journey in Chartres. The traces of corpus can be grasped through the oeuvres of Fulbert of Chartres (970 – 1028). The proof which relates the Chartrian manuscript to its origins in Fleury and Micy are two texts which were sent to the Abbey of Micy. Fulbert wrote a poem in order to help his pupils to memorize the names of the stars placed on the rete of the astrolabe. These stars are among the brightest stars in the sky and enabled to locate the celestial coordinates. The names of stars are in Arabic. Moreover, the notes that served him in the writing of the poem are available to modern scholars. Among these notes, Fulbert added a list of 28 Arabic terms related to the astrolabe and he mentioned the Latin translations for each of the term. It is identified that he benefited from *Sententie astrolabii* and also from *De stellis horarum*. Both of them were texts from the Early collection. He most probably accessed to these texts via the manuscript Chartres 214 which is one of the manuscript from the Early collection. This Chartres manuscript also contained two other treatises that make evidence of its relation to Micy. One is Gerbert's *Epistola de sphaera* composed by Constantin/Stabilis and a work of Ascelin of Augsburg who wrote another version of *De mensural astrolabii*. This version is based on Lupitus' work on the astrolabe. Thus, most probably, Fulbert's knowledge on astrolabe is based on Chartres manuscript 214 that included the Early Collection.

1.2.1.2.3. Lotharingia

J. W. Thompson and M. C. Welborn during the 1930's claimed that Lothringia was the first cultural center where Arabic science, most notably the Arabic version of astrolabe was seen in the Latin West. However, J. – M. Millàs Vallicrosa's⁸⁵ findings

⁸⁵ Kunitzsch, Les Relations Scientifiques.

revealed that the first translations emerged in Ripoll. Thus, the attribution of Lothringia as gateway for Arabic science penetration was disproven. Thus, Lothringia is not the first place in the Christian scientific world where the Arabic astrolabe and translations of Arabic treatises were effective. Nonetheless, the role of Lothringia in the diffusion of Arabic science to England and Germany remains an undeniable fact.

It is not still clarified when and how the Arabic science penetrated in the Lothringian region. However, there are important clues that make evidence that the Arabic science was already influential in this northern part of France (in the second quarter of the eleventh century). Lothringia and especially Liege were important centers of learning in the tenth century among others such as Reichenau, St. Gall, Reims, Paris, Chartres, Cluny and Lothringia. These cities were already known for their scientific love and interest in the tenth century. Especially, thanks to the efforts of Bishop Notger (bishop 971 – 1008). Notger – a reputable scholar at the same time - gave special attention to the development of the schools. He encouraged not only the development of astronomy but also, he incited the study of mathematics and other sciences. During the stay of Bishop Notger, there were several scholars interested in astronomy in Liege. Radolf of Liege (still alive in 1048) was among them. He was a pupil of Fulbert of Chartres. Afterwards, he became teacher in the cathedral school of Liege. His correspondence with Ragimbold (dead before 1033) who was also magister in the schools of Cologne reflect the scientific interest of the period. Ragimbold was also educated by Fulbert of Chartres. He had been in Liege also for his education under Wazzon. The letters between Radolf and Ragimbold were mostly about geometry and arithmetic. However, one of them treated an astronomical matter which was about the astrolabe. In this letter, Radolf talks about the astrolabe that he had in his possession and he invited his colleague to St. Lambert to see it. The exchange of letters was made around 1025. Even though, Radolf was not skilled enough to understand the geometrical theory of the astrolabe, he was aware about its use and practical details of its construction⁸⁶. Although, the Arabic astrolabe started to circulate within the Christian lands of Europe and it was already known in the Lothringia region by the second quarter of the eleventh century, the scholars were not enough skilled to

⁸⁶ McCluskey. *Astronomies and Cultures in Early Medieval Europe*, p. 177 - 178.

understand its use and construction properly due to the lack of geometrical knowledge. Since, anyone who intended to understand an Arabic astrolabe ought to know geometry which was not the case Christian scholars of eleventh century.

The Manuscript 7377c in the National Library of France contains a group of treatises on the astrolabe which were redacted in Lothringia.⁸⁷ However, it is difficult to identify if they belong to the Early Collection or not.⁸⁸ Hermann Reichenau's (same person as Hermann the Lame, Hermann Contractus) version of the astronomical collection is presupposed to be assembled in Lothringia.⁸⁹ Although not proven yet, there are some assumptions that John of Gorze had brought some manuscripts from his sojourn in Cordoba. Due lack of sources concerning the Arabic science in Lothringia, its introduction and sphere of influence cannot be illuminated within the frame of this thesis. However, as the region, most notably Liege was an important intellectual center of the era, it attracted many scholars from outside the region. Furthermore, starting from the reign of Knut (1016 – 1035) - King of England - many monastic scholars from Lothringia were assigned as archbishops, bishops and masters in the schools in the nearby Christian lands as England and Germany.⁹⁰

Although the schools of Lorraine lost their reputation starting by the twelfth century, during the eleventh century it had been an important cultural center which contributed to the development of scientific activities and also a diffusion point of knowledge via scholars and scientific oeuvres.

Hermann of Reichenau and Walcher of Malvern are among the most outstanding figures who spread scientific knowledge from the north of France to other parts of Europe.

⁸⁷ Welborn, Mary Catherine. "Lotharingia as a Center of Arabic and Scientific Influence in the Eleventh Century." *Isis* 16, no. 2 (1931) p.192.

⁸⁸ It can be understood unless the manuscript is analysed. Moreover, during the preparation phase of this current thesis, I could not identify more sources related to Arabic science influence in Lothringia region.

⁸⁹ Zuccato, Arabic Singing Girls, p. 100.

⁹⁰ Welborn, loc.cit., p.197.

1.2.1.2.4. Hermann of Reichenau

Hermann of Reichenau (1013 – 1054) is also known as Hermann the Lame or Hermann Contractus. He was called “the Lame” or “Contractus” as he had a disability which limited his movements and ability to speak. He was born in Altshausen – southern Germany as the son of the Count. He pursued his education in the monastic school of Reichenau in 1020 and became monk at the same monastery in 1043. He is one of the key figures in the transmission and diffusion of Arabic astronomical technics and instruments i.e. he contributed to the introduction of the astrolabe, the quadrant with the cursor and the chilinder i.e. a portable sundial⁹¹ in the Latin West. Additionally, in the field of astronomy he composed an astronomical corpus which is considered as a continuation of the corpus emerged in Ripoll and evolved in Fleury and Micy. Hermann’s version contains mainly three parts:

- *De utilitatibus astrolabii*: it consists of a treatise on the astrolabe in twenty–one chapters. Hermann took the text from Lupitus’s translation including his prologue.⁹² It contains many Arabic expressions. The treatise was not written by Hermann in its entirety. The sections on the description of the chilinder and quadrant are ascribed to Hermann.
- *De mensura astrolabii*: this part was composed by Hermann, but surely based on Arabic sources since it contains Latinized Arabic word and Hermann did not know Arabic.⁹³ The treatise describes the circles constituting the astrolabe, the construction of the rete and the shadow square. Furthermore, it gives the explanation of *umbra versa* or *umbra recta* i.e. a practice of expressing angles in twelve points of either the inverse or plane shadow. Originally this is a Hindu practice which was transmitted through the Arabic writings⁹⁴.
- *De horologio viatorum*: Hermann describes in this treatise the portable sundial based on an Islamic model. Furtherly, this sundial was developed into a travel sundial which took in consideration the irregular lengths of the temporal hours.⁹⁵

⁹¹ Claudia Kren, “Hermann the Lame,” in *Dictionary of Scientific Biography*, vol. 6 (New York: Princeton University, 1975), p.301–303.

⁹² Burnett, King Ptolemy and Alchandreas the Philosopher, p.339

⁹³ Kren, loc.cit., p. 301.

⁹⁴ Ibid.

⁹⁵ Jürgen Hamel, “Hermann the Lame,” in *The Biographical Encyclopedia of Astronomers* (New York: Springer, 2007), 489.

It is not evident how, where and when Hermann acquainted with the Arabic astronomy. There are some assumptions. Bern of Prüm is said to be his mentor since Bern had been the abbot in Reichenau from 1008 – 1048. It coincides with the period when Hermann had been pupil in the same monastery. Bern of Prüm had studied astronomy in Fleury around 995. He should have taken part in the composition of the astronomical corpus of Fleury established in the circle of Constantine. Thus, Hermann might have got the Arabic inspiration from his master Bern. Moreover, Hermann is said to have gone to the cathedral school of Augsburg when he was seven years old (before he went to Reichenau). In Augsburg, he might have been student of Ascelin who also was a compiler of the astronomical corpus.⁹⁶

The roots of Hermann's knowledge on Arabic astronomy are not well defined yet. However, his version of the astronomical corpus displays the traces of Arabic influence on Latin West's astronomy. Hermann's works make evident that by the early eleventh century the Islamic astronomy had already reached to southern Germany.

1.2.1.2.5. Walcher of Malvern

Walcher of Malvern was a monk who played a major role in the diffusion of Arabic science to England. He was known as astronomer and mathematician. He was a monk of Lothringian origin who traveled first to Italy and then to England in 1091. The same year became prior of Malvern in England where he stayed until his death in 1135.

In 1091, Walcher had observed the lunar eclipse of 30 October while he was in Italy. At that time, he could not determine its exact time. He was conscious about the inadequacy of computistical tables to calculate the exact time of Moon eclipse. He attached importance to accurate prediction of each New Moon since some medical treatments such as cauterization, lancing of abscesses, and bleeding depended on the waxing and waning of the Moon.⁹⁷ The following year, in 1092, he managed to observe the Lunar eclipse of 18 October. This time, he arrived to determine its exact time by

⁹⁶ Burnett, King Ptolemy and Alchandreus the Philosopher, p.334.

⁹⁷ McCluskey, Astronomies and Cultures in Early Medieval Europe, p.182.

the help of his astrolabe. His astrolabe seems to be an Arabic one as Walcher mentioned it by its three points with their Arabic names.⁹⁸ In England, it was the first time that the astrolabe was used and an astronomical prediction and observation was recorded.

Based upon the observation that Walcher had done by his astrolabe, he made his own computations and developed his tables displaying the dates of the New Moon for the interval of 1036 - 1111. Then, Walcher pursued his observations of eclipses and compared them with his tables. As a result of his comparisons, he detected discrepancies between the dates of the eclipses and his predictions. The misleading point in Walcher's calculations came from the earlier computists' method of calculations. They used to build on their computations upon an average value for the mean lunar month. They took in consideration an average value of 29.53085 days as if the Moon moves with a stable speed along its orbit i.e. it draws ahead or remains behind its mean speed by five degrees at new or full moon. Additionally, the earlier computists neglected the similar fact for Sun's path as well i.e. the Sun also deviates by two degrees from its average speed through the zodiac. The variant rhythm of Sun's and Moon's motions is effective on the eclipse date. Since the earlier computists were unaware of these nuances concerning the Sun and Moon's paths, their methods of calculations lead them to inaccurate results as it was the case for Walcher's tables. As long as Walcher had observed the eclipses and recognized his tables inexactitude, he became aware of the inconstancy in the course of the Moon.⁹⁹

Therefore, after Walcher had benefited from the astrolabe to make astronomical observation in exactitude and achieved to build his tables of lunar eclipses, he needed more developed theories in order to go further in his astronomical works. He would find answers for this curiosity in his master Peter Alfonsi. Peter Alfonsi was a Jew and converted to Christianity in 1106. He was from Aragon in north-eastern of Iberian Peninsula. After he migrated to France, he came to England. Walcher and Peter met in Malvern and Walcher was educated by Peter on astronomical issues.

⁹⁸ Charles Homer Haskins, *Studies in the History of Medieval Science*: By Charles Homer Haskins (Harvard University Press, 1924), p. 114.

⁹⁹ McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p.182.

The fruits of his education are revealed in Walcher's oeuvre, *Sententia Petri Ebrei, cognomento Anphus, de Dracone* (the Opinion of Petrus the Hebrew, called Alphonsus, on the Lunar Nodes). Walcher presented in his corpus, the theories concerning the lunar nodes¹⁰⁰ that he learnt from his teacher.¹⁰¹ The importance of knowledge on lunar nodes that it rendered the method of determining the eclipses in relation to the motion of the Sun, Moon and lunar nodes.¹⁰² In order to provide deeper acknowledgements, Walcher also gave place in his oeuvre to the values for the average daily motion of the Sun, Moon and lunar nodes. Most probably, Walcher got this knowledge from Peter, his teacher which was based on from al-Khwārizmi's tables.¹⁰³ Moreover, Walcher shew how to calculate the average motion in terms of days, weeks, months and years.

At the time when Walcher came to England and made his first observations by the astrolabe, his works were limited by clumsy methods of Roman fractions. Later, Walcher wrote his *Sententia Petri Ebrei* in 1120. After thirty years, in his book he got acquainted by more refined calculations such as computations dealing with degrees, minutes and seconds.¹⁰⁴ Walcher can be described as a transitional figure¹⁰⁵ in regard to several aspects i.e. firstly he came to England from Lothringia. His homeland was among the earlier intellectual centers where the Arabic astronomy was influential on Christian scholars. He should have got the first taste of Arabic science in his native region.¹⁰⁶ Afterwards, he met Peter Alfonsi in Malvern and he was trained by this person who was also very effective on Arabic scientific penetration in Latin West. Therefore, Walcher contributed to the scientific transition in Europe in double sense i.e. geographically as he moved from France to England and culturally since he provided more developed theories and practices under Arabic influence to medieval Christian astronomers and mathematicians. Walcher was also transitional in terms of scientific achievement i.e. he emerged from a scientific culture which was pursuing

¹⁰⁰ Lunar nodes: the points where the orbit of the Moon crosses the ecliptic i.e. the apparent path of the Sun on the celestial sphere.

¹⁰¹ C. Philipp E. Nothaft, "Roman Vs. Arabic Computistics in Twelfth-Century England: A Newly Discovered Source," *Early Science and Medicine* 20, no. 2 (2015): p. 189.

¹⁰² McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p.183.

¹⁰³ *Ibid.*

¹⁰⁴ Haskins, *Studies in the History of Medieval Science*, p. 115.

¹⁰⁵ McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p.183.

¹⁰⁶ Information about Walcher life before he came to England could not be found.

knowledge for liturgical purposes. In other words, the cleric savants of his age were working out astronomy for monastic timekeeping and computes.¹⁰⁷ However, Walcher like his teacher Peter was in sake of knowledge for knowledge i.e. he aimed to determine the exact timing of the lunar eclipses in service to medical practice. This impulse led him to make astronomical observations that shew him the insufficiency of earlier computists' methods. Therefore, he began to ask scientific questions that push him to deal with scientific problems i.e. why discrepancy between his predictions and eclipses dates. Even though he did not achieve to handle with big problems as the calculations of the true positions of the Sun and Moon by geometrical means.¹⁰⁸ Thus, he was transitional also in scientific sense.

1.2.2. *Alchandrean Corpus*

The astronomical corpus is the first text written in Latin under Arabic science influence. It was composed upon the first crude translations and introduced the astrolabe to the Latin West. It appeared first by the end of the tenth century in the Catalan region and diffused very quickly to France. Its diffusion pursued its path within the other parts of Europe such as Germany and England. In the frame of this study our aim is to analyze the first translations within the Western scientific process. The astronomical corpus was only an attempt of scientific pursuit. It was a knowledge seeking activity rather than scientific. The weak methodology of its composition makes evidence proof of it. Even though the astronomical corpus is a rude incentive for knowledge, its history (its composition, its diffusion etc.) depicts us the systematic seek of knowledge pursued by the cleric savants of the tenth and eleventh centuries. That is to say the monks who were interested in science engaged collectively in the astronomical corpus. Several cultural centers of Europe in the hands of the Church contributed conjointly to the understanding of the astrolabe. They worked in the search for knowledge not only for a short while, but they insisted in their attempt for centuries. Subsequently, the Western knowledge tradition of the era began to crystallize. This tradition became apparent when the savant clerics broadened their horizons beyond

¹⁰⁷ Ibid., p.181.

¹⁰⁸ Ibid., p.184.

their classical sources. Besides the Roman classics they oriented their search for knowledge to Arabic scientific literature. So they began to translate and elaborate their treatises upon this Arabic tradition. Furthermore, the Western tradition which became apparent around the astronomical corpus drew at the same time the path of knowledge within Europe i.e. after the astronomical corpus was formed in Catalonia, it passed to the north of the Pyrenees. Then, it was cultivated and matured among the different monasteries in France from where it spread to other parts of Europe. In other words, the Arabic science transferred to Latin circulated through the network of knowledge firstly in France and consequently in the further northern European lands. Thus, the composition and development of the astronomical corpus displays the general features of the Western knowledge tradition in its pre-scientific era.

The astronomical corpus is the most important text that occupied the agenda of knowledge seekers during the tenth and eleventh centuries. However, it is not the only source which presents to us the Western knowledge tradition of the time. At the end of the tenth century, another corpus emerged which also shows apparently the Arabic science's penetration in Europe. It is the astrological corpus attributed to Alchandreas. The astrological corpus supports my assumptions regarding the Western knowledge tradition in the tenth and eleventh centuries. For this reason, it is crucial to trace its composition and development and also situate it within the same context as the astronomical corpus.

The astrological corpus is made of several treatises mainly related to astrology. However, it also includes some treatises about astronomy. Its main topics are planets, zodiac signs, lunar mansions, twelve houses, lunar nodes and planetary hours. The astrological corpus, like the astronomical corpus, was also composed under Arabic science influence. The use of Arabic terms such as the names of the stars, planets renders the Arabic origin apparent. Also, it includes methods and concepts peculiar to the Arabic astrology that did not exist in Antiquity. Firstly, as an astrological oeuvre, it contains inherently several treatises about prognosis i.e. guessing personality and destiny of a person etc. However, the methodology of prognosis in the astrological corpus does not follow the classical method i.e. calculation of the horoscope, observation of astronomical tables. Rather the prognosis is based on the numerical

values of the individual's name which is a typical trait of Arabic astrology. Secondly, the reference to lunar mansions is frequent within the corpus although it is not frequent to classical astrology but a distinguishing mark of Arabic culture.

Similar to the astronomical corpus, the astrological corpus emerged by the end of the tenth century. Initially, it appeared as a primitive corpus. Afterwards, different versions of the corpus were elaborated up to the sixteenth century. Seventy-two of its manuscripts have been identified¹⁰⁹ until recently. However, the astrological corpus, similar to the astronomical corpus, is dispersed in regard to its content. That is to say that all the manuscripts are different from each other i.e. the layout of the topics is different among the copies; they are more or less systematic. Most of the versions that were re-drafted according to their plan or content. D. Juste explains,

“this situation however is not exceptional, more or less obviously, this is also the case of all scientific corpus of high middle ages, most notably if it has a practical vocation, not only the corpus on the astrolabe, but also the corpus on the computation, medicine and geometry”.¹¹⁰

Thus the corpus is irregular rather than a coherently elaborated ensemble.

As it was the case for the astronomical corpus, our knowledge of the astrological corpus is also based on its different manuscripts. There is no account that gives us further clarifications on its origin or composition. The original texts neither in Arabic nor in Greek on which the corpus is based could not be identified. Except in one of its treatises, *Proportiones*, the author admits that he used texts from Arabic tradition alongside his sources of Christian and Jewish traditions. But he did not mention the name of his Arabic source. It is evident that the two treatises, *In principio* and *Benedictum* are translations or adaptations from Arabic oeuvres. However, their Arabic originals remain obscure. In primitive Latin versions of the corpus, the lunar mansions, the planets, the zodiac signs are given in Arabic i.e. the Arabic terms were in their transliterated forms. Furthermore, letters from Arabic alphabet, the masculinity and femininity of the Sun and the Moon in Arabic tradition and the functions attributed to the planets are reserved in the Latin texts. Moreover, some treatises refer to Arabic astrologers. For example, *Liber Alchandreii* and *Proportiones* mention the names of

¹⁰⁹ Juste, *Les Alchandreana primitifs*, p. 29.

¹¹⁰ *Ibid.*

Arabic scholars such as Ascalu, Arfarfau/Argafalau and Aluaten. Even Alchandreus is supposed to be an Arabic name. According to some theories, Alchandreus is identified with al-Kindī.¹¹¹ Moreover, in some manuscripts *Breviarium* and *Proportiones* are ascribed to Māshā'allāh.

The astrological corpus was born in the Iberian Peninsula, most probably in Catalonia, like the astronomical corpus by the end of the tenth century. The way of its composition is very similar to the astronomical corpus. Its primitive version was composed by crude translations that were made directly by someone who knew Arabic or by the help of a Mozarabic. For example, the author of *Proportiones* was accompanied by a Mozarab while the Arabic translations or adaptations of *In principio* and *Benedictum* were directly made by a Mozarab or Jewish Spanish. The initial translations and their Latin commentaries constitute the basis of further versions of the corpus. In other words, the authors of *In principio* and *Benedictum* used elaborated versions as sources. They did not only benefit from texts of Arabic origin but also they redrafted them, re-organized the chapters and cultivated them from other sources.

Before the year of 1000, the different treatises were compiled to form a corpus. One of the earliest version of the compilation was formed at Saint-Martial in Limoges, France. Then, it pursued its path to Fleury. The transfer of the corpus from Limoges to Fleury took place before 1040.¹¹² The evolution of its content presents us also the transition of the Western knowledge tradition. The version of Limoges which belongs to its earlier period contained some astrological oeuvres of the Carolingian era (Pliny, Aratea, Bede, Isidore of Seville etc.). When the corpus arrived to Fleury-sur-Loire, its compilers added within the astrological corpus treatises on the astrolabe.¹¹³ So we can conclude that the impact of Arabic science, most notably the astrolabe penetrated already within France by 1040. The cleric savants were so influenced by the Arabic science that they replaced their classical reference by an alien culture. It is significant

¹¹¹ For further details, see Juste, David. *Les Alchandreana primitifs: étude sur les plus anciens traités astrologiques latins d'origine arabe (Xe siècle)*. BRILL, 2007.

¹¹² Ibid., p.262

¹¹³ For further details, see Juste, David. *Les Alchandreana primitifs: étude sur les plus anciens traités astrologiques latins d'origine arabe (Xe siècle)*. BRILL, 2007, p.263

in respect to Western knowledge tradition since it began to edge itself to its transition from pre-scientific to scientific activity.

The sphere of the astrological corpus extended beyond France. As it was the case of the astronomical corpus, France also played the principal role in the diffusion of the astrological corpus to the other parts of Europe. Before the twelfth century, the copies of the corpus reached to Lothringia and Germany. But this time, the astrological corpus passed to Lothringia and Germany not through Fleury but Reims. It is supposed that Lothringian and German astrologers acquired the corpus by the means of Gerbert's oeuvres. Furthermore, it is known that the corpus accessed to England at the beginning of the twelve century. Towards the second half of the twelve century, Guillaume of Malmesbury acquired a copy. Also, a copier from Colchester or Hereford re-drafted *Liber Alchandreii* and *Breviarium*.

Consequently, the learning of astrolabe was very weak when it first emerged in Catalan. Then, it passed to the north of Pyrenees and spread quickly between the monasteries of France where it planted the seeds of Arabic science. Firstly, the clergy who were hunting for knowledge tried to understand the tool and the information behind it. So that, manuscripts of different versions emerged. Each monastery contributed to its cultivation to the extent that they were able to absorb its construction. Thus, France became inherently a common platform for the cleric savants to work on this new sort of knowledge. Since, the communication and exchange between the monasteries were effective, the monasteries constituted an open network for the astrolabe and astronomy. Beyond, its networking role, France also acted as an artery that conveyed the Arabic science to other parts of Europe.

II. TRANSLATIONS OF THE TWELFTH CENTURY

Ernest Renan divides the Western history of science and philosophy of the middle ages into two periods: in the first period the Western scholars were restricted only by fragmentary compilations excerpted from Roman Schools, especially infiltrated from Martianus Capella, Bede, Isidore; while in the second period they met and absorbed the learning of ancient civilizations such as Greek, Babylonian, Persian and Indian with their Islamic Civilization's contribution.¹¹⁴ The turning point between the two periods is the translation period that started in the tenth century and achieved its zeal during the twelfth century and beginning of the thirteenth century. The translation activities took place predominantly in the lands of Spain, especially in Toledo. Spain which remained under Muslim dominance since the 710's was challenged by the Reconquista i.e. the Christians took over the region of Limia River in the 1050's, Toledo in 1085 and Zaragoza in 1118. After the Reconquista, the Hispanos became inherently the inheritors of the Islamic Civilization. Among the Islamic inheritance, the Arabic scientific and philosophical oeuvres were obviously the most valuable. The transmission of the Arabic writings began by the 1130's in Spain, not only in Toledo but also in other centres in northern Spain and southern France. After the 1140's the translations concentrated around Toledo. Thus, by the beginning of the thirteenth century, almost all the Arabic scientific and philosophical corpus were already translated to Latin.

How the Hispanic peoples who had been under Islamic rule for three centuries and did not owe any intellectual tradition could undertake and manage such a huge labour? In this chapter I will describe very briefly the translation process in Spain and give a general perspective on its achievement. In regard to my question, I argue that the impulse and also the support for the translations came from outside Spain, beyond the Pyrenees i.e. France. In this chapter, firstly I will intend to describe France's role in the translations of the twelfth century. In general, the scholars of our era are inclined to associate the translations of Arabic scientific and philosophical oeuvres to Latin by the Reconquista. This kind of approach considers the transmission of Arabic science

¹¹⁴ Haskins, *Studies in the History of Medieval Science*, p. 3.

as an occasional intellectual movement that occurred as a result of political, social and military events between the Islamic and Western Civilizations. However, the diplomatical, political and cultural relations between the Andalusian Muslims and Christian Europeans (as I explained in the first chapter by the cases of John of Gorze and Gerbert d'Aurillac) and also the earliest translations of the tenth and eleventh centuries had already generated the interest for Arabic learning among the Christian scholars. The Western impulse for the reception of Arabic science (as we have seen in the first chapter) did not appear in Spain, but in the different monasteries in France (Fleury, Micy, Chartres, Orleans, Rheims, Gorze etc.) that were also the learning centres. The translations and their integration in the astronomical and astrological corpus in the tenth and eleventh centuries was not significant in terms of scientific knowledge. Nonetheless, its contribution is an undeniable fact as it infused to Western scholars the motivation to remedy from their lacks knowledge with the Arabic science i.e. the Western scholars became aware that what they had missed in regard to knowledge, had come to their vicinity via the Muslims and they could supply their deficiencies by its acquisition.

By the eleventh century, the Western scholars had already the initial pleasure of the Arabic science. The eleventh century and the first half of the twelfth century is a transitional period within the translation process. The most striking feature of this era is the fact that the translations were in a slow motion. The standstill of the translations was linked to the cultural barrier between Christians and Muslims. This obstacle had two dimensions. Along the transition from the eleventh century until the twelfth century, there was a cultural barrier between the Christian scholars and Arabic science. It seems that this standstill was linked to this obstacle that had two dimensions. The first dimension is the hatred against Muslims as the era was at the edge of the first Crusades and secondly, the inability of Westerners to understand the Arabic scientific language.¹¹⁵ In the first part of the second chapter, I intend to describe how the cultural

¹¹⁵ By Arabic scientific language, I aim to extend the content of the term "translation". The medieval translations were not only a literal translation from Arabic to Latin. Before the introduction of Arabic science in the Latin West, neither the Western scholars mind, nor the Latin language was ready to receive all the concepts, theories and terms in the Arabic learning. Therefore, at the beginning, the translations were crude and the terms were transferred by transliteration rather than Latinized terms. The translated texts passed through a digestion period in Europe to produce its effects in the Western scientific process. For this reason, I prefer intentionally to use the expression of Arabic scientific language.

barrier was overcome. I explain the role of France in the remedy of the obstacle. Mainly two actors coming from France were influential; Cluny order and the contribution of the Toulouse centre of translations. Moreover, I cultivate my claim that the translations were part of the Western scientific process and France's involvement in the translation activities makes it evident. That is to say the translations which were made in Spain and southern France were transmitted to the northern intellectual centres of France such as Chartres and Paris. Indeed, the Western scholars in France were the principal demanders of the translated oeuvres. Thereby, the Arabic science would show its repercussions. France was not only influential on the translations but also the translations, in turn, were influential on France. I will intend to discuss the initial repercussions of translations in France in the third chapter. However, in order to give an idea of how France influenced the translations in Toledo and also of what was transmitted to France, I dress a very short summary of Toledo's twelfth century translations.

2.1. The Cultural Barrier between the Western scholars and the Arabic science

In this thesis, my aim is to place the translations in a more appropriate historical context. The academic works related to the field concentrate mostly on the translations of the twelfth century that occurred in the Hispano lands. Although the translation activities began by the end of the tenth century, in the academic sphere they are associated by the Reconquista. In order to provide a better understanding of the translation period in the West, it is essential to elucidate the earliest translations of the tenth and eleventh century and explain the missing link between the first wave of translations and the translations of the twelfth century. This part of my thesis intends to show the continuity between the earliest period of the translations and the translations that intensified during the twelfth century. After the first Arabic science inspired oeuvres emerged by the end of the tenth century and beginning of the eleventh century, the translations did not turn into a persistent movement until the 1130's. Although the first astronomical and astrological corpus attracted attention, until the Toulouse Group's translations, the translation activity remained weak. Most probably,

the hatred against the Muslims must have abated the transmission of Arabic science in the Western world. The hostility against the Muslims constitutes the first cultural barrier in front of the Arabic science penetration in the West. The Cluny Order was effective on the remedy of this obstacle. In the first section of this part, I discuss the role of the Cluny Order in the removal of this religious barrier. The second reason for the slow rate of earliest translations is the difference between the Islamic and Western Civilizations in terms of scientific and intellectual achievement. The Western science at this time was not still ready to recupere the Islamic inheritance in its entirety. Therefore, the Western translators and scholars undertook the Arabic science reception gradually. The group of translators who were active in the northern Spain and Southern France acted as intermediary actors who prepared the suitable ground for the acceleration and intensification of the translations in the twelfth century. The second section of this part explains in details how the Western world became the recipient of the Arabic science and philosophy.

2.1.1. The Cluny Order's Impact on the Course of the Translations

The Cluny Order was established in Burgundy, east-central France in 910. The order was very influential and grew very quickly. There were ten thousand monks and more than six hundred monasteries that were associated to this order in the Christian Europe towards to the twelfth century. Pierre Maurice de Montbossier who was known as Peter the Venerable became abbot of Cluny in 1122. Under his abbacy, the Cluny became the biggest church in the Latin West and a centre of sciences and arts. The order collected and maintained numerous writings from Antiquity and also Christianity. His abbacy coincided with a challenging era of Christian-Muslim relations that was the beginning of the Crusades. The Crusades were formally launched in 1095 by the sermon of the Cluniac Pope Urban II at Clermont. His words did not only trigger the raids on Muslims but also sanctified the use of the sword against them. Peter the Venerable was happy with the course of the Crusades. He saw the Turks, Saracens, Persians and Arabs as the enemies of Christianity. However, he considered the use of the sword problematical. According to him, the rightful sword of the Church

could be only the Gospel. His attitude did never take the form of an apparent opposition or reaction. He thought that the main aim of the Crusade was to convert the Muslims into Christianity. Therefore, he saw his role to study Islam and know well the enemy. Indeed, Peter was an intellectual rather than a warrior. If he would engage in a battle, he would do it by words, but not by weapons. His battle was doctrinal that he defended in the continuation of the tradition of the Church Fathers. By this purpose, he had already written four apologetically treatises for Christianity and two polemical works against Muslims and Jews before the 1140's. In the age of the Crusade, he was aware of Europeans ignorance of Islam and he knew that the Muslims could not be defeated unless the Christians knew them very well. This constituted the basis of his impulse for the Toledan Collection that he started during his visit in Spain in 1142. It was among Peter's ordinary tasks to visit the Cluniac monasteries all over Europe. However, in 1142, he received a special invitation from the Emperor Alfonso VII, king of Galicia, Leon and Castille. This invitation gave the impetus to Peter to visit Spain in the winter of the same year.

This trip gave to Peter the occasion to find and hire Hermann of Carinthia and Robert of Ketton, two curious men who had already engaged with the Arabic learning. He supported his team of translators by three others: Peter of Toledo, Peter of Poitiers and Muhammad. This group composed a collection that was based on translations from Arabic that would provide information on Islam to Christians. The Toledan Collection consists of the translation of the *Qur'an*, *Fabulae Saracenorum* - a collection of hadith on the lives of prophets, including the life of the Prophet Muhammad -, *Liber generationis Mahumet et nutritia eius* - the main topic is the light of the prophet (nūr) -, *Doctrina Mahumet* - consists of an an imaginary didactic dialogue – and lastly, *Epistola Saraceni and Rescriptum Christiani* – about two letters discussing the Prophet Muhammad, the Qur'an and the battles of the Prophet Muhammad. By the accomplishment of the corpus, he achieved his first target that was to provide the doctrinal basis that would donate Christians by the recognition of the enemy. In regard to his second objective, he left the refutation of Islam and the struggle against Muslims by intellectual weapons to Bernard of Clairvaux who was assigned as the head of the

Military Order of the Temple.¹¹⁶ Peter's own word summarizes at best his attitude towards Muslims, he believed the way to deal with Muslims was not "*as our people often do, by arms, but by words; not by force, but by reason; not in hatred, but in love.*"¹¹⁷

As we have seen, Peter the Venerable has nothing to do with the scientific translations that had been going on since the tenth century in Europe. But this unconcern was only in appearance. Indeed, Peter's endeavour was totally apologetic i.e. he aimed to bring in the Christian world the acquaintance of Islam that would help them in their battle against the enemy. Hence, his personal effort enabled to the composition of the Toledan Collection, consisted of writings on the religion of Islam, including the Qur'an. However, his project changed its direction in the course of the events and time. It is known that Peter met the archbishop Raymond, while his journey to Spain, in Salamanca in late July of 1142. At that time, Raymond was responsible of Toledo which was full of Arabic books. When a learned man and apologist such as Peter met with the prelate at the head of Toledo, it was impossible to that they did not discuss on the precious Arabic intellectual inheritance.¹¹⁸ Raymond who had been archbishop of Toledo since 1125 was not very involved in the translations activity until the 1140's i.e. until his meeting with Peter. Beginning from 1140's he became active in the transmission of Arabic science to Latin. The dedications to him in the prefaces of the translations by different translators made his support evident.¹¹⁹ Raymond would incite the translators of Toledo to translate Arabic philosophical oeuvres to support the doctrinal battle not only against the religion of Islam, but also against the Islamic thought.

At the end, the Church's position was clear cut i.e. it aimed to learn the Arabic culture to be able to prevail them. By this purpose, the Cluny order provided the translators the appropriate conditions to undertake the transmission of Arabic science i.e. procurement of Arabic books, funding etc. At this point it seems crucial to me to make a distinction. The high-rank clerics such as Peter the Venerable and Raymond of Toledo engaged in fostering the Arabic sources in order to defend Christianity and

¹¹⁶ Kritzeck, James Aloysius. *Peter the Venerable and Islam*. Princeton University Press, 1964, p. 20.

¹¹⁷ Ibid. p. 47.

¹¹⁸ Ibid., p. 55.

¹¹⁹ I will discuss how Raymond's involvement changed the orientation of the translations in the context of Toledo.

defeat the Muslims. Their apologetic purpose was ostensible. However, the Cluny Order's impulse for the translations should not be mixed with the relatively secular scholars', most of whom were clerics, sake of knowledge for their scientific curiosity and practical needs.

The official policy of the Cluny Order did not encompass all. Among the clerics who were involved in the scholarly activities in the monastic schools and also some regular scholars out of the ecclesiastical organization set up the translation activities by another sake. That was to remedy Christian world's intellectual deficiency.¹²⁰ These allegedly secular scholars/translators of the twelfth century who were active in the northern Spain and southern France¹²¹ held their activities independently i.e. in terms of the choice of oeuvres to be translated and of sponsorship. Hermann of Carinthia and Robert of Ketton did not have ecclesiastic patrons in their scientific translations. The only trace of cleric sponsorship was Peter the Venerable's in the Toledan Collection. If they had sponsors, it was not obviously the Church but it might have been Thierry of Chartres. Therefore, their initiative must be evaluated wisely. They had relations with ecclesiastic elites but in their translation programme, they kept themselves at distance and indulged themselves to their curiosity of Arabic learning. I will analyse in details hereafter the aforementioned translators of northern Spain and southern France.

¹²⁰ Any study on the translation should keep in mind this dichotomic posture within the Christian intellectual sphere. In the academic literature, the scholars emphasize the Cluny Order's interest for arts and science. However, until they had free access to Arabic science, their learning activities were concentrated around the Seven Liberal Arts. Even though they owned the writings of the Greek tradition that they call "pagans", thus dangerous, harmful and threatening the Christianity. I think that the attempts of Peter the Venerable and Raymond of Toledo were tentative of establishing the doctrinal basis for apology against Muslims. Beyond this, they were not seeking knowledge for knowledge. Despite the fact that, Raymond's encouragement for Arabic philosophical translation opened the gate for Aristotelian natural philosophy that would challenge the Western scientific process (I will mention very briefly the impact of Aristotle's natural corpus as it is the subject of another stage in the Western history of science that is not in the scope of my thesis). Thus, the policy of Cluny Order should not be considered as a pure sake of scientific knowledge although in the course it contributed to it.

¹²¹ I refer to the Group of Toulouse that I will describe in this chapter.

2.1.2. Translators of France – Twelfth Century

The share of France in the translations between the tenth and twelfth century was considerably small when compared by the translations that were made in Spain during the twelfth century. However, the role of translators who worked in the Northern Spain and Southern France cannot be neglected i.e. they not only introduced the Arabic science with all its aspects such as astronomy, mathematics, chemistry, even the natural philosophy to the Western scholars, but also they prepared a suitable environment for further translations. In this section, I argue how the translators of France contributed to the literal phase of translations.

2.1.2.1. An attempt to positioning the translators of France

Alongside the fragmentary translations within the astronomical and astrological corpus, during the second half of the eleventh century, we encounter other translations from Arabic to Latin at Monte Cassino, Italy. Constantine the African (d. 1098/1099) translated some Arabic oeuvres to Latin, but this time in the field of medicine. He translated the *Aphorisms* of Hippocrates with Galen's commentary. Furthermore, he compiled an oeuvre (*Pantegni* – composed before 1086) on Hellenistic and Islamic medicine that he adapted by translating from 'Ali ibn 'Abbas's *Kunnash al-Maliki*. His translations were influential on the naturalists of the twelfth century such as William of Conches and Hermann of Carinthia. Another important translator who was also a scholar was Adelard of Bath (1080 – 1151). He was active as translator/scholar during the first half of the twelfth century. He was from Bath, England. He left his homeland and went to France for his education. He was taught at Tours and Leon. Then he travelled to Italy and Sicily in Europe and also to Tarsus and Antioch in Anatolia. He came back to England with Arabic oeuvres. He translated from Arabic to Latin two astrological texts; a summary from Abu Ma'shar's Great Introduction to Astrology, named *Ysagoge minor Iapharis* and another treatise on astrological images and horoscopes by Thabit ben Korra. His most crucial translations were obviously the Euclid's *Elements* and adaptation of al-Khwārizmi's astronomical

tables for the meridian of Cordoba. Adelard was among the most important figures of the early twelfth century who contributed not only to the transmission of Arabic science but also to its assimilation through his oeuvres that he wrote under Arabic science influence. Plato of Tivoli (1110 – 1145) was another translator/scholar who was active around the middle of the twelfth century. He was born in Italy. He lived in Barcelona between 1134 – 1145. He was proficiency both in Arabic and Hebrew. Therefore, he translated from both languages. His translations encompassed the fields such as astronomy, astrology, mathematic and geomancy. Among his translations; he translated Ptolemy's *Quadripartitum* from Arabic. An important translation of Plato in the field of trigonometry was Al-Battani's *De motu stellarum*. Furthermore, he translated Theodosios's *Spherics* and Ibn al-Saffar's treatise on the use of astrolabe from Arabic and also, Abraham bar Hiyya's *Liber embadorum* (on practical geometry) from Hebrew.¹²²

Besides Adelard of Bath and Plato of Tivoli, there were two other translators/scholars; Peter Alfonsi (died around 1116 - master of Walcher of Malvern mentioned in the first chapter) and Abraham ibn Ezra (1092/1093 – 1167) both of them were initially Jews. However, Peter was converted to Christianity, later one, in 1106. And also both of them were itinerant and spread their pleasure of Arabic learning to the places where they circulated. Peter was born in Al-Andalus. It was known that he had been at Huesca, northern Spain. Then, he went to England around the year 1116. Thereby, he became the medicine of the King Henry I and taught Walcher of Malvern. Finally, he moved to northern France. His works did not present any scientific originality.¹²³ He wrote a Latin oeuvre, *Tabulae astronomicae* (Astronomical Tables) that he adapted from al-Khwārizmi's tables with explanatory texts. Another of his writing is *Epistola ad petrus alfonsi peripateticos in Francia*, Letter to the Peripatetics in France. In this treatise, he complained about the Latin scholars' lust to study grammar and logic and negligence of astronomy that he calls the hard science. He called them to lean to Arabic science. His call did not remain non-influential. Adelard of Bath who had been in France at that time, decided to leave and travel in the pursuit

¹²² For other translations of Plato of Tivoli see, Sarton, *Introduction to the History of Science*. Vol. 2., p. 177 - 179.

¹²³ Lemay, Richard. "Dans l'Espagne du XIIe siècle, les traductions de l'arabe au latin." *Annales. Économies, Sociétés, Civilisations* 18, no. 4 (1963), p. 645

of Arabic learning. Therefore, Petrus can be evaluated among the significant figures who acted appreciably in the transmission of Arabic science in the early twelfth century i.e. he contributed efficiently to engage Western scholars interest in Arabic science around the years 1110 and 1120 in the different parts of Europe where he circulated. In respect to Abraham ben Ezra, he was also from Spain. In the middle of twelfth century he was travelling in Europe; Rome, Salerno, Lucca, Pisa, Mantua, Verona, Béziers, Narbonne, Bordeaux, Angers, Dreux, London and Winchester. His main interest was the astronomical tables. He established tables for the cities that he visited. He translated into Hebrew a commentary of Ibn al-Muthannā's commentary of al-Khwārizmi's tables. Other Spanish Jews, like Peter and Abraham, acted as injectors who presented the first germs of Arabic learning and inoculate its interest to Latin scholars in France, England and Italy. Among these Jewish transmitters, some of them went to Spain and learnt Arabic to be involved in the translation process.¹²⁴

The translations at Toledo began around in 1135. Until this time, as described above, the translations were held as personal efforts (Constantine the African, Adelard of Bath, Plato of Tivoli, Peter Alfonsi and Abraham bin Ezra). Therefore, the number of translators and translators remain limited in number and their geographical dispersion was less concentrated in regard to the further phases of the translation period (that I will attempt to describe here below). This infertile phase of translations can be placed between the second half of the eleventh century and the second quarter of the twelfth century (around 1130's). Since the 1130's, the translations came alive not only at Toledo, middle Spain but also, in a region covering the both sides of the Pyrenees i.e. southern France and northern Spain (Map 2¹²⁵). More precisely, in this region, a group of translators emerged. Within this group, there was a key figure around whom the translators formed an ensemble i.e. Hermann of Carinthia was at the centre of this nexus who was related with translators in the aforementioned region. Hermann was raised in France and he passed his most active times in the southern France. Therefore, the group of translators around Hermann is called the Toulouse

¹²⁴ d'Alverny, Marie-Thérèse d'. "Translations and Translators." In *La transmission des textes philosophiques et scientifiques au Moyen Âge*, edited by Charles Burnett, Ashgate Pub Co, 1994, p. 444.

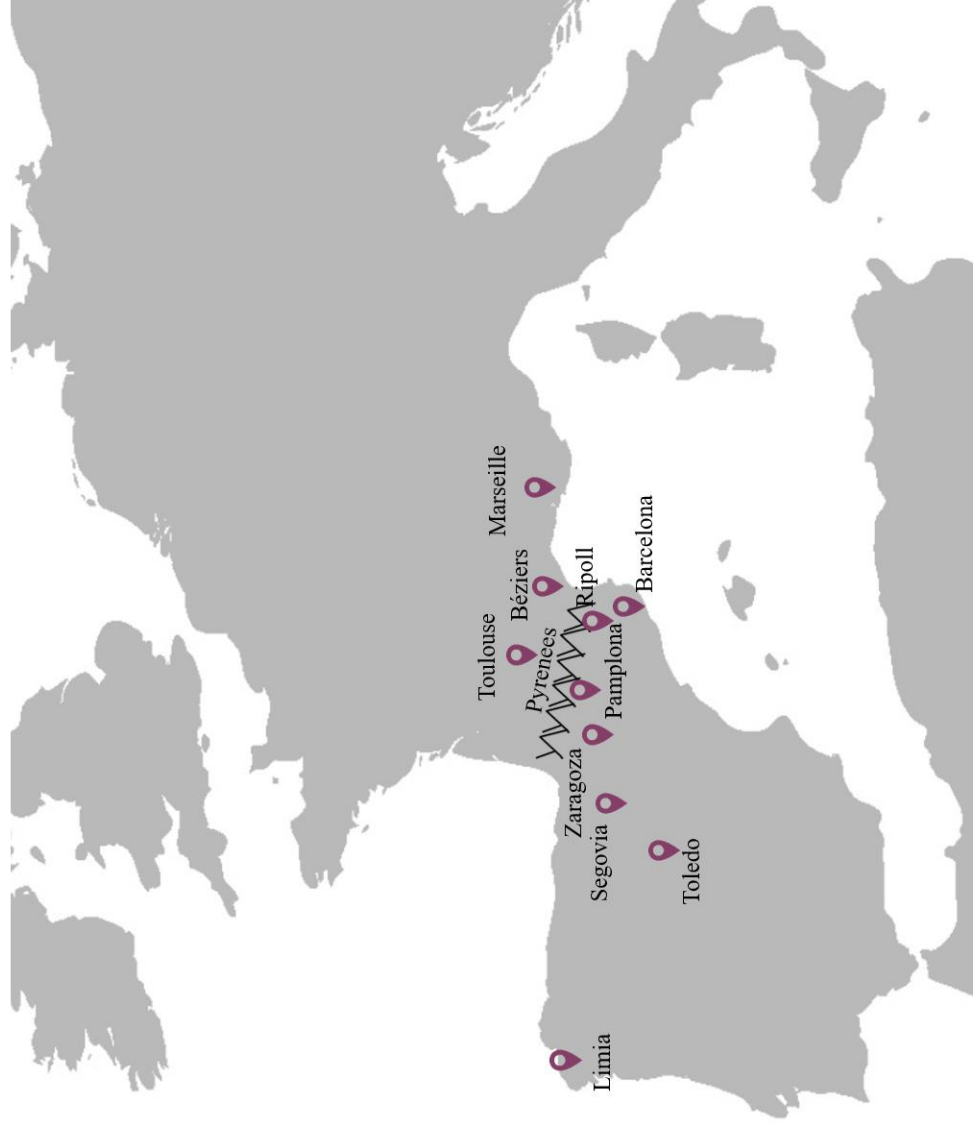
¹²⁵ https://commons.wikimedia.org/wiki/File:Roman_Empire_map-2.gif

centre of translations.¹²⁶ Hermann of Carinthia as its crowning figure, Robert of Chester, Hugo of Santalla and Rudolph of Bruges were the members of this centre that I will intend to analyse more deeply.

¹²⁶ Fuat Sezgin *İslamda Bilim Ve Teknik. Fuat Sezgin İslamda Bilim Ve Teknik. Vol. I, 2014, p. 118.*

Map 2

Translations Centers from Arabic to Latin: 10th – 12th Centuries



2.1.2.2. Translators of France – the Group of Toulouse

2.1.2.2.1. Hermann of Carinthia (born around 1110 and died around 1154¹²⁷)

Our knowledge on Hermann's life is very limited. What we know depends mostly on the years that he spent in northern Iberian Peninsula and southern France, between 1138 and 1143. It is known that Hermann had come to the Ebro Valley, in the south of the Pyrenees before 1138. He stayed on the Spain side of the Pyrenees up to 1140 or 1141. Then he must have moved to the north of the Pyrenees. In 1142, he was at Leon (southern France) and in 1143, at Toulouse (southern France). He wrote his magnum opus, *De Essentiis* in Béziers (southern France) that he completed in 1143. Thus, Hermann passed his most prolific days in the southern region of France. Indeed, he can be evaluated as the translator who contributed at most to the translations in France i.e. the number of translations and translators in France is meagre when it is compared with Spain, Italy and Sicily. The scantiness of translators in France renders Hermann inherently the most important translator of France. Furthermore, in terms of quantity and significance of oeuvres translated, he was less important than his counterparts in the other parts of Europe, such as Gerard of Cremona, Gundissalinus, Johannes Hispanus and Michel Scot. However, this fact does not shadow his fame to be “among the notable pioneers in the field of Saracen learning.”¹²⁸ Both C. H. Haskins (1924) and C. Burnett (1982) attribute to him a peculiar role as point of junction between the classical Latin tradition of Platonism and the Aristotelianism that would be latter on infused by the Arabic science. Beyond such kind of assessment, my aim in the frame of this study is to analyze Hermann's role as a translator/scholar in the Western scientific process¹²⁹ during the twelfth century. Therefore, I will intend to explore Hermann's contribution in the infusion of Arabic science into the Western

¹²⁷ The only source which gives the year of his birth and death is Kutlesa, Stipe. “Croatian Philosophers 1: Hermann of Dalmatia (1110 - 1154).” *Prolegomena* 3, no. 1 (2004): 57–71.

¹²⁸ Haskins, *Studies in the History of Medieval Science*, p. 43.

¹²⁹ Hermann's contributions fall into the pre-scientific era of the Western process. It is largely discussed in the third chapter of this thesis.

scientific process. For this purpose, I will emphasize on the combination of his two identities which is the blend of translator/scholar.¹³⁰

Hermann is known with different appellations: Hermannus de Carinthia, Hermannus Dalmata, Hermannus Sclavus or Hermann Secundus. Each of them points out a different feature of Hermann, reflecting his personal and scholar path. Among his epithets, the first three refer to his native land. It seems that he was from Dalmatia, on the east shore of the Adriatic Sea, Croatia or Carinthia, the southernmost part of today's Austria. In regard to Secundus, it has connotation with Hermann Reichenau (Contractus), the contributor to the astronomical corpus by his three famous treatises *De utilitatibus astrolabii*, *De mensura astrolabii* and *De horologio viatorum* (as mentioned in Chapter 1). By taking the name "Secundus", he must have wished to be remembered as the continuation of the studies on astrolabe which achieved a wide reputation thanks to his predecessors such as Lupitus, Gerbert of Aurillac and finally, Hermann Reichenau.¹³¹ Hermann received his first training in the Duchy of Carinthia where he was most probably educated in a Benedictine monastic school. Thereby, he received a training of classical type i.e. he studied Latin grammar, classical literature, logic, rhetoric, poetry, music, astronomy and astrology. Hermann was an enthusiastic student, "seeking out a master after master in order to satisfy 'the hydra of his curiosity'."¹³² His curiosity drove him from the eastern Holy Roman Empire to the schools in France.

Hermann pursued his higher education in France, at Chartres or Paris (1130 – 1135). Thanks to his education, he got acquainted with Latin sources.¹³³ Among these

¹³⁰ Indeed, some of the translators of the twelfth century were not only translators but also, they were scholars. I do not use intentionally, the word "scientist" as the Western tradition was still in its pre-scientific era, therefore knowledge tradition rather than scientific process. The figures that we know as translators, at least some of them, were scholars at the same time who had students, made research in sake of knowledge and wrote their own books. So I find it appropriate to use the epithet "translator/scholar" for those who assumed these two functions at the same time. Hermann of Carinthia, Adelard of Bath, Gerard of Cremona and Gundissalinus were only a few examples.

¹³¹ Carinthia, Hermann of. *De Essentiis*. Edited and translated by Charles Burnett, 1982, p.4 and also Burnett, Charles. "Hermann of Carinthia." In *A History of Twelfth-Century Western Philosophy*, 386–404. Cambridge University Press, 1992, p. 387.

¹³² Burnett, Charles, "Hermann of Carinthia's Attitude Towards his Arabic Sources, in Particular in Respect to Theories on the Human Soul." In *L'homme et son univers au moyen âge: actes du septième Congrès international de philosophie médiévale (30 août-4 septembre 1982)*, Editions de l'Institut supérieur de philosophie, 1986, p.306.

¹³³ C. Burnett (1986) reckons the Latin sources that Hermann knew and referred to in his writings. such as Apuleius, Aristotle's *Logic vetus*, Augustine, Ausonius, Boethius, Calcidius, Hermannus Contractus, Hermes Trimegistus, Isidore, Jerome, Lucan, Macrobius, Martianus Capella, Orosius, Ovid, Palladius, Plato, Pliny, Porphyry, the younger Seneca, Solinus, the Sibylline prophecies, Virgil and Vitruvius.

sources, the influence of Plato and Boethius was preponderant. Firstly, Hemann was familiar with the Platonism that the School of Chartres perpetuated in his era. There is no concrete evidence that depicts us his formal affiliation to the school of Chartres. However, it is known that Hermann had great respect for Thierry of Chartres. Even he dedicated his translation of *Planisphere* to Thierry as *diligentissime preceptor* (most loving teacher)¹³⁴ and the “*soul of Plato granted once again by heaven to mortals.*”¹³⁵ He got his earliest inspirations of philosophy, natural science and astronomy from his great teacher. Hermann, in the pursuit of his admired master, was inspired from Plato. He took Plato’s principle;

“legitima causa and ratio which makes everything necessarily as it is, and one must, therefore, concentrate on discovering the causes, rather than simply describe the results”.¹³⁶

Also, he made frequent reference to the conception of Same-Different of Plato. Even he structured the first part of his book, *De essentiis* following the outline of Plato’s *Timaeus*. He got acquainted with *Timaeus* through the commentary of Calcidius. Secondly, Hermann was largely influenced by Boethius, especially in the field of arithmetic i.e.

“Hermann sees in the *De Institutione Arithmetica* (Boethius oeuvre of arithmetic) a model for generating from the Platonic Same and Different a diversity of creatures. This model is valid both from the side of matter, in that the elements, like Boethius’ units, are indivisible and individually ‘the same’, but, in combination, are divided into Same and Different (or masculine and feminine) and mixed in varying proportions for generating all things; and from the side of form, in that the outermost sphere of the universe is the Same and, through its interaction with the Different (the next sphere), it generates all diversity in the sublunary world.”¹³⁷

Subsequently, Hermann was educated on the liberal arts in the monastic schools and was infused by Platonism in the French schools. He cultivated in a context in which the scholarship was still not independent from the ecclesiastical system. Differently than his colleagues in Northern France and Spain, it seems that Hermann did not have a canonical function. Although J. Kritzeck (1964) argues that Hermann was a priest¹³⁸, there are not much evidence that proofs the veracity of his office as a

¹³⁴ Reichert, Michelle. “Hermann of Dalmatia and Robert of Ketton: Two Twelfth-Century Translators in The Ebro Valley.” In *Science Translated: Latin and Vernacular Translations of Scientific Treatises in Medieval Europe*, edited by Michèle Goyens, Pieter De Leemans, and An Smets, 1 edition. Leuven, Belgium: Leuven University Press, 2008, p. 51.

¹³⁵ Dronke, Peter. “Thierry of Chartres.” In *A History of Twelfth-Century Western Philosophy*, edited by Peter Dronke, Cambridge University Press, 1992, p. 359

¹³⁶ Carinthia, Hermann of. *De Essentiis*, p.16.

¹³⁷ *Ibid.*, p.19.

¹³⁸ Kritzeck, *Peter the Venerable and Islam*, p.66.

churchman. Even so, he was surrounded by an ecclesiastical entourage due his educational and scholarly background. His primary network (as described below) encompassing the translators such as Hugo of Santalla and Robert of Ketton were both in the service of the Church. Furthermore, the famous abbot of the Cluniac order, Peter the Venerable hired Robert and Hermann for the translations of apologetic purpose. Hermann and Robert worked together in Peter the Venerable's project in the companion with Peter of Poitiers. This latter was a Cluniac monk who worked as abbot and also served to Peter the Venerable as his secretary. Indeed, Hermann's circumference was intrinsically ecclesiastic. However, he did not follow a sacred way in sake of knowledge. Contrarily, he chose a non-conventional path for his era and he nourished his scholarship with the Arabic science.

Hermann's connection to the Chartrian School instigated him to satisfy his curiosity with the Arabic science. In his study of Arabic learning, it seems that he adopted the Chartrian principles i.e.

“a championship of reason over authority, a particular interest in the role of nature as secondary cause (after God), and an imaginative experimentation with different cosmological systems combined with an avowed sympathy with Platonism.”¹³⁹

This kind of approach led the Chartrian scholars to turn to Latin sources without Christian content. They broadened their visions by not limiting themselves by the Latin tradition allowed by the Church. Subsequently, the fellows of Chartres used Arabic scientific books. In this sense, Hermann followed his Chartrian counterparts and dived into the Arabic treasures of knowledge. It is not known exactly when and how Hermann met the Arabic science. It is supposed that Hermann and Robert of Ketton (Chester), his most intimate collaborator went to a journey to Orient between 1135 – 1138. Their trip included France, Italy, Southern Croatia, Greece, Constantinople and Damascus. Presumably, they encountered the Arabic science there¹⁴⁰. Finally, they returned to Spain in 1138. The same year, Hermann translated an astrological treatise¹⁴¹ of Sahl bin Bischr from Arabic to Latin in 1138. The

¹³⁹ Carinthia, Hermann of. *De Essentiis*, p.21.

¹⁴⁰ Kutlesa, loc.cit., p. 58

¹⁴¹ The treatise of the Sahl (786-845, Jewish astrologer, astronomer and mathematician known also as Zeal) is related to the prognostics about the universe or the nations as a whole rather than individual foretelling (Burnett, 1982).

translation is known as *Zaelis Fatidica*, or *Pronostica*, or *Liber sextus astronomie*.¹⁴² The date of translation depicts us that by this year he was already sufficiently acquainted with the Arabic language and science that he enabled him to make such a translation.¹⁴³ The translation of *Fatidica* does not reflect only Hermann's proficiency in Arabic, but also his strong literary style and ability to use technical terms translated from Arabic that he used consistently among his works.¹⁴⁴

By 1140's, Hermann and Robert gained sufficient reputation when Peter the Venerable found them in the Ebro Valley. On one side, the abbot Peter acknowledged Hermann's skills as a scholar. Even he called him "*a scholar of the most incisive and literary genius*."¹⁴⁵ This expression reflects apparently the abbot's recognition for Hermann's intellectual capacity as a scholar. His translations and his oeuvres corroborates also this fact. On the other side, Hermann had a relatively independent and innovator profile as a medieval scholar. Firstly, he was not bound by any religious institutional affiliation. Rather he was a wandering scholar. We do not have much clues about his mastership. In his era, towards to the middle of the twelfth century, students used to take a master's teaching called *lectio*. After this lecture, the students used to get a *magisterium*. This kind of scholarship depended on the direct relation between the master and pupil, without being affiliated to any school. So the pupils followed the master wherever he went. C. Burnett (1996) places Hermann in this kind of instructorship. Plausibly, he had pupils around him who accompanied him in his journeys between northern Spain and southern France. Nonetheless, only one of his students is known that is Rudolph of Bruges. Secondly, Hermann he is identified as "*the more itinerant and apparently secular of the two*."¹⁴⁶ when compared to Robert of Ketton. Peter the Venerable was suspicious about Hermann and Robert's common agendas that was to discover the Arabic science. He criticized them by saying "*These men, examining that most secret library of the barbaric people, put together not a small book for Latin readers from the aforementioned material*."¹⁴⁷ Peter's diagnosis

¹⁴² Haskins, *Studies in the History of Medieval Science*, p. 44.

¹⁴³ *Ibid.*, p. 55.

¹⁴⁴ Burnett, Charles. "Arabic into Latin in Twelfth Century Spain: The Works of Hermann of Carinthia." In *Mittellateinisches Jahrbuch XIII*, 1978, p. 117.

¹⁴⁵ Kritzeck, *Peter the Venerable and Islam*, p.66.

¹⁴⁶ Reichert, *loc.cit.*, p. 47.

¹⁴⁷ Kritzeck, *Peter the Venerable and Islam*, p.33.

about “the most secret library” was true in Hermann’s conjecture since Hermann had access directly or indirectly via Hugo of Santalla to the Library of Banū Hūd. Most probably, it was in this library, Hermann and his two colleagues Hugo and Robert found the Arabic versions of Hermetic works.

During the years following the Reconquista, the French clergy, most notably the Cluny order paid special attention to the lands of Spain. Hermann might have moved to northern Spain within this trend.¹⁴⁸ Around the years 1140 – 1141, Hermann was in the Ebro Valley, northern Iberian Peninsula with his intimate collaborator Robert of Ketton. When Peter found Hermann and Robert in the Ebro Valley in 1141, they had already dedicated themselves to the translation of Arabic science. So, the abbot Peter had to convince them by a promise of remuneration to interrupt their program.¹⁴⁹ Otherwise, it would be hard to deviate them from their commitment to the labor of Arabic learning. So, they made the first translation of Qur’ān and also they translated two treatises against the Prophet Muhammed (*De generatione Mahumet*¹⁵⁰ and *Doctrina Mahumet*¹⁵¹). Hermann and Robert interrupted temporarily¹⁵² and reluctantly¹⁵³ their common agenda that was to discover the newly coming science from the Muslim world. Until Robert went to Pamplona for his ecclesiastical duty, Hermann and Robert put together for their scientific pursuits. They were associated to each other by a common program of translations. Their ultimate goal was to translate Ptolemy’s *Almagest*. As they were aware of the complexity of this oeuvre, they planned to make other translations that would prepare them for *Almagest*. In his preface of translation of al-Kindi’s *Iudicia*¹⁵⁴ that he dedicated to Hermann, Robert noted:

“Although, after Euclid, I would have more willingly sweated over the *Cosmometria (De Sphaeris)* of Theodosius and a book concerning proportions, so that an easier

¹⁴⁸ Burnett, Hermann of Carinthia, p. 386 - 387.

¹⁴⁹ Robert’s designation as archdeacon to Pamplona would be evaluated as his remuneration for his contribution to the Toledan collection.

¹⁵⁰ *De generatione Mahumet* contains the legends about the Prophet Mohammed

¹⁵¹ *Doctrina Mahumet* is about a dialogue between the Prophet Muhammad and a Jew.

¹⁵² Hermann and Robert ceased their studies on Arabic science by the request of Peter the Venerable. They did so most probably, they would receive a remuneration in return. In the following years, Robert would be assigned as archdeacon of Pamplona.

¹⁵³ Reichert, loc.cit., p.52.

¹⁵⁴ The Arabic original is *Ahkām an-nugūm* and in English it is translated as *The Book of Judgements of the Stars or Forty Chapters*. It is about horary and electional astrology i.e. answering questions and choosing auspicious times to act. It is translated and edited by Dykes, Benjamin N. *The Forty Chapters of Al-Kindi*. Cazimi Press, 2011.

approach to the *Almagest* (which is the principal goal of our study) should lie open, nevertheless, I have translated the *Iudicia* for you.”¹⁵⁵

It seems that Hermann and Robert could not achieved to translate *Almagest*.¹⁵⁶ Hermann and Robert had a common program and shared target, but they translated separately. Sometimes, one translated on the request of the other. They usually dedicated their translations to each other. Based upon the acknowledged and non-acknowledged quotations¹⁵⁷, it is presupposed that Hermann knew the bulk of translations assumed by Robert. Robert translated one work of al-Battāni, *De Scientia Astrorum*. Hermann served from this translation.¹⁵⁸ Furthermore, Robert revised Adelard’s translation of al-Khwārizmi’s astronomical tables.¹⁵⁹ It is known that Hermann also worked on these tables. Hermann’s source might have been directly Adelard or indirectly Adelard via Robert’s version. Lastly, Hermann surely knew the translation of al-Kindi’s *Iudicia* as Robert dedicated it to him in its preface.

Hermann as a translator was directly and indirectly in contact with other translators of his era. Hugo of Santalla was another translator with whom Hermann had affiliation.¹⁶⁰ C. Burnett corroborates their relationship based on four main arguments. Firstly, Hermann’s *Liber imbrum* and Hugo’s translation on the Indian theories of astrological meteorology own the same technical terms. Secondly, Hermann, in his *De Essentiis*, refers to *De secretis nature*, a hermetic work attributed to Apollonius de Tyane. Hermann was familiar with this oeuvre via Hugo’s translation or the same translation that also used Hugo. Thirdly, Hermann, again in his momentum, displays strong marks that he knew Ptolemy’s *Almagest*, partially at least. The first translation of *Almagest* from Arabic was accomplished by Gerard of Cremona in 1175.¹⁶¹ As Hermann wrote his book in 1143, it is not plausible that he had access to the translation of Ptolemy’s book. On the other side, it is known that

¹⁵⁵ Carinthia, Hermann of. *De Essentiis*, p.6.

¹⁵⁶ Its translation would await Gerard of Cremona who translated it in 1175.

¹⁵⁷ In *De essentiis*, Hermann benefited from his own translations and the translations made by his collaborators. While in some quotations he mentioned openly his source, in some paraphrasing he did not refer to his sources. However, studies on his writings reveal us some of his quotations without reference.

¹⁵⁸ Haskins, *Studies in the History of Medieval Science*, p. 64.

¹⁵⁹ Carinthia, Hermann of. *De Essentiis*, p.26.

¹⁶⁰ Charles Burnett elucidates Hermann and Hugo’s connection. For further details, see, Burnett, C. S. F. “A Group of Arabic-Latin Translators Working in Northern Spain in the Mid-12th Century.” *Journal of the Royal Asiatic Society of Great Britain and Ireland*, no. 1 (1977): 62–108.

¹⁶¹ *Almagest* was firstly translated from Greek in Sicily in 1160.

Hugo wanted to translate al-Kindi's commentary of *Almagest*. Even though such a translation has not been identified yet, it is probable that Hermann knew *Almagest* via al-Kindi's commentary¹⁶² as it was mentioned by his colleague, Hugo. Finally, Hugo contributed to the translation of some parts of *Liber trium iudicum*, a collection of astrological treatises written by three authorities i.e. al-Kindī, Sahl ibn Bischr and 'Umar ibn-al-Farrukhān al-Tabarī. Hermann, in his book, referred to this astrological corpus that most probably he acquired from Hugo. Subsequently, we can assume that Hermann was in contact with Hugo and knew at least his translations that were reckoned here above.

Rudolph of Bruges was Hermann's student. He is counted among the group of translators around Hermann of Carinthia. This group¹⁶³ was active in terms of the translations in the southern France and northern Spain during the first half of the twelfth century. This circle connected around Hermann began to translate Arabic oeuvres to Latin just before the translations were activated in Toledo. I think it is appropriate to take the nexus of translators that formed inherently around Hermann as his primary network of translators. However, we know that Hermann was also utilizing the translations of other translators such as Adelard of Bath, Plato Tivoli and Constantin Africanus. There is no evidence that shows a direct relation between Hermann and Plato. However, Rudolph, Hermann's pupil and Plato worked for the same patron, John David. Furthermore, Plato worked at Barcelona, northern Spain between 1134 – 1145. He was also interested in the science of stars like Hermann. We can assume that Hermann and Plato were sharing the same environment in terms of translation and knowledge activity. Furthermore, Hermann benefited from the description of animal psychology that was explained by Constantin in his medical oeuvre.¹⁶⁴ It seems that Hermann was aware about the translators and translations in his vicinity (in terms of location and timing i.e. translations of eleventh and twelfth

¹⁶² Al Kindi's book which is in question is *Kitāb fi 'l-sinā'at al-'uzmā*. See C. Burnett (1977).

¹⁶³ C. Burnett brought up this grouping which is formed by Hermann, Hugo, Robert and Rudolph. This group, except of Hermann and Rudolph, worked mainly in the northern Spain. Nonetheless, I prefer to include them in the frame of my study even though it is focusing only on France. Indeed, I do so intentionally because Hermann had tight relations with Hugo and Robert based on exchange of translated knowledge. In fact, their group was connected around the new coming Arabic science. Furthermore, Hermann utilized the outcome of his group members' translations. Therefore, it would not be appropriate to treat only Hermann by cutting him out of his entourage.

¹⁶⁴ Carinthia, Hermann of. *De Essentiis.*, p.23.

centuries) even though he did not know them personally. So we can consider the translators that Hermann knew only via their translations as his secondary network.

At the beginning of their venture, Hermann and Robert preferred to study the Arabic science in secret and shared their translations only after a hard work.¹⁶⁵ Moreover, Hermann furthered his advocacy of Arabic learning i.e. he was among its earliest advertisers.¹⁶⁶ In his preface of the *Planisphere*'s translation, he recommended to his master, Thierry of Chartres other Arabic oeuvres on geometry and astronomy that Robert and himself were translating to Latin.¹⁶⁷ Even though Hermann promoted all of their translations to Thierry, only the translation of Al-Khwārizmī tables reached to Chartres in the twelfth century.¹⁶⁸ While Robert changed his path and accepted to be the archdeacon of Pamplona, Hermann persisted in his challenge to deal with the new coming science from the Islamic world. Hermann chose the enjoy of the private studies to which he acceded via the translations and he seems to regret his collaborator's choice by saying that "*Robert must expose himself to the 'public wrestling ground' and 'endure the hostile attacks of fellow competitors'.*"¹⁶⁹ In Hermann, we see a determined pursuit of knowledge and a constant curiosity that led him to dive into the treasures of Arabic science.

Apart from Robert Ketton, Hermann translated a considerable number of books from Arabic to Latin by himself. He knew both Arabic and Latin. He was sufficiently proficient in the two languages. So he could make translations without the companion of a Mozarab or a Jew, differently than his colleagues in Toledo. Hermann's translations encompassed oeuvres from all the fields of quadrivium except of music.

In the field of astrology, Hermann Carinthia translated *Zaelis* or *Fatidica* or *Pronostica* or *Liber Sextus Astronomie* of Sahl ibn Bischr.¹⁷⁰ Hermann's translation

¹⁶⁵ Haskins, *Studies in the History of Medieval Science*, p. 55.

¹⁶⁶ Charles Burnett uses this term of "advertisement of the new science" of which forerunner is Petrus Alphonsi. For further details, see Burnett, Charles. "The Institutional Context of Arabic-Latin Translations of the Middle Ages: A Reassessment of the 'School of Toledo.'" In *Vocabulary of Teaching and Research Between Middle Ages and Renaissance. Proceedings of the Colloquium London, Warburg Institute, 11-12 March 1994*, edited by Olga Weijers, 58:214–35, 1996.

¹⁶⁷ Burnett, Charles. "The Coherence of the Arabic-Latin Translation Program in Toledo in the Twelfth Century." *Science in Context* 14, no. 1–2 (June 2001), p.258

¹⁶⁸ Burnett, Arabic into Latin in Twelfth Century Spain, p. 117.

¹⁶⁹ Reichert, loc.cit., p. 51.

¹⁷⁰ The Arabic original is *Kitāb tahwīl al- 'ālam* i.e. the Book of the Revolution of the Universe.

does not encompass the entirety of Sahl's astrological corpus, but it consists only of its sixth book. Its subject-matter is the prognostics about events concerning the universe or nations rather individual predictions. Hermann pursued his astrological interest by another translation. That is the translation known as *Introductorium Maius*¹⁷¹ of Abū Ma'shar (*Abū Ma'shar Ja'far ibn Muḥammad ibn 'Umar al-Balkhī* or in its Latinized form Albumasar). He accomplished the translation in 1140. Hermann's version was not the earliest translation. John of Seville had already translated the same book before Hermann. Finally, Hermann translated another astrological oeuvre of Abū Ma'shar that is *De Revolutionibus Nativitatum*.¹⁷² Hermann would use all of these three translations in his own book *De essentiis*. However, Abū Ma'shar's *Introductorium Maius* would remain his most important Arabic reference.

Hermann also contributed to the translations of Arabic mathematical oeuvres. Euclid's *Elements* on geometry is one of most important translations made from Arabic. Before Hermann, Adelard of Bath and Gerard of Cremona translated this magnum opus from Arabic to Latin. Indeed, Hermann did not translate it as a whole, rather he wrote a commentary on Adelard's translation.¹⁷³ Hermann's commentary started by a preface. This preface points out that besides Adelard's translation, Hermann owned an Arabic version of Euclid's *Elements* that he utilized as source.¹⁷⁴ In his *De Essentiis*, he refers also to the *Elements* that introduced a geometry-based natural science to the Western world. Besides, Hermann shew his inclination towards geometry in another geometrical translation in his own book that is *De Sphaeris* of Theodosius. It was a work on spherical geometry. Furtherly, it would be translated also by Plato of Tivoli and Gerard of Cremona. Nonetheless, the version of Hermann has been not still identified.¹⁷⁵ Hermann's name is also associated with the translation of Khwārizmīan tables.¹⁷⁶ It is known that he worked on Al-Khwārizmī's tables, probably

¹⁷¹ The Arabic original is *Kitāb al-madkhal al-'kabīr 'alā 'ilm ahkām an-nujūm* i.e. the Great Book introducing the Science of Making Judgements from the Stars. It is about the general theory of the practice of astrology and it contributed to the introduction of Aristotle's natural philosophy in the Christian Western sphere during the twelfth century. I discuss its significance further on.

¹⁷² The Arabic original is *Kitāb taḥāwil sinī al-mawālīd*, it is Book of the Revolutions of the Years of Nativities. It is about the predictions of individuals.

¹⁷³ See, C. H. Haskins (1924), p. 50. And C. Burnett (1982), p. 7.

¹⁷⁴ Burnett, Arabic into Latin in Twelfth Century Spain, p. 104.

¹⁷⁵ C. Burnett (1978) is suspicious about Hermann's attribution of the Translation of *De Sphaeris*. Rather, he attributes the translation used by Hermann to Adelard on which Hermann made some redactions.

¹⁷⁶ Termed also as "Al-Khwārizmī, Zij".

translated by Adelard. He must have revised Adelard's version based on an Arabic original. Again in his book *De Essentiis*, he mentions his translation of the astronomical tables of al-Khwārizmi. However, his version could not be found until today. Hermann has also other works in arithmetic, neither their manuscripts are found yet.¹⁷⁷

Hermann's most important contribution in terms of translation activity is obviously his translation of Ptolemy's *Planisphaerium*.¹⁷⁸ The Planisphere's original is lost i.e. there is no available Greek version of it. However, it was translated from Greek to Arabic in Baghdad, sometime between the eighth and tenth century. Then, in some way, the Arabic translation reached to Muslim Spain and it was studied there by Maslama al-Majrīṭī during the second half of the tenth century. Maslama, as it is a tradition in the Islamic scientific tradition, added some notes and commentaries on the Arabic text of the book.¹⁷⁹ Ptolemy's Arabic *Planisphere* with Maslama's notes should have passed in the hands of Hermann who translated the whole book with its additional notes from Arabic to Latin. Therefore, thanks to the Arabic translation of *Planisphere* and the contributions of Arabic astronomers, this monument of Ptolemy reached the Latin West and consequently has come down to us. The translation of *Planisphere* had been attributed to Maslama for long time. This misunderstanding has been solved by the inquiries of two manuscripts of the book in İstanbul and Tehran.¹⁸⁰ Hermann made the translation at Toulouse, southern France in 1143.

Besides translating Arabic books to Latin, Hermann wrote also some original works. *Liber noster de circulis* (about the movements of celestial bodies) was one of his writings that he mentioned in his translation of *Planisphere*. It concerned the value

¹⁷⁷ Haskins, *Studies in the History of Medieval Science*, p. 50.

¹⁷⁸ *Planisphaerium* was translated into Arabic under the name of *Tastih basit al-kura*, then it was known also as *Taliq 'alā Batlamiyūs fī Tastih basit al-kura* with Maslama's notes. Ptolemy's book is the Book of the Projection of the Surface of the Sphere. The book is significant as it describes the theoretical background of the construction of the astrolabe.

¹⁷⁹ Maslama, following the Islamic tradition of annotation (*Sharh* and *Hashiye*), added his notes and commentaries about Planisphere directly on the text of the book. He also marked his name so that his contributions could be easily distinguished from the original wording of the oeuvre. However, the Western translators or the authors who wrote based on the translations did not follow this rigidity of annotations. In contrary, they benefited from the translations i.e. they took passages from translations and integrated them directly within their own text without showing the references and making annotations appropriately.

¹⁸⁰ Kunitzsch, Paul. "The Role of Al-Andalus in the Transmission of Ptolemy's Planisphaerium and Almagest." *Zeitschrift Für Geschichte Der Arabisch Islamischen Wissenschaften* 10 (1996 1995), 152.

of obliquity of the ecliptic. *De Occultis* (on the ways how to find lost treasure as described by Arabic astrologers) and *Liber Imbrium* (on weather forecasting via stars and planets) were Hermann's oeuvres in the field of astrology. *De Occultis* consisted of three tracts. The first one was a summary of eighth book of Abū Ma'shar's *Introductorium Maius* while the third one was a summary of a procedure by Māshā'allāh. Initially, in this work, Hermann aimed to make a synthesis of different astrologers' methods on how to find hidden or buried money and treasures. As he could not achieve to find a common ground between the astrologers, he could not make a synthesis but a compilation. In respect to his *Liber Imbrium*, this was a compilation of Arabic and Latin treatises. It included the translation of Jafar Indus' work on rain by Hugo Santalla. Also, Hermann used another Arabic work which is not identified yet.¹⁸¹

Hermann's most important oeuvre was *De essentiis*. This was a cosmological treatise in which he explained his cosmogony. His system was based on essences. The essences were the things which had a simple substance and maintained their nature without changing. There were innumerable essences. Hermann classified them in five groups that were cause, movement, place, time and habitude. These essences led everything that existed (*namely genitura*) to come into existence. There were three principles of existence. These principles were material cause (why the thing is), formal cause (what defines the thing) and efficient cause (why the thing is). The coming-to-be started by the first *motus* which was the creation of God. Therefore, God was the first and efficient cause. The two principles that were matter and form were created by God. Matter was shapeless and unorganized while the form entered into the matter to shape it. This motion was the creation of everything, namely this was the second being. Indeed, the first cause had two kinds of motion. The first one was the creation of principles at the beginning while the second one, generation of the things from the pre-given principles. The creation was not made by God, but it was generated by him. Like a creation in which the craftsman and the instrument were the same. Therefore, God had made first things through himself and for the generation of the secondary things he created the secondary cause which was His instrument. So the generation came out from the second cause. There were two kind of generations, the primary and secondary

¹⁸¹ Burnett, Arabic into Latin in Twelfth Century Spain, p. 125.

generations. The primary generation was the first coming-together of form and matter. The primary generation resulted by a primary genitura. All primary genitura was deathless and unchangeable. Its matter was essence which is the four elements, pure and never intermingling.¹⁸² It was the body of universe i.e. the upper/heavenly sphere (supralunary). The heavenly domain consisted of eight spheres. The lowest sphere was Earth and the highest sphere was the region of the fixed stars. Between them, there was the intermediary sphere of the Moon, Mercury, Venus, Sun, Mars, Jupiter and Saturn. The secondary generation produced the secondary genitura. It produced the lower/earthly (sublunary) sphere. This latter derived from the primary genitura. Differently than the primary generation, it was continuous and it was dispersed in different places. Its matter was substance that was the four elements perpetually mixing and remixing. The earthly sphere consists of four elements that are earth, water, fire and air. The middle between the two extremes (for example, the highest and lowest spheres) was of great importance. The middle was not the same as the extremes, but at the same time it was not completely different. The middle which was of mixed nature refers to Plato's Same-Different conception.¹⁸³

Hermann's system was not influential except of a few discussions at the end of the sixteenth century.¹⁸⁴ Notwithstanding, his approach was peculiar in regard to its sources. In order to establish his cosmological system, Hermann did not limit himself by the classical sources of the Latin tradition. First of all, he took Plato's *Timaeus* as his starting point. Besides *Timaeus*, he referred to other scientific and philosophical works which are non-Christian such as the Asclepius, Macrobius and Calcidius' commentaries. Moreover, he did not hesitate to utilize Arabic sources. Alongside the translations that were made in his network (as mentioned above), while writing his

¹⁸² Eastwood, Bruce. Review of *Review of De essentiis*, by Hermann of Carinthia and Charles Burnett. *Speculum* 59, no. 4 (1984).

¹⁸³ In order to give just a clue of Hermann's system, I intend to give here above a very short summary of his cosmogony. However, my aim is not to feature any philosophical discussion in my thesis. Hermann is among the first scholar/translator who grasped the earliest influence in terms of Aristotle's natural philosophy. He attempted to blend the Platonic approach with the new coming Aristotelianism by respecting the Christian theology. In that sense, he is an important figure who reflects us how the Arabic science started to penetrate within the Western scientific and philosophical minds. This issue is discussed in the third chapter. Anyway, for anyone who is interested in further details of Hermann's system, see C. Burnett (1982) and for a summary of his system see also S. Kutlesa (2004).

¹⁸⁴ Kutlesa, loc.cit., p. 68.

magnum opus he served from other Arabic oeuvres.¹⁸⁵ Hermann referred to *Almagest* in his treatise. At the time Hermann wrote the *De essentiis*, *Almagest* was still not translated from Arabic to Latin.¹⁸⁶ However, he knew it by intermediaries. al-Bāttani's *De Scientia Astrorum* translated by Plato of Tivoli followed very closely in some parts *Almagest*'s text. Hermann might have known al-Bāttani's work through his network and used it. Furthermore, it is supposed that Hermann owned an Arabic version of *Almagest* and benefited directly from its content.¹⁸⁷ It seems that Hermann found in *Almagest* useful arguments to support his demonstration of Plato's cosmology. His grasp of *Almagest* remained very limited.¹⁸⁸ However, he introduced *Almagest* to the Western world before its complete translation. In regard to Euclid's *Elements*, Hermann attempted to show how geometrical theorems could be applied to astronomical issues. Apart from Arabic versions of Euclid and Ptolemy, Hermann was largely influenced by Abu Ma'shar's oeuvres – especially *Kitāb al-Ulūf* and *Kitāb al-madkhal al-'kabīr 'alā 'ilm ahkām an-nujūm*. He integrated several morsels of *Introductorium* into the text of *De essentiis*. Indeed, the astrological parts of his book was based on Abu Ma'shar's oeuvre. The significance of Abu Ma'shar's astrology is the fact that it contained the principles of Aristotle's natural philosophy. Although that, Aristotle's literature concerning his natural philosophy had not been yet translated into Latin at the time of Hermann, he grasped its first traces via Abu Ma'shar's astrology and integrated it into his system. In Hermann's approach, there were other hints of Aristotle's natural philosophy. Indeed, Hermann did not accede directly to Aristotle's oeuvres. But he was connected to his oeuvres by intermediaries.¹⁸⁹ C. Burnett (1982) argues that Hermann was familiar with Aristotle's *De Generatione et Corruptione*, *De Anima*, *De Caelo* and *Meteorologica*. Furthermore, Hermann referred to the alchemical works based on Aristotle's approach on minerals of Morienus. He had also

¹⁸⁵ For further details, see C. Burnett (1982).

¹⁸⁶ *Almagest* had been translated from Greek to Latin by Henry Aristippus around 1160's. However, it never became influential. The translation from Arabic to Latin was finally made by Gerard of Cremona in 1175. Therefore, *Almagest* was still not translated when Hermann wrote his book.

¹⁸⁷ This assumption is based on the fact that Hermann referred to Erastosthenes that is mentioned by Ptolemy in *Almagest* but not in al-Bāttani's *De Scientia Astrorum*.

¹⁸⁸ Carinthia, Hermann of. *De Essentiis*, p.29.

¹⁸⁹ *Ibid.*, p.33.

some other hermetic sources that he reached through the Arabic sources such as *De Secretis Nature* attributed to Apollonius, *Data Neiringet* and Hermes' *Aurea Virga*.

Finally, in his *De essentiis*, Hermann achieved to build a synthesis between Platonism of Chartres, the Aristotelian physics as he grasped through Abu Ma'shar and the Hermetic texts in his disposition.¹⁹⁰ Indeed, his system was an expression of his intellectual accumulation. On one side, he was cultivated under the classical tradition of the Western world which was stuck in the frame of the Encyclopedias. Nonetheless, he opened up his mind in parallel to the Chartrain school which managed to integrate non – Christian Platonic elements in their approach. On the other side, Hermann broadened his perspective thanks to the oeuvres of Abu Ma'shar, Ptolemy, Euclid and Hermeticism that he provided through his own translations and his network of translators. At the end, he managed to integrate the Arabic learning that was transmitted to the Western world up to his time in his cosmological system shaped by the Latin tradition up to the twelfth century. Hermann was a significant translator/scholar as he was the first among who contributed to the assimilation of Arabic science.

2.1.2.2.2. Hugo of Santalla (1119-1151)

There is no abundant information about Hugo of Santalla's life. He was active during the second quarter of the twelfth century. As Hugo did not put any sign related to the years he worked, neither in his translations, nor in his works; we do not know the exact ordering of his activities. However, the dedications that he made in the prefaces of his translations corroborates that he was translating for Michael, Bishop of Tarazona. Tarazona was located in Zaragoza which was significant in terms of Arabic learning. After the fall of the Caliphate of Cordoba in 1018, an independent Muslim state was established in this region. The Banū Hūd took over the rule of the state in 1038. When the Almoravids defeated the Banū Hūd in 1110, the emirate installed in Rueda Jalón, in the southwest of Zaragoza. In 1118, the Christians took Zaragoza from the Almoravids and established the Aragon Kingdom over this territory. Around 1140,

¹⁹⁰ Haskins, *Studies in the History of Medieval Science*, p. 57.

the last inheritor of the Banū Hūd, Imad al-Dawla left Rueda Jalón and ceded the town to Alfonso VII. Banū Hūd owed a library which was rich of Arabic scientific books. It provided to Christian knowledge seekers who inhabited around Zaragoza a considerable amount of sources on mathematics, astronomy, astrology, magic and geometry during the residence of Banū Hūd in the region (until 1140, then the library was moved to Toledo). Bishop Michael was assigned to Tarazona in 1119, just after the area was captured by Christians. Primarily, he was in charge of the recovery of the ecclesiastical order of the region. Nonetheless, as an intellectual man, he was very interested in learning and attracted by the Arabic manuscripts, especially the inherited ones from Banū Hūd.

Indeed, Hugo was already interested in Arabic science even before he met his patron Michael.¹⁹¹ However, Hugo's translations were generally associated with Bishop Michael. His association with Bishop Michael reveals us that Hugo had worked in Aragon, north-eastern Spain between 1119 – 1151 (throughout the diocese of Bishop Michael). It is supposed that the bishop and Hugo had some relations with France. Bishop Michael was of French origin and probably he was a Cluniac. It is supposed that Michael and Hugo acted as a provider of translations for France i.e. the translated oeuvres were sent to the north of the Pyrenees, most probably to Chartres and Paris and also perhaps to Cluny.¹⁹² Bishop Michael, as a patron and sponsor, found, chose and determined the Arabic oeuvres to be translated for Hugo. Their main interest was in astronomy and astrology. C. Haskins presents him as a student of astrology and divination who considered both of the fields as the justification for the study of astronomy.¹⁹³ However, at the end we see that his efforts resulted by a collection of translations mostly concentrated on astrology with very little astronomical portion.

Hugo translated Ptolemy's astrological oeuvre, *Centiloquium*¹⁹⁴ from Arabic to Latin, by the request of his patron. Michael wanted to use Hugo's translation as a

¹⁹¹ Haskins, Charles Homer. "The Translations of Hugo Sanctelliensis." *The Romanic Review* II (1911): 1, p. 10.

¹⁹² Delisle, Jean, and Judith Woodsworth. *Translators through History: Revised Edition*. John Benjamins Publishing, 2012, p.189.

¹⁹³ Haskins, loc.cit., p. 7.

¹⁹⁴ The Arabic translation is *Kitāb al Thamara* i.e. the Book of the Fruit.

guide to understand other astrological treatises at his disposition.¹⁹⁵ Alongside *Centiloquium*, Hugo translated six astrological treatises to which he did not give any name. Moreover, he made translations in more specific spheres of astrology. For instance; Hugo translated one treatise of Abu Ma'shar on meteorological predictions and also, four treatises on nativities; one from Masallah, two from Abu Ma'shar and one from Alcuifi.

In the field of astronomy, Hugo translated Ibn al-Muthannā's revision on al-Khwārizmī's tables and also Mohammed ben Ahmed el-Biruni's commentary on al-Fargani, supplemented by tables and geometrical methods of Ptolemy. Additionally, it is known that Hugo translated al-Kindī's commentary on *Almagest*.¹⁹⁶ Hugo's translation was of significant importance as it included the Aristotelian chapters of the first book of *Almagest*.¹⁹⁷ It might have been Hermann's source of knowledge on *Almagest*'s first book. It seems that Hermann benefited from other translations of Hugo. Hermann referred to Hugo's translation of Jafar Indus on meteorological predictions in his *Liber imbrium* and also his translation of al-Kindī's *Iudicia* in his *De occultis*. Hermann's reference from Hugo was not only limited to his translated works on astrology. He also utilized Hugo's translation of *De secretis nature*¹⁹⁸, the hermetic alchemical oeuvre. Furthermore, Hermann and Hugo contributed to the compilations of the *Liber novem iudicum*¹⁹⁹ and *Liber trium iudicium*.²⁰⁰ While the translation of Umar's *iudicia* is attributed to Hugo, Sahl's *Iudicia* was associated with Hermann as this latter translated the sixth book of Sahl. Moreover, Robert of Ketton also contributed to the compilation by his translation of al-Kindī's *Iudicia*. Hermann's references to Hugo's translations and their contribution to the compilations of *Iudicia*'s supports the idea that there was a common programme of study between Hermann and Hugo.²⁰¹

¹⁹⁵ Haskins, loc.cit., p. 5.

¹⁹⁶ The Arabic original is *Kitāb fī 'l-sinā 'at al-'uzmā*. Its translation is still not identified.

¹⁹⁷ Burnett, C. S. F. "A Group of Arabic-Latin Translators Working in Northern Spain in the Mid-12th Century." *Journal of the Royal Asiatic Society of Great Britain and Ireland*, no. 1 (1977), p. 65.

¹⁹⁸ The Arabic translation is *Kitāb al sirr al-halīqa*.

¹⁹⁹ The Book of Nine Judges consists of the translation of astrological judgements of al-Kindī, Sahl ibn Bishr, 'Umar ibn al-Farrukhān al-Tabarī, al-Bitrīq, Masallah, Dorotheus, Aristotle, Abu Ma'shar and Jerges.

²⁰⁰ The Book of Three Judges consists of the translation of astrological judgements of al-Kindī, Sahl ibn Bishr and 'Umar ibn al-Farrukhān al-Tabarī.

²⁰¹ Burnett, A Group of Arabic-Latin Translators, p. 71.

Hugo is also known as an author or compiler of some other treatises. He wrote a treatise on geomancy and two treatises on spatulamancy. His most crucial work was obviously the compilation that he made from two hundred and fifty-five volumes of Indians's astrology; *Liber Aristotilis* i.e. the Book of Aristotle. Contrarily to its title, the compilation had nothing to do with Aristotelianism. It is a collection based on different sources of ancient astrology. Among its sources, there was a Pahlavi edition of Valens (Hellenistic astrologer), a version of Dorotheus's *Carmen Astrologicum* (translated from Pahlavi version to Arabic by 'Umar and Mashallah), an edition of Ptolemy's *Tetrabiblos* and *Almagest*, an edition of commentary on Paul of Alexandria (through Mashallah), an edition of Rhetorius the Egyptian (among the last classical astrologers – through Mashallah), a Pahlavi Book of Nativities, a book on annual predictions by a certain Hermes, the *Zīj al-Shah* or *Zīj al-Shahyār* (an book of astronomical tables from the Sassanians), a Book on Nativities by al-Andarzaghār and finally a sixth century Greek book transmitted through the Sasanians.²⁰² Hugo's compilation included different spheres of astrology that were collected among sources of Hellenistic, Pahlavi and Arabic traditions. Despite he gathered knowledge from different origins, he served from a unique source that was the Arabic learning. As it was the case in the other fields of science and philosophy, the Islamic tradition transmitted the astrologic accumulation of the history, including the Arabic contribution. Hugo's *Liber Aristotilis* was only an illustration that reflects us how the scientific and philosophical accumulation of humanity travelled through the different civilizations.

Hugo with his patron, Bishop Michael aimed at the beginning to translated the Arabic sources on astrology and divination that they conceived as the means to prepare the understanding of astronomy. Hugo's translations concentrated mostly on astrology and his works were on both astrology and divination. Therefore, we can assume that within his lifetime, he could achieve the preparatory objective of his ultimate idea. The output of his labours depicts us that he was a translator rather than a compiler or author.²⁰³ He cannot be reckoned as a translator/scholar as it was the case of Hermann

²⁰² Dykes, Benjamin N. *Astrology of the World I*. Cazimi Press, 2013, p.xv - xviii.

²⁰³ Haskins, *Studies in the History of Medieval Science*, p. 80.

of Carinthia. He never pretended that his writings were of his own knowledge. Moreover, Hugo did not make word-for-word translations. His wording was not comprehensible for the average readers. In his translations, he attempted to generate new terms in Latin. However, they were not maintained as his terminology was superseded by John of Seville's vocabulary that this latter invented in his translations succeeding Hugo.²⁰⁴

2.1.2.2.3. Robert of Ketton (1110 – 1160)²⁰⁵

Robert of Ketton was the English collaborator of Hermann of Carinthia. Before his association with Hermann, Robert settled down in Barcelona in 1136 and studied thereby as a pupil of Plato of Tivoli. It is not known when and how he came to the Ebro Valley and joined to Hermann. Robert and Hermann had already acquired proficiency in Arabic and elaborated their common programme to translate and study the Arabic science when Peter the Venerable hired them around 1140 – 1141. Robert's interest was to study geometry and astronomy. Indeed, his main goal was to write an astronomical treatise in which he would include all planets and stars with their movements, effects and natures.²⁰⁶ Robert with Hermann interrupted his project for Peter the Venerable's Toledan Collection. Among this collection, Robert translated the Qur'an and *Fabulae Saracenorum*. Indeed, Robert was the first to translate the Qur'an. After he completed the translation of the Qur'an in 1143, he was assigned as the archdeacon of Pamplona. This designation was evaluated as a remuneration in turn of his contribution to the Toledan Collection i.e. his new office was a promotion for Robert who had been priest. This was how Robert exposed himself to the public wrestling grounds as described by his collaborator Hermann. However, his new position led Robert neither to leave aside his common project with Hermann, nor the pursuit of knowledge within the Arabic oeuvres. He kept on translating Arabic books to Latin in the spheres of astrology, astronomy, mathematics and even alchemy.

²⁰⁴ Dykes, *Astrology of the World I*, p. xiii.

²⁰⁵ Robert of Ketton is also known as Robert of Ketene, Robertus Retinensis and Robert of Chester.

²⁰⁶ Kritzeck, *Peter the Venerable and Islam*, p.62.

In astrology, Robert translated al-Kindi's *Iudicia* for Hermann. There is no indication about its translation date or place. After he was designed to Pamplona, he translated an alchemical treatise, *Liber de compositione alchemiae* of Morienus in 1144. It was among the first treatises on alchemy which was translated from Arabic to Latin. The following year, in 1145, Robert made a significant contribution to the Western history of science which was his translation of al-Khwārizmī's algebra. He made this translation in Segovia. Robert's version was not its unique translation. The same oeuvre would be translated by his contemporary, Gerard of Cremona. The translation of Robert was not as faithful nor as correct as the version of Gerard. There were several omissions, transpositions and additions in Robert's Latinized algebra of al-Khwārizmī. The discrepancies between the Arabic original and Robert's translations were much more concentrated on the illustrative parts based on geometrical figures with necessary calculative demonstrations than the descriptive texts i.e. Robert was much more loyal to the original in the translation of the text.²⁰⁷ Beyond the weakness of Robert's translation, his attempt to introduce al-Khwārizmī's algebra to the Western world was undeniably of vital importance i.e. behind al-Khwārizmī's algebra, indeed there was the accumulation of algebraic ideas that developed within the mathematical traditions of ancient civilizations such as Egypt, Babylon, China and India.²⁰⁸ This tradition found its expression in Arabic learning, not only in terms of Arabic language but also including the contributions of Islamic mathematicians. What is the significance of this tradition? The algebra is an exercise of the human mind. But beyond this, it is the way of human reason to understand the universe via numerical demonstrations. Therefore, this algebraic inheritance was infused within the Western scientific process starting from Robert's translation. Furthermore, it would be diffused within the European schools as it was reckoned among the widely used textbooks.²⁰⁹

After the year 1145, he returned to his native country, England. In 1147, he translated a treatise on astrolabe. The original treatise was assigned to Ptolemy, but it

²⁰⁷ Muhammad ibn Musá, of Chester Robert, and Louis Charles Karpinski. *Robert of Chester's Latin translation of the Algebra of al-Khowarizmi*. New York : Macmillan, 1915,p. 43.

²⁰⁸ Ibid., p. 11 - 12.

²⁰⁹ Kritzeck, *Peter the Venerable and Islam*, p.63.

might have another Arabic treatise on astrolabe. He accomplished this work in London. He would revise this treatise in 1150, again in London. The same year, Robert compiled a set of astronomical tables revised according to the meridian of London. For the adaptation to London's position, he took as basis the astronomical tables of al-Battāni and al-Zarqālī. Robert might have adapted these tables from his translation of al-Battāni's *Opus astronomicum*.²¹⁰ Hermann referred to this translation of Robert in the preface of *Planisphere*. Probably, Robert had translated al-Battāni's treatise before or around 1143 (before Hermann's translation of *Planisphere*). Robert furthered his work on astronomical tables. He revised Adelard of Bath's astronomical table that he had adapted for London based on al-Khwārizmī's tables. Robert's revision concerned largely the Arabic terms that Adelard used in his version. Robert replaced most of the Arabic terms with Latin terms in his adaptation. In this work, Robert used firstly the term *sine* that he derived from the Arabic trigonometrical word *jaib*.

Robert, also contributed to the translation of Euclid's *Elements*. It is known that there are three different versions of *Elements*' translation that belong to the twelfth century. These translations were made by Adelard of Bath, Hermann of Carinthia²¹¹ and Gerard of Cremona. Besides these translations, Robert made a compilation based on Euclid's *Elements*.²¹² Robert compiled his work from different sources; the translations of Adelard and Hermann, an Arabic version of *Elements*. Moreover, Robert replaced some enunciations from Arabic sources with enunciations from Boethius tradition.²¹³ Robert's version is described as the most influential i.e. the numerous manuscripts points out its popularity that were used by scholars up to the thirteenth and fourteenth centuries.²¹⁴ Indeed, its influence spread already during the

²¹⁰ The Arabic original is *Kitāb al-Zīj*.

²¹¹ Hermann's version is disputable whatever it is a translation or revision of Adelard's translation.

²¹² Euclid's *Elements* includes Euclidian geometry and the ancient Greek version of elementary number theory. The *Elements* contains definitions, postulates (axioms), propositions (theorems and constructions), and mathematical proofs of the propositions. Most of the propositions are explained through a pattern. Firstly, the enunciation which is the general statement of the problem or theorem to be proved. Secondly, setting out the problem or theorem; defining an example on which the enunciation will be demonstrated. For example, Let A B be the given finite straight line. Thirdly, specification; announcing the problem to be solved or proved. For example, thus it is required to construct an equilateral triangle on the straight line A. Fourthly, construction of the main algorithm. Fifthly, the proofing; arguing that the construction solves the problem. Finally, the conclusion; restating what has been proved.

²¹³ For further details, see, Busard, H. L. and Menso Folkerts. Robert of Chester's Redaction of Euclid's *Elements*, the so-called Adelard II Version: Vol. 2. Springer Science & Business Media, 1992.

²¹⁴ *Ibid.*, p. 11.

twelfth century. Robert's version took part in the *Eptateuchon*²¹⁵ i.e. it became a textbook thought in the schools by 1141.²¹⁶ The exact date of Robert's compilation has not been identified. He benefited from Hermann's version that the latter completed in the late 1130's. Therefore, Robert's compilation dated between the late 1130's and beginnings of 1140's. Most probably, Hermann sent Robert's version to Thierry of Chartres very soon after its accomplishment. It was Robert's version rather than Hermann's version which Thierry included in his curriculum. It might have been due Thierry's appreciation of Boethius arithmetical teaching who might inserted Robert's version in his textbook. Moreover, there is another interesting point in regard to Robert's compilation. In the earliest manuscripts of his work, there were not at all any proofs of Euclid. Indeed, in its earlier phase, Robert omitted the proofs from his version of *Elements*. However, in the manuscripts of Robert's compilation that he wrote after the translation of Qur'an, somehow he added some of Euclid's proofs. It means that Robert kept on working on Euclid's *Elements* and revised his own work to cultivate it with additional elements that were absent in Adelard's version.

Robert cannot be evaluated as translator/scholar like his friend Hermann i.e. he did not write an independent work (the astronomical treatise that he announced as his ultimate goal seems to be not achieved as there is no indication about its realisation) or we do not know if he had any students or he lectured. However, as a translator, we can emphasize on his innovative endeavour. He is the first translator of the Qur'an. J. Kritzeck points out to his ironical situation in regard to his accidentally incorporation to the Toledan Collection,

“he is less often recognized as Robert of Ketton, the astronomer and geometrician, the first to use ‘*sinus*’ (sine) in its trigonometrical acceptation, than as Robert of Ketton, the first translator of the Qur’an.”²¹⁷

Secondly, he has been the first to introduce the algebra to the Western world. Finally, he was also innovator as he translated an alchemical work differently than other translators of his era. Moreover, besides his non-traditional attempts by translating original works from Arabic science, Robert strove for the accurate

²¹⁵ A textbook that includes the texts used for teaching the seven liberal arts. Thierry Chartres is responsible for its selection and composition. (Busard and Folkerts. 1992).

²¹⁶ It is known that *Eptateuchon* was composed before 1141.

²¹⁷ Kritzeck, *Peter the Venerable and Islam*, p.65.

reception and understanding of Arabic science. He reviewed, adjusted and supplemented from Arabic sources the translations that had been done by his contemporaries.

2.1.2.2.4. Rudolph of Bruges

Rudolph is known as the student of Hermann of Carinthia. There is not much information about his life and works. He lived in the second quarter of the twelfth century. He worked on astronomical subjects in the different cities of Northern Spain and Southern France. A treatise on astrolabe is ascribed to him. It is disputable whether he translated it from Arabic²¹⁸ or he wrote himself²¹⁹. In this treatise, the construction of the different parts of the astrolabe is described. The work depicts Rudolph's knowledge on the available literature on astrolabe of his era which is based on Arabic learning. He recommends to his readers the translation of *Planisphere* made by his teacher Hermann. Therefore, he uses many Arabic terms within the text. Moreover, at the end of treatise, he puts a star table in which he depicts the latitudes of places. He also gives the calculations that he made for Beziers, as location and for the date of April 24, 1144. By this way, we know the redaction date and place of the treatise.

It seems that Rudolph was collaborating with his teacher Hermann to make astronomical observations. In a manuscript of Chartres, the traces of their observations in 1139 and 1140 are found²²⁰.

²¹⁸ G. Sarton considers it as a translation from Maslama. See, Sarton, George. *Introduction to the History of Science*. Vol. 2a., p. 177.

²¹⁹ P. Kunitzsch's works concludes that Rudolph's work is his own writing. See, Kunitzsch, On the Authenticity of the Treatise, p. 57.

²²⁰ Duhem, Pierre. *Le Systeme Du Monde: Histoire Des Doctrines Cosmologiques de Platon a Copernic*, Vol. 2, 2014, p. 183.

2.1.2.2.5. The Astronomical Tables of Marseille and his author, Raymond of Marseille

Raymond of Marseille is an astronomer of the first half of the twelfth century. He cannot be evaluated as a translator. Rather, he worked for the adaptation of available astronomical tables that were transferred to Western scientific sphere through Arabic science. His tables are significant not in terms of scientific development but they do indicate us the questions in the mind of the Western scholars who were challenged by the reception of Arabic science. During the twelfth century, the cutting line between astronomy and astrology was still tenuous. The study of celestial bodies was not separated definitely from the study of their effects on the earthly life. Therefore, the two fields had common tools and methods. For example, the astronomical tables were a means of calculating the latitudes of the planets and stars for a definite location. They provided information on the course of the planets and the positions of the stars. Besides, the astrologers used these tables to make judgements and prophecies about the mundane beings (nations, human beings etc.) and events (any kind of disasters etc.) of the related geographical position. The works of Raymond serve as an illustration of the twelfth century's Western scholars i.e. Most of them interested in astronomy, willing to achieve in this field to further their works on Divine cosmology and utilizing other sciences (astrology, geometry, arithmetic, alchemy etc.) in service of this purpose. Raymond pursued mostly his search of knowledge in astronomy. He was specialized on the astronomical tables. He cultivated his specialization by his acquaintance of astrolabe and supported his tables by mathematical calculations.

Firstly, the place where he lived is significant for us since the city of Marseille, thanks to his ports, was a contact point with Muslims traders. The commercial relations brought inherently cultural exchanges which rendered Marseille among the important points of Arabic science reception. Marseille might have been a receiving environment of Arabic science due its commerce and also to its vicinity to the important centers of translations. Raymond might have reached Arabic sources directly from the city he lived and/or other cities in which the translation activity was dense. It is for sure that

he conducted independently his works. We do not have any trace of Raymond's relation with Hermann's nexus, and neither with the Toledan translators or scholars. Although, he was not far away from them. Another fact that demonstrates his unallied endeavor is Raymond's pretension that he was the first to acquire the Arabic science among the Latins. His claim points out his ignorance of the translations and studies on Arabic learning assumed by his contemporaries such as Adelard of Bath and Plato of Tivoli.²²¹ Hence, Raymond was isolated from the translators and scholars involved in the reception of Arabic learning.

Raymond wrote two treatises, both of them were on astronomy; *Liber cursuum planetarum* (Treatise on the course of the planets) and *De compositione astrolabii* (on the Construction of the Astrolabe). There is nothing exceptional in regard to his writings. In his Treatise on the course of the Planets, he attempts to achieve a method to perfect the astronomical tables while in his treatise about the astrolabe, he sufficed to describe the instrument and its construction. However, his oeuvres reflect us his profile as a typical Latin scholar of his era. The first feature was his piety. In his Treatise on the course of the planets, he started by a general introduction on astronomy. He praised and justifies the study of astronomy by Christian invocation by noting that this was a treatise written by the consent of God and in the honor of Jesus Christ. He mentioned intentionally the year of the treatise's composition in terms of the Christian calendar which took the beginning as the incarnation of Jesus-Christ. By this way, he wanted to glorify the Christianity and avoid any connotations with Greek, Persian and Arabic calendars. Besides his insistence of the Christian calendar, Raymond fortified the justification of astronomical studies by referring to the Bible and also to the Saints such as Ambrose, Augustine and Gregory. Also, like the other scholars of his time, he mentioned the classical authors such as Galen, Ovid, Priscian and of course, Boethius.

Although Raymond worked lonely in the Arabic science, he was not detached from the philosophical discussions of his time. In Raymond, the traces of Platonism can be seen in the way it was treated by the School of Chartres. As a pious, he acceded the Chartrain view that the Soul of the Sky and also the Soul of the Seven Planets were

²²¹ Haskins, *Studies in the History of Medieval Science*, p. 98.

of the Holy Spirit. He repeated the idea that the God attributed to the skies and planets the virtue of pursuing their courses in an unchanging manner and predicting the future. Therefore, astronomy and astrology were the results of these two sacred virtues. The objective to study the path of heavenly objects was to foretell the future events. Thence, two blessed fields of study that are inseparable; astronomy and astrology.

Raymond's *Treatise on the Course of the Planets* consists largely of astronomical tables. Indeed, his tables can be evaluated as the continuation of the Toledan tables and model of al-Zarqālī. His aim was to provide astronomical tables that were as accurate as possible. Indeed, Raymond acknowledged that the tables available at his time were not punctually correct. He corroborated his claim by referring to Ptolemy who thought that the information on the course of the planets must be corrected along very long time. Raymond joined to Ptolemy's argument since his study on the construction of the astrolabe shew him that none of the savants up to his time could have avoided errors in the calculations of degrees, minutes and seconds. Thus the astronomical tables required many years of observations and precise calculations but also continuous revisions et corrections. He emphasized the importance of perpetual work on the tables that would be updated by the help of the astrolabe and numerical tables. He wanted his successors not to lose time on re-discussing the movements of planets but to ameliorate the calculations of them. So, in his treatise, he suggested a method of observation and corrections for the tables. Besides his method, he also defined the models to read the tables and extract knowledge from them. Furthermore, he gave instructions for anyone who wants to determine the longitude of a place other than Marseille. Finally, he added a description on how to make astrological judgements from the tables. His method was inspired from Abu Ma'shar's *Introductorium*.

Raymond was an adaptor²²² rather than a translator. He worked in the tradition of the Toledan tables and models of al-Zarqālī. He adapted them to the meridian of Marseille and to the Christian calendar. He was not very influential during his era. His tables would be re-treated only a century after by William of Marseille. However, he

²²² Duhem, *Le Systeme Du Monde: Histoire Des Doctrines Cosmologiques de Platon a Copernic*, Vol. 2, p. 216.

is significant as his case draws a picture of Western savants' pursuit of knowledge in the France of twelfth century. The bulk of them were concentrated mostly on astronomy and astrology. They studied as supplementary for the science of the stars. Raymond's experience shows us that by the twelfth century, Arabic astrologers and astronomers such as al-Zarqālī and Abu Ma'shar were already known. Furthermore, they grasped not only the astrolabe only with its functionality but also its construction and assimilated its use. Additionally, we see that they became accustomed to calculations to adapt the astronomical tables for their cities.

As explained above, France's contribution to the literal translations was limited to the works of the group of Toulouse. Their translations were mostly in the fields of astronomy, astrology, mathematics and alchemy. The first clues of Aristotle's natural philosophy penetrated, not directly from Aristotle, but indirectly from Abu Ma'shar. The translators were surrounded by an ecclesiastic entourage; however, they remain independent in their pursuit of knowledge within the Islamic science. Their translations began to circulate in France, especially they became effective in Chartres. On one side, the translations of Toulouse were not as scarce and fragmentary as the translations of the tenth century; on the other side, they were not as intense as the translations of Toledo. Moreover, they took place between the 1130's and the beginning of the 1150's. Thus, we can describe the translations of Toulouse as a transitional phase within the translation period i.e. a transition between the scarce and intensive phases. It is significant because it corroborates that the translations and the Western scientific process moved up together; in parallel, gradually and interdependently.

2.2. Translation period in Toledo

In the framework of this thesis, my aim is not to describe the translations of Toledo. However, it is crucial to understand the Toledo centre of translations in its correlation with France. Firstly, the Cluny Order and scholars in France were very influential on the translations of Toledo. Peter the Venerable and the archbishops designated from France oriented the course of translations. Moreover, the Frankish clergy who immigrated to Toledo provoked the demand for Arabic learning and acted as the agents who spread the Arabic science beyond the Pyrenees. Secondly, the

translation activities of Spain, especially in Toledo enabled great challenges in the schools of France. The translations served as textbooks in the schools of Chartres and Paris and awaked the scientific interest thereby. In the first section, I intend to explain how the clerics of France directed the translation activities of Toledo. Then, I endeavour to make very brief summary of Toledan translators and/or scholars' contributions in the second section. By this way, my aim is to prepare the ground of evaluation of translations in the Western scientific process (Chapter 3).

2.2.1. The Role of Ecclesiastics of France on Toledo's Translation Programme

The translations in Toledo did not start before the 1130's. Since 1130's the translations came alive slowly. Toledo became a brilliant, prolific and reputable centre of translations only after the second half of the twelfth century. On one side, there were some factors that hindered the translations until the 1130's. On the other side, the conjuncture became suitable, stimulating and even accelerating around the second half of the twelfth century. The impeding reasons can be placed within the socio-political context of Toledo. The Christians took over the city from Muslims in 1085. The bulk of the Muslims habitants of Toledo preferred to quit. Most notably, the Muslims elites abandoned and left their books behind them. Thereby, after 1085, alongside the Christians, mostly the Mozarabs, the Jews and a small population of Muslims stayed in the city. Before the conquest, the Muslims, the Mozarabs and the Jews had strong relations with eastern Islamic lands which extended from the Pyrenees to India. Belonging to the Islamic Civilization, they had had easy access to its common scientific culture. By the conquest, they were isolated from their scientific environment.²²³ So, by the conquest, a group of Muslims, Mozarabs and Jews who knew Arabic and also the local dialects of Romance became idle. In regard to the Christian population, their intellectual activities had depended to the Muslims during the years they remained under the Islamic sovereignty until the conquest. They were

²²³ Lemay, loc.cit., p. 642

also cut from the scientific milieu from which they had benefited. The departure of Islamic civilization's members put the Toledans in an intellectual standstill.

Furthermore, starting by 1085, the Christian society submitted to a challenge that was oriented by the clerics and the lords. Firstly, the Cluniac Pope Urban II made Toledo the primary episcopal see in 1088. After the Reconquista, the bishops and the lords struggled for ecclesiastical reorganization, repopulation of the destroyed regions, moral reforms, revival of education and involvement in diplomatically relations with the remaining Taifas, the Christian military chiefs and also the Papacy.²²⁴ The Church was very implicated in the allegedly rehabilitation of the lands captured from Muslims. Especially, the Cluny Order in France shew special interest in the old lands of the Islamic Civilization. Just after the conquest, the order designated Bernard of Sédillac to Toledo as bishop (1086 – 1125). In succession of Bernard, another Frankish Cluniac cleric, Francis Raymond of Sauvetât was assigned. He had been archbishop of Toledo between 1125 and 1152. During the diocese of Bernard and the first years of Raymond's bishopric at Toledo, both of them were preponderantly occupied by numerous administrative tasks related to the reorganization after the conquest. The concentration on the re-Christianization at Toledo distracted the attention from the scientific pursuit. In such a period, there was no demand, nor interest for the scientific inheritance that Christians took over from Muslims. C. Burnett defines this situation as a lack of audience at Toledo which continued until 1130's.²²⁵

The conjecture which held back the translations was challenged by a sequence of events. Firstly, the last emir of the Banū Hūd Ja'far Ahmad III who had been at Rueda Jalon exchanged his property in turn of a part at Toledo. This means the library of the emirate moved to Toledo which would provide to the knowledge seekers a rich collection of scientific oeuvres. Secondly, the invasion of Almohads to Spain around the middle of the twelfth century enabled to a social mobility. The Almohads were not tolerant towards the Jews and Mozarabs. As a result, they escaped from them and sheltered at Toledo. This move cultivated the multicultural context of the city. Thirdly, the ecclesiastical interest to Toledo was not only limited to the upper levels of the

²²⁴ Ibid.

²²⁵ Burnett, *The Coherence of the Arabic-Latin Translation Program*.

divine organization. Besides the archbishops assigned by and from France, the Frankish clergy flocked to Toledo to the extent that a Frankish quarter was established near to the Cathedral of Toledo. This Frankish cleric community would create a demand for the translations²²⁶ and this community would turn into the audience of the translations. Finally, a special event pulled the trigger for translations. The archbishop Raymond drew his attention towards the transmission of Arabic science. During the first years of his bishopric, he was detained by his duties related to the administrative parts of his ecclesiastical position. This Benedictine archbishop would become very influential on the translations and translators of Toledo by the 1140's. But how, what happened? Peter the Venerable made a journey to Spain in order to reform the Benedictine Abbeys. This visit in 1141 would change the course of the translations at Toledo. Peter the Venerable charged a small group of translators to translate the Qur'an and some oeuvres about the Prophet Muhammad and got prepared the Toledan Collection for apologetic purposes. It is supposed that Peter the Venerable met Raymond of Toledo during his trip and challenged him in regard the translations. Raymond became conscious that Arabic science could be threatening the Christianity and it was necessary to be equipped by ways and means of apology. Thus, the recognition of Raymond led more translators to work on the transmission of Arabic science, especially to turn towards philosophical Arabic oeuvres.

2.2.2. Toledan Share in the Transmission of Arabic Science

John of Seville (also known as Jean de David) was among the earliest translators who initiated the translations at Toledo. He was active between 1135 – 1153. He was a Jewish translator who translated from Arabic to Latin and worked for Bishop Raymond. We can describe him as a translator/scholar as he made numerous translations and some compilations from Arabic. He mainly translated astrological and astronomical oeuvres i.e. he translated some treatises of Mashallah, a book of al-Farghani (*Liber Alfragani in quibusdam collectis scientiae astrorum et radicum*

²²⁶ For further details on the context of Toledo see, Burnett, The Coherence of the Arabic-Latin Translation Program.

motuum coelestium et est xxx differentiarum),²²⁷ a treatise from Abū 'Alī al-Khayyāt, Abu Ma'shar's *Introductorium Maius*, a treatise of al-Kindi, 'Umar ibn al-Farrukhān's *De nativitatibus et interrogationibus*, a commentary of Ptolemy's *Centiloquium* and some other treatises. Among his important translations, there was an arithmetic treatise on algorism, *Liber alghoarismi de practica arismetrice*. In medicine, he translated *Secretum secretorum*²²⁸ which is a pseudo-Aristotelian treatise including advices of health to princes. Also he translated some philosophical oeuvres i.e. a pseudo-aristotelian writing, *De causis*, al-Fārābī's *Liber Alfaribii de ortu scientiarum*²²⁹, Qustā ibn Lūqā's *De differentia spiritus et animae*²³⁰, partially Ibn Sinā's *Kitāb al-shifā*, Al-Ghazzālī's *Maqāsid al-falāsifa* (The Intentions of Philosophers).

John of Seville collaborated with Dominicus Gundissalinus (1110-1190). Dominicus was archdeacon in Segovia while living at Toledo. He can be also categorized among the translators/scholars. He translated al-Fārābī's Classification of Sciences. He collaborated with Hebrew translators. Avendauth was among his associates. They made a collaborate work on their partial translation of Ibn Sinā's *Kitāb al-shifā*. He also worked with Iohannes Hispanus, another Jewish translator. They translated Al-Ghazzālī's *Maqāsid al-falāsifa* and also Ibn Gabirol's *Fons Vitae*.²³¹ Besides his translations, Dominicus Gundissalinus is also known as a philosopher. He wrote philosophical treatises; *De divisione philosophiae* which depended on al-Fārābī's Classification of Sciences. Furthermore, he composed three other treatises which he derived from Ibn Gabirol's *Fons Vitae*. These are *De immortalitate animae*, *De processione mundi*, *De unitate* and *De anima*. Dominicus used severely the translations and his other sources such as Hermann of Carinthia's *De essentiis* i.e. in his oeuvres, he made serious quotations from other writings without indicating his sources. In today's standards, his works included plagiarism.

The most prolific translator of Toledo was obviously Gerard of Cremona (1114 – 1187). He was also a clergy associated to the Cathedral of Toledo. He translated over

²²⁷ The Arabic original is *The Kitāb fi harakāt al-samāwiya wa jawāmi' 'ilm al-nujūm* i.e. the Secret of Secrets.

²²⁸ The Arabic original is *Sirr al-asrār* i.e. the Book on Celestial Motion and Thorough Science of the Stars.

²²⁹ The Arabic original is *Kitāb ihsā' al-'ulūm* i.e. the Classification of Sciences.

²³⁰ The Arabic original is *Kitāb al-fasl bain al-rūh wal-nafs* i.e. On the Difference between the Soul and the Spirit.

²³¹ The Arabic version is *Yanbū' al-hayāt* i.e. Fount of Life in English.

seventy Arabic oeuvres from the fields such as logic, philosophy, mathematics, astronomy, physics, mechanics, optics, catoptrics, medicine, astrology, alchemy and geomancy. Gerard did not put his own name as translator on the oeuvres that he translated. After his death, his students elaborated a list of his works. The amount of his translations was indicative of his plausible collaborations with other translators or his students. Gerard's most important contribution is apparently his translations of Arabic versions of Aristotle's corpus. He translated Aristotle's *Analytica posteriora*, *Physica*, *De caelo*, *De generatione et corruptione* and *Meteora* and also some pseudo-Aristotelian writings such as *Liber de causis*. He contributed to the Latinization of Aristotle's corpus by Themistios and al-Fārābī's commentaries of *Analytica posterior*. He furthered his works on Arabic philosophy's transmission to Latin by the translations of al-Kindī, al-Fārābī, Ishaq al-Isrā'īlī. In mathematics, he brought in Latin the Arabic works of Euclid, Archimedes, Apollonios, Theodosios, Ptolemy, al-Khwārizmi, al-Farghānī, Thābit ibn Qurra, al-Zarqālī and some others. In medicine, he also worked for the translations of Galen, al-Kindī, Ibn Māsawaih, Yahyā ibn Sarāfyūn, al-Rāzī, Abū-l-Qāsim, Ibn Sinā, Ibn al-Wāfid, 'Alī ibn Ridwān.²³²

While the earliest translations at Toledo concerned mostly natural sciences such as astronomy, astrology and medicine, further translations began to concentrate on Arabic philosophy. The Western world warmed up with the Arabic philosophy by the translations of Alfarabi, Algazel, Avicenna. The translations from Arabic oeuvres of Aristotle were translated only latter. The translations of Aristotle's natural philosophy waited until the time of Gerard of Cremona. The Aristotelian translation started up only after 1170.²³³ The Aristotelian translations were pursued by successors of Gerard in Toledo such as Alfred of Shreshill and Michael Scot during the late twelfth century and thirteenth century.

The translations of Toledo reached very quickly to the learning centers of France. Especially during the reign of Philippe August (1180 – 1223), the translated

²³² For a complete list of Gerard of Cremona's translations see, Sarton, George. *Introduction to the History of Science*. Vol. 2a., p. 338 - 344.

²³³ We know this by the witness of Daniel Morley. He was an Englishman who got bored from the classical teaching at Paris and came to Toledo to discover the Arabic science. His reports from his stay at Toledo show us that around the year 1170, Aristotle's philosophy was still not treated in the entourage of Gerard of Cremona.

oeuvres spread to schools in France. The philosophical oeuvres of al-Kindi, al-Farabi, Avicenna and al-Ghazali, Aristotle's natural philosophy and the medical texts that had been translated in Toledo during the twelfth century passed to the schools in northern and southern France. It is known that the translations of Toledo arrived to the schools of France by the end of the twelfth century and beginning of the thirteenth century. The itinerant scholars were carrying the translations of philosophy and natural science written in small notebooks.²³⁴ Montpellier and Paris were the important cultural centers that received mostly the translations.

²³⁴ D'Alverny, Marie-Thérèse, and Charles Burnett. "Les Nouveaux Apports dans les Domaines de la Science et de Pensée au Temps de Philippe Auguste: La Philosophie." In *La transmission des textes philosophiques et scientifiques au Moyen Âge*, p. 864.

III. EVALUATION OF THE TRANSLATIONS OF TENTH, ELEVENTH AND TWELFTH CENTURIES

In the first two chapters of my thesis, I intended to present an analyse of the translations in France with their translators and their context. My emphasis has been so far on the translation centres which participated in the transmission of Arabic science in Latin and also the other actors who oriented the process. I have tried to investigate the aforementioned centres and actors which/who were originated from the north of the Pyrenees i.e. France. As my aim in this thesis is to argue that the translations are part of the Western scientific process that had been already ongoing before the Reconquista, in the first and second chapters I attempt to question and challenge the focus of the studies of translations which are inclined to concentrate on Spain, Italy and Sicily i.e. the centres where the bulk of translations was made. By skipping the spotlight from Spain to France, I wish to contribute to place the translation studies in a more appropriate framework. Thus, in third chapter, I intend to position the translations from tenth to twelfth century in the framework of Western scientific tradition as it is described by Alparslan Açıkgenç. In doing this, I will try to evaluate the translations by using the theory, model and method developed by Açıkgenç who demonstrates that the translations belong to the disciplinary stage of the Western scientific process.

My main concern in this chapter is therefore to try to assess the translations in the disciplinary stage of Western scientific process. In the context of this thesis, I will not interpret the whole disciplinary stage. But I will attempt to present an inquiry of the translations within this specific phase of Western scientific tradition. Before, analysing the translations according to the aforementioned phase, I start by describing the preceding steps through which the Western history of science passed as it is described in Açıkgenç's approach.

3.1. The Beginnings of the Western Scientific Tradition: the worldview stage and the stage of problems

Firstly, according to Açıkgenç, science is a disciplined knowledge which is a product of a long historical process within a certain social context that is the civilization²³⁵. The prerequisite to have science in a society is the worldview that is appropriate for the scientific activities that leads to the accumulation of knowledge. This worldview forms the suitable environment for a scientific tradition to emerge. Açıkgenç defines scientific tradition as follows:

“the way a group of scientists carry out their scientific activities constitutes a ‘tradition’ that carries the mentality developed in that community as a framework of these activities.”²³⁶

Therefore, the mental structures of the individuals in a given society produces the science of this society. If the knowledge activities are pursued along a very long period in history in a specific civilization, they yield a scientific tradition. This scientific tradition is peculiar to the society from which it emerges since it arises out of its own specific mentality carrying the characteristics of its peculiar worldview. In other words, science is peculiar to the society from which it emerges. Behind the mental environment, there must be a worldview that depends on two conditions; the moral struggle and knowledge process within its social context. I would like to apply this scheme in my evaluation of Latin translations from Arabic science. According to this scheme a scientific process is an historical process which leads to the emergence of sciences within a civilization. According to Açıkgenç, this historical development takes place stage by stage. Primarily he argues for the existence of four stages prior to the emergence of science which he also terms “Pre-Scientific Era”. The first is worldview stage when a suitable worldview for knowledge activities emerges; the second is the stage of problems. In this stage, a knowledge tradition emerges within the civilization in question because without knowledge tradition activities cannot sustain themselves. Then the knowledge accumulated within this tradition is classified and methodology for each class of knowledge begins to develop and thus knowledge

²³⁵ Açıkgenç, *Islamic Scientific Tradition in History*, p.9.

²³⁶ *Ibid.*, p.15.

activities acquire the character of a discipline which is thus called by Açıkgenç “disciplinary stage” as the third development in the scientific process. The fourth stage is naming the sciences which are acquired from each class of knowledge. I shall now discuss these developments within the West.

3.1.1. The Worldview Stage (100 – 500) and the Stage of Problems (500 – 800) in the Western Scientific Tradition

As far as Christianity spread, the Christians thinkers encountered a moral struggle. The Hellenistic philosophers criticized Christianity by their rationalistic system. So the Early Church Fathers needed to defend their religion against them. For this reason, first they studied the Hellenistic thought and developed their apology based on their way of reasoning. The defence of Christianity by the Church Fathers had already formed one aspect of the Christian worldview within which its world structure gradually emerged.²³⁷ The formation of the worldview with its world structure took place between A.D. 100’s and 300’s. However, this worldview was devoid of a knowledge structure.²³⁸ Therefore, it could not give birth to the scientific process. The knowledge structure became apparent only between the 300’s and 800’s. It was Augustine of Hippo (354-430) who effectively initiated the process of forming a knowledge structure within the first emerging Western worldview as characterized by Christianity. The knowledge structure was based on Divine Authority (that is Jesus Christ), reason and faith i.e.

“faith in Christ prepares the way for understanding, and once there is faith, then the reason intervenes it make it more intelligible.”²³⁹

Augustine, different than the Church Fathers, knew very well the Greek thought. While the Church Fathers engaged themselves in Greek philosophy to defend Christianity, Augustine built the foundations of the Christian thought on the basis of

²³⁷ Açıkgenç considers the world structure among the mental structures available in human mind that lead every human being to think about its origins, the meaning of its existence and its destiny.

²³⁸ Açıkgenç considers the knowledge structure among the mental structures available in human mind that carries the potential for pursuit of knowledge.

²³⁹ *Ibid.*, p.16.

the Greek philosophy.²⁴⁰ Once the worldview earned its knowledge structure, the worldview stage of the Western scientific tradition was completed by the 500's.

The works of Boethius (480-524) and John Scotus of Erigena (815-877) strengthened the knowledge structure of the Western worldview. The period starting by Boethius and ending by John Scotus encompasses the stage of problems and emergence of the Western knowledge tradition (500's and 800's). Boethius was among the earliest thinkers who recognized the contradiction between the Christian worldview and philosophy. Therefore, he attempted to reconcile them. He was very influential all along the Medieval ages and inspired many thinkers following him. Among his followers, there was his pupil, Cassiodorus (477-570). He was the compiler of a textbook (called *De artibus ac disciplinis liberalium litterarum*) in which he summarized the *trivium* and *quadrivium*. This textbook would be used during the Middle Ages in the Latin schools. Another important figure of the stage of problems was also an encyclopaedist like Cassiodorus, Isidore of Seville (570 – 630). Bede the Venerable (672/3 – 735) was another thinker of this phase. His main occupation was history. And also, he was at the head of education of Irish monasteries. Finally, John Scotus of Erigena was the most important thinker of the stage of problems. He followed the Latin thinkers such as Augustine of Hippo, Boethius, Cassiodorus, Martianus, Capella and Isidore. He translated and commented the pseudo-Dionysius which was a Neo- Platonic corpus. Açıkgenç attributes a special role to John Scotus of Erigena,

“But with John Scotus of Erigena we may claim that Western knowledge tradition emerged fully as he is the most original thinker of the stage of problems in Western scientific process. But unfortunately, he had no followers mainly because the Western scientific process has not become fully operational.”²⁴¹

John Scotus represents the transition from the stage of problems to the disciplinary stage.

Along the first two phases of the Western scientific tradition (the worldview stage and the problematic stage), the worldview was formed. At the beginning, it was

²⁴⁰ Açıkgenç, A. (2016). “İslâm Bilim Geleneğinin Batı Bilim Geleneğinin Doğuşundaki Rolü Bilim Epistemolojisi ve Sosyolojisi Açısından Tarihi Bir Değerlendirm”. *Yeni Türkiye Dergisi*, p.14.

²⁴¹ Açıkgenç, The Impact of the Islamic Scientific Tradition on the West, p.24.

only based on a world structure that was developed as a result of the apologetic labours of the Church Fathers. The knowledge structure came later by the contribution of Augustine of Hippo that marks the end of the worldview stage. Afterwards, during the stage of problems, the Western worldview was sophisticated. By this way, the knowledge structure was fortified. The works of John Scotus had emerged a doctrine of knowledge. But there was no sufficient intellectual dynamism within the Western world to pursue the knowledge tradition launched by John Scotus. Normally, according to Açıkgenç's system, it is during the problematic stage when the knowledge activities produce a huge accumulation of knowledge. But in the Western context, as the knowledge tradition could not be perpetuated, the accumulation of knowledge did not occur at his stage. Thus, the knowledge tradition came to a standstill despite that the Western tradition owed a suitable worldview and knowledge structure. Indeed, the Western scientific tradition, at the end of its stage of problems, was still not ready to seek knowledge systematically.

3.2. The Penetration of Islamic Science and the Disciplinary Stage (800 – 1200)

After the worldview stage and stage of problems in a scientific process comes the disciplinary stage. As explained above, the Western scientific tradition owed its worldview to the Christian worldview. This worldview was based on its world structure and knowledge structure but as its earlier stages it was deprived of a knowledge tradition. So, the Western science and philosophy were in a state of stagnation. However, by the seventh century, the Christian Western world re-entered into a phase of moral struggle that would awaken the intellectual dynamism. There were two main factors that lead the Western world into a period of encounters; on one side, the pagan gothic tribes and on the other side, the Muslims presence in Europe. Christians struggle with the gothic tribes was stabilized by the beginning of the eighth century however their wrestle with Muslims would not cease before the end of the eleventh century, even during the twelfth century. However, this time Christians' moral struggle would generate the required intellectual dynamism. Because, meanwhile the Muslims in Europe carried the Islamic Civilization's cultural

accumulation to the Western world and the Christians witnessed the Arabic science and philosophy. It was this witness that would challenge the course of the events.

When Christians encountered the science in the hands of Muslims, there was a meagre creative scientific or philosophical activity in the western world. Although they owned the Christian worldview and knowledge structure suitable for scientific activities, their knowledge activities were turning around of some excerpts from Latin classics. The curriculum consisted of the liberal seven arts that was cultivated by fragments from the writings of the encyclopaedists. The fact that there was no significant scientific and philosophical achievement in the West during the Dark Ages is generally accepted phenomenon. However, it is also true that “at this time the dynamics of Western scientific tradition was active”.²⁴² Otherwise the Christian Westerners would not be attracted towards the science and philosophy of the Muslims. The Christian worldview and Western knowledge structure had already constituted the suitable ground for Western knowledge tradition. So when they began to get acquainted with the Arabic science, the Western knowledge activities gained dynamism. By encountering the Arabic learning, Western minds were stimulated and responded affirmatively to this stimulation. As a result, the intellectual dynamism, which remained in standstill after John Scotus, this time was activated. In the second and third chapters, I tried to explain the process by which this activation took place. Indeed, I attempted to present a reading over France. From hereafter, my aim is to combine my perspective based on France with the frame of the scientific process, especially the disciplinary stage.

Before diving into the core of the disciplinary stage, I would like to go back into the discussion whatever the translations in the Medieval Europe are a translation movement or a translation period. At large, the translations of the Middle ages are described as a movement and entitled as “translation movement”. Contrarily to this general tendency, Açıkgenç evaluates the translations not as a movement but as a period within the Western scientific tradition.

“it can be assumed that this period started around the 900’s and still continues today, however the big interaction in respect to the scientific process is up to the 1400’s. The

²⁴² Açıkgenç, *The Impact of the Islamic Scientific Tradition on the West*, p.28.

translations from Arabic to Latin did not only abide as a movement in the Western world, but rather it developed so that it became a current.”²⁴³

Defining the translations of the medieval ages as a movement is to attribute these activities with ephemerality. But the translations lasted for centuries. Indeed, the translation period is divided into two sub-periods: the first period concerns the translations that are subject of this present work i.e. the translations between the tenth and twelfth centuries; secondly, the period between 1480 and 1700 that is called the Renaissance translations.²⁴⁴ Moreover, the dimension of the translations does not only extend over hundreds of years but also covers thousands of translated scientific and philosophical books. Thus, it effects not only the translators and scholars who lived in the era and in the vicinity of the translation activities. But also, the scholars all over of Europe, including generations of the following centuries who were influenced by the translations.

The translations are a period rather than a movement within the Western scientific. This interpretation conjoins with the holistic approach’s relevance. To have a deeper and more appropriate understanding of the translations, it is necessary to englobe the three phases (acquaintance, literal and assimilation) in a generalist study,²⁴⁵ thus to take the translations as period in the Western history of science. This period would lead to the activation of scientific and philosophical activities to the extent that new trends of thought would emerge and contribute to the culture of the Western civilization.²⁴⁶

The starting point of this translation period was obviously the diplomatic and cultural relations that occurred between the Muslims and Christians in the tenth century. Indeed, since the Muslims conquered Spain in the beginning of the eighth century, there had been already a Christian and also a Jewish population who lived

²⁴³ Açıkgenç, The Impact of the Islamic Scientific Tradition on the West.

²⁴⁴ Hasse, Dag Nikolaus. “The Social Conditions of the Arabic-(Hebrew-)Latin Translation Movements in Medieval Spain and in the Renaissance.” In *Wissen Über Grenzen: Arabisches Wissen Und Lateinisches Mittelalter*, 68–87. Berlin: de Gruyter, 2006.

²⁴⁵ In my opinion, the holistic approach is necessary for the studies that seek to explain the translations in a general context. The inquiries on a peculiar manuscript may not need to adopt such an approach. But I think that, the inquiries on the content of the translated science and the context of translators/translations require to take in consideration the triple approach.

²⁴⁶ Açıkgenç, The Impact of the Islamic Scientific Tradition on the West, p.33.

under Islamic rule. So, the cultural exchange already began with the conquests. During the Muslim sovereignty, there was a group of Christians who were submitted to the preponderance of the Islamic culture. Thus, a population called “Mozarabs” emerged who knew both Arabic and the local vernaculars. This peculiar group had been very influential in the translation process since most of the times, the translators were accompanied by a Mozarabic, especially the Toledan translators. The cultural relations were furthered by the diplomatic relations. Especially, John of Gorze, Recemendus and Ibn Sharput were the most relevant diplomats who acted as cultural agents also (described in details in the first chapter). The cultural relations were extended as the curious knowledge seekers like Gerbert of Aurillac made long or short sojourns in the Islamic cultural centres such as Toledo, Cordoba, Zaragoza etc. Although there is no evidence whether these cultural agents brought Arabic oeuvres with them to Europe, they must have been inspired from the Arabic science and learnt from their Arabic colleagues. This first inspiration and knowledge transfer prepared the ground for Western scholars to further their research within the Islamic culture and satisfy their curiosity. So, even before the translations took place, the Western knowledge seekers became conscious, less or more weakly, of what the Muslims had carried from the East to the boundaries. When the cultural agents such as Gerbert and John witnessed the Arabic science, their interest for knowledge seeking was activated. The word “activation” is used intentionally because the Western worldview and its knowledge structure was already in place. Even though they could not animate the knowledge activities until the encounter with the Islamic science, they had been already implanted in the minds of the scholars. The worldview and knowledge structure had already given to the scholars the scientific interest. This interest was revitalized by the Arabic learning and set the scholars in motion. Indeed, the reactions of the scholars who received the first inspiration came out because the Western scientific process was already in place and constituted the suitable ground to pursue, hunt and grasp the Islamic science. If the dynamics of the Western scientific process were not available at that time, the scholars and translators might not have responded in that way i.e. they might not persist on the reception of the Arabic science. As it is stated by H. Gibb, a culture receives an influence from another culture only if there is an existing activity

in the related fields. This existing activity creates the point of attraction.²⁴⁷ This is also compatible with the continuity principle of the scientific tradition. After John Scotus of Erigena, the Western process was in an idle sleep. That is to say, it was not dead i.e. as it is intended by the epithet “Dark Ages”, contrarily it was alive i.e. it did not produce anything fresh in scientific and philosophical fields. Then, it was awakened by the penetration of Islamic science and continued its achievement under its influence. The awakening of Western scientific process began when the Christian Westerners became conscious of themselves and the Islamic Civilization.

3.2.1. Western Consciousness

Starting by the eighth century, under the reign of the Abbasid Caliphate until the tenth century, the Islamic Civilization had translated into Arabic all scientific and philosophical oeuvres that had been produced in Ancient Greek, Indian, Persian, Egyptian and Mesopotamian cultures. Therefore, the Islamic Civilization had become the cultural inheritor of all human history. However, the scholars of the Islamic Civilization, starting from its earliest period, had already endeavored scientific and philosophical activities even before they encountered the sources of elder cultures. When they acquired the science and philosophy of precedent civilizations via translations, they began to contribute to the cultural and intellectual accumulation that they inherited. Thus, by the tenth century, the human cultural inheritance was in the hands of the scholars who were gathered in eastern cultural centers of Islamic Civilization. By the second half of the ninth century, the caliph ‘Abd al-Rahmān II introduced and imported this Arabic science to Al-Andalus. Indeed, what he brought from east to west was the cultural inheritance of all human history. Therefore, the science and philosophy which were far away from the Western Christians came to their vicinity. Furthermore, the scholars in Al-Andalus, like their counterparts in east, contributed also to the development of sciences in the cultural centers as Toledo, Cordoba, Saragossa in Muslim Spain.

²⁴⁷ Gibb, loc.cit., p.85.

The consciousness²⁴⁸ of Westerners in respect to the Islamic Civilization was challenged when the Muslim conquests reached to Spain. On one side, they were face to their enemies. Until the arrival of Muslims in Spain, Muslims were their enemies because they were the followers of the Islamic religion. However, by the conquests, the Muslims became the invaders of their native lands. This hatred against Muslims brought in the consciousness of the other and also of the self-identity as far as Christians got acquainted with their counterparts. This consciousness would lead the Christians to launch the Crusades by the end of the eleventh century. On the other side, as long as the Christians and the Muslims cohabiting in Europe interacted, they got acquainted with each other. This interaction enabled Christians to recognize the intellectual superiority of their rivals. Thus, the consciousness gained a second aspect. That is the cultural consciousness. As a result of this kind of consciousness, two kinds of reactions were developed within the Christian society. Firstly, they aimed to add an additional way to defend the Christianity against Muslims other than the sword i.e. Peter the Venerable made prepared the Toledan Collection in order to form the doctrinal base for the Christian apology. By this way, he did not only provide the translations of the Qur'an and some Islamic religious texts but also incited Raymond of Bishop to accelerate the translations of Islamic thought. The aim of the Christian leaders was totally apologetic. Secondly, the Christians became conscious of the fact that the Muslims were much more advanced in science and thought and their possession could be a remedy for their deficiency.

3.2.2. Western Scientific Tradition vs. Islamic Scientific Tradition – Ninth to Eleventh Century

The Westerners recognized their deficiency in regard to the Islamic scientific tradition. However, it does not mean that they grasped at once the Islamic science.

²⁴⁸ Açıkgenç considers the consciousness of the other as an important phenomenon in the case of Western civilization. Indeed, in his system of scientific tradition he values in general the concept of consciousness, especially the scientific consciousness. According to him, scientific consciousness is a function of human's system of knowledge by which humans perceive science as a unity of organized body of knowledge. The scientific consciousness is a non-discernible part of human mind that owes a knowledge structure suitable for the pursuit of knowledge activities. In the Western scientific process, this concept has a peculiarity. As described the scientific consciousness was available in the Western scientific tradition since its early stages but it was in standstill. However, when the Westerners encountered the Islamic Civilization, the consciousness of the other stimulated the scientific consciousness.

Before dealing with this crucial question, it would be appropriate to remind what was the deficit of the Christian Europe at that period to better elucidate the contribution of these translations and their significance in the Western history of science. Therefore, we should return to the astronomy of the ninth century. Astronomy had been among the most crucial sciences in Europe since Charlemagne (d. 814), the emperor of the Carolingian reform (from the late eighth century to the ninth century). The reform was designed for religious purposes but it had also repercussions on the knowledge activities, especially on astronomy in accordance with its divine cause. In other words, the guiding principle of the reform was “*uniform adherence to authoritative standards*.”²⁴⁹ As a result, the calculation of the liturgical calendar (Easter and other feasts) and times of praying became among the important issues discussed at the court. To achieve the “*ritual uniformity*”,²⁵⁰ agreement and coherence on the day of the feasts and the times of prayer were the prerequisites. Indeed, they would remain the problematical questions that would occupy the cleric-savants for at least two more centuries i.e. until they would find the solutions in the Arabic science.

In respect to the determination of the Easter day and other feasts, the computus increased in importance. During the medieval times, the computus was used to calculate the date of the Paschal Full Moon and consequently the Easter. These calculations were based on arithmetic methods. At the time of Charlemagne, this instrument was taught to the clergy as a part of their curriculum. Furthermore, Alcuin of York (d.804), scholar at Charlemagne’s court, emphasized the studies of the computists and Pliny. Hence, astronomy based on arithmetic methods, as it is proposed by the computists represented the astronomical tradition that would remain predominant in Europe up to the eleventh century. Indeed, during the ninth and tenth centuries, the Christian scholars were able to calculate the date of the Paschal Full Moon that helped subsequently to calculate the Easter. Also, they could predict the solstices and the equinoxes. However, these estimations were far away from exact predictions i.e. the Western scholars could not determine exactly the date of the Easter and other feasts. Because, even though they utilized the computus in their calculations,

²⁴⁹ McCluskey, *Astronomies and Cultures in Early Medieval Europe*, p. 131.

²⁵⁰ *Ibid.*, p. 132.

they were taking in consideration the motion of the Sun and the Moon in their zodiac by their average motion. Thus, they used to ignore the effect of the variations from the average motion, as it was described by Ptolemy. As a result, they could not predict or even determine the exact day of Easter.

On the other side, concerning the times of prayer, the techniques of the clergy were based on observations of the Sun and the stars. During the daylight, they could calculate the time and observe the strength of the day. So it was relatively feasible to determine the ritual time. However, for the prayers during the night, they counted on simple observations of the course of Sun and the stars. In fact, they were - similarly to the Easter date - unable to give the exact times since they could not explain the changing length of the day and changing visibility of the stars.²⁵¹

Consequently, the clergy of the ninth and tenth century who were still attached to traditional methods of monastic timekeeping. However, the ecclesiastic tradition was not able to give them the required precisions related nor to dates of the feasts neither to ritual times. Besides, astronomy was in the curriculum of the monasteries. Nonetheless, the theoretical teaching did not help them to overcome the practical issues. The teaching of computus in the monasteries was supported by Pliny, Isidore and Capella's texts. Since, the astronomy taught at the schools were presented "*in a literary and artistic form rather than scientific and philosophical*"²⁵² manner, the clerics could not satisfy their practical needs from their teaching. Since the teaching astronomy was based on arithmetic techniques of the computus, they could not achieve to overcome the handicaps of their calculations and observations.

The Christian Western world could only remedy these defects when it encountered the Arabic science, most notably the astrolabe. The acquaintance with the astrolabe did not start before the first translations that appeared at Ripoll Monastery and the introduction of the Arabic astrolabe in the West at the end of the tenth century. The astrolabe was an instrument which was used to observe the celestial bodies. It ensured its user to measure the angular height of the celestial body i.e. star, the Moon,

²⁵¹ Ibid., p. 163.

²⁵² Ibid, p. 170.

the Sun or the planets i.e. it gave the height of the body in the sky in terms of degrees of angle in a given time. That is to say that, the astrolabe was an instrument that ensured the geometrical illustrations and explanations of celestial events and movements.²⁵³ Beyond its functionality of observation, it also served as a watch i.e. its user could compute the time during the day and also the night. Even, its model was appropriate to define the hour in case of unequal strength of days. Hence, when the cleric savants encountered the Arabic astrolabe and its texts at the end of the tenth century, they also found the remedy for their monastic timekeeping needs. This tool did not help them only to measure the time and to make much more appropriate predictions of celestial events, but also provided them astronomical data that they did not own hitherto. Indeed, they had been aware of the circular movements of the celestial bodies, the brighter stars of the constellations. However, their knowledge used to be descriptive rather than quantitative. But with the introduction of the astrolabe and the first translations, they learnt about the specific procedures of celestial circles, the names of the stars and their coordinates etc.²⁵⁴ The astrolabe and the first translations was the introduction of the astronomy based on geometry to the West. By the help of the Arabic tools and theories, the Western scholars became able to combine the theoretical and practical that was what we see in the teachings of Gerbert (described in the first chapter).

The first translations helped the Western scholars²⁵⁵ to get acquainted with the use and construction of the astrolabe. They were still at the stage to utilize this instrument for the practical monastic timekeeping and calendar calculation. Only Walcher of Malvern and Peter Alphonsi attempted to use the astrolabe and the knowledge surrounding it in the service of another knowledge that was medicine. The astrolabe brought also some astronomical knowledge into the Western world. The translations targeting to grasp the astrolabe included inherently knowledge related to the star tables, astronomical tables etc. that would preoccupy the Western scholars

²⁵³ Ibid., p. 171 – 174.

²⁵⁴ Ibid., p. 179.

²⁵⁵ Açıkgenç prefers to call the persons who are in sake of knowledge and pursuit of scientific activities as “scientific community”. In the framework of my thesis, I avoid this term as I deal only with the translations up to the twelfth century that belong to the disciplinary stage that corresponds to the pre-scientific era. So I use intentionally the word scholar for anyone involved in the knowledge activities.

during the eleventh century. As the astronomical tables were also used in astrological judgements and predictions it became current to study the astronomical tables for the cities of Western Europe. However, the translations of tenth and eleventh centuries could not extend its boundaries very much and remained limited within the astronomical and astrological corpus (treated in the first chapter).

The translation period would only achieve its zeal by the middle of the twelfth century. As it is stated by Açıkgenç,

“usually a movement which gradually unfolds itself into a period, does not begin at a whole-scale level rapidly; on the contrary, it begins very slowly, expands, verifies itself gaining thereby a momentum only gradually until it disseminates into the learning centres in almost every corner of the newly emerging scientific tradition.”²⁵⁶

The translations of the tenth and eleventh centuries present the phase of the translations in which the movement advances very slowly, in small steps. The earliest translations which appeared in the northern Spain spread to France within the astronomical and astrological corpus. The amount of translations might have been meagre but it produced its effects as we have seen that the astronomical corpus preoccupied the Western scholars up to the fifteenth century. The astronomical circulated through the network of scholars who were largely clerics. The monasteries such as Fleury, Micy were the milieu where the first clues of Arabic science were tested before its spread accelerated. The Western scholars i.e. the clerics at the monasteries studied, adapted and attempted to develop the writings that ensued from the translations. As far as the translations circulated among the community of scholars, the Arabic science gained its reputation. Especially, the teaching of Gerbert d’Aurillac played an important role in that sense. He was a scholar who did not only know the translations that circulated in France and Spain at his time, but also he had got some direct training from the Arabic scholars. He based his teaching of astronomy on the technics and instruments that he had acquired from the Arabs. As a master, he propagated his inspiration of Arabic science to his students such as Fulbert of Chartres who also became a master in the School of Chartres. Gerbert’s case is very illustrative in regard to understand how the Arabic learning and the scientific interest passed

²⁵⁶ Açıkgenç, *The Impact of the Islamic Scientific Tradition on the West*, p.35.

through the generations of scholars. Gerbert diffused to his students what he knew on the Arabic science and also the potential that this alien science could present to the Western world to remedy their scientific backwardness. Gerbert brought up a pupil like Fulbert of Chartres who would also infuse to his students what he learnt from Gerbert. The scholars of Western world began to be inspired from the Arabic science and spread its influence around their circles that would carry this inspiration to further generations. Moreover, itinerant scholars such as Peter Alfonsi and Abraham bin Ezra were circulating in the different cities of Europe and contributed to the infusion of Arabic science to the pupils thereby. Their efforts were not non-influential. Adelard of Bath would make a long journey in the sake of Arabic learning. His interest that was awakened by Peter Alfonsi would lead to make the earliest translations of the twelfth century. The diffusion of the translations and the scientific interest stimulated by the encounter of the Arabic science points out us the relevance of the sociological aspect of the history of science. The communication between the monasteries eased the translations' circulation in France. Moreover, the efforts of the Jewish itinerant scholars contributed to the diffusion of the taste of the new coming science. These two factors created a promoting trend within France towards the Arabic science.

The translations and the knowledge activities around these translations during the tenth and eleventh century can be evaluated within the acquaintance phase. Because the translations were very meagre and fragmentary. The inspiration of Arabic science was much more preponderant than the science itself.²⁵⁷ The cleric scholars tended towards the Islamic science for their practical needs. Moreover, the knowledge activities were closer to the stage of problems rather than the disciplinary stage during this period. They can be acknowledged as a simple pursuit of knowledge. But their incentive was rather technical/sacred. Thus, the Western scientific tradition was still

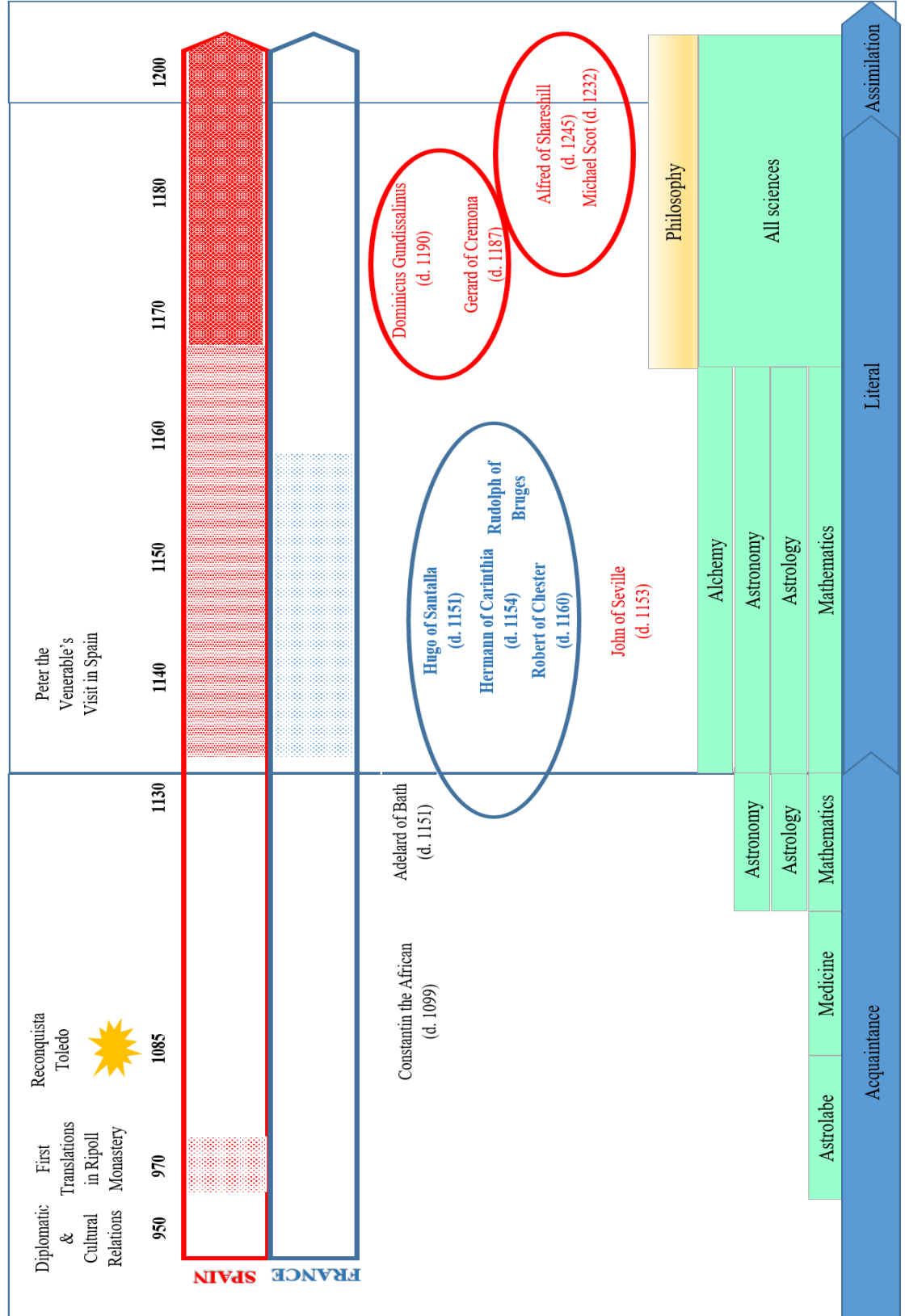
²⁵⁷ At this point, I would like to make a distinction. The Arabic science penetrated into the Western scholars mind at the beginning only by small pieces. However, the first meagre transmission sufficed to activate the curiosity of Western scholars. Therefore, for the beginning, we must keep in mind, on one side there was a few information transferred from Arabic to Latin, on the other side, this meagre amount of learning stimulated the interest for Arabic science that would revival the intellectual dynamism and the Western scientific interest. The Western scientific tradition which stayed at standstill since the emergence of knowledge tradition during the era of John of Scotus would be set in motion towards the disciplinary stage. Thus, I think it is important to bear in mind the impact of Arabic science's transmission by its double aspects: transfer of knowledge and the stimulation of the scientific interest.

far away from sake of knowledge for knowledge. However, the period esteems very highly as it prepared the suitable context for the further translations.

3.2.2. Western Scientific Tradition vs. Islamic Scientific Tradition – Twelfth Century

A century after the astronomical corpus depending on Arabic sources began to circulate in Western Europe, the translations entered in a new phase. It is the phase of literal translations which accelerated by 1130's and achieved its peak by the 1180's. The initial infiltrations of Islamic science did not only provide knowledge to the scholars in France, but also stimulated their scientific interest. Therefore, the Western knowledge seekers gained a certain intellectual dynamism when they arrived at the edge of the intense period of translations. The intellectual dynamism bore its fruit first in northern Spain and southern France, at the two sides of the Pyrenees. This region which had been a political, geographical and cultural intermediary between the Islamic Civilization and Western Civilization since the Muslim conquests, turned into a medium between the Islamic scientific tradition and Western scientific tradition. Therefore, the Group of Toulouse became active around the 1130's. The extent of this group's translations was very limited when it is compared by the translations made in Toledo. The Toledan translators who became active concurrently with their counterparts in northern Spain and southern France accelerated and condensed their translations after the 1150's. This center of Toledo achieved its zeal in 1180's. By the end of the twelfth century and beginning of the thirteenth century, almost all the Arabic oeuvres in the fields of astronomy, astrology, mathematics, medicine and philosophy including the Aristotelian corpus had been translated to Latin (see Figure 1).

Figure 1 The Translation Process from Arabic to Latin in Europe: 10th – 12th Centuries



The translations of the twelfth century enabled the Western scientific tradition to access to the scientific and philosophical inheritance of human history. Indeed, this is the way how the accumulation of knowledge was provided in the Western scientific tradition. According to Açıkgenç's approach, the scientific traditions ensure their accumulation of knowledge during their stage of problems. When the scholars begin to organize this accumulation of knowledge, the disciplinary stage or the stage of methods begins. However, the Western tradition was stagnated after its knowledge tradition had emerged and could not achieve the accumulation of knowledge. (As it is explained by Açıkgenç, the Greek and Islamic scientific traditions accumulated knowledge at their stage of problems.) If the worldview of a society is suitable for the pursuit of scientific knowledge, questions or problems emerge around which the scholars gather in order to explain. The efforts of the scholars result by emergence of a huge body of knowledge. The accumulation of knowledge occurs usually within the internal dynamics of the scientific tradition since the sake of knowledge is firmly linked to the worldview of the society. In the accumulation process of knowledge, the civilization may undertake some translations activities in order to grasp knowledge. By this way, the accumulation of knowledge is supported by an external dynamic. However, the reception of another culture's science and thought through translations pass through an assimilation process within the receiving culture. Indeed, as stated by H. Gibb, a receiving culture absorbs "the borrowed elements to the extent that they are adaptable to and blend with its native forces."²⁵⁸ In terms of Açıkgenç, the assimilation is possible only through the worldview of the receiving civilization. Indeed, it is the worldview which filtrates the knowledge acquired and re-formulates it accordingly to itself.

3.2.2.1. Accumulation of Knowledge in the Western Scientific Tradition

In the case of Western scientific tradition, the accumulation of knowledge took place not in the stage of problems, but in the disciplinary stage. This accumulation was

²⁵⁸ Gibb, loc.cit., p.87.

ensured by the translation period, especially the translations of the twelfth century. During this phase of the Western scientific tradition, translation became the most frequent method of knowledge acquisition. There were weak attempts to use other methods such as observation, experimentation, calculations etc. However, they were still not matured to produce knowledge. Thus, the Western scholars' main method of knowledge acquisition was the translation. As a method, the translation technics evolved during the translation period i.e. the translators of the tenth and eleventh centuries did not work in the same way as the translators of the twelfth century.

- First of all, the translations of tenth and eleventh centuries were not the translations of Arabic sources in their entirety. Rather, they were partial translations of Arabic books or treatises.
- These fragmentary translations were integrated in the Latin texts by different authors, rather compilers. Most of the time, the compilers gave place to the translations and added their own interpretations upon them.
- The difficulty of the corpus, the translators/compilers did not cite their Arabic sources and did not esteem to distinguish the translations and their interpretations. So, it requires a hard work on different manuscripts in order to detect the original translations and their sources.
- Transliterations of Arabic terms were very commonly used in the translations of the tenth and eleventh century. As there were no equivalents in Latin for all the Arabic terms, the translators suffice to transliterate the terms. Therefore, still today, there are many words of Arabic origin in the Western scientific language, most notably in astronomy and mathematics.
- The astronomical corpus began by presenting the description of the astrolabe and its use during its earlier period. Its construction which requires more technical understanding in terms of astronomy and geometry comes after, only in the second generation of the corpus. Most probably, the first translators/compilers were not able to grasp its composition to construct it.

However, during centuries (from the tenth to the sixteenth century), Western scholars kept on working this corpus by developing its content. The corpus extended

its sphere to France, Germany and England before the end of the eleventh century. All though their method to develop the corpus was not systematic, their attempt to acquire the deeper knowledge related to the astrolabe and their insistency make evidence of sake of knowledge. Thus, we can conclude that the translations of tenth and eleventh century were fragmentary transmission of Arabic knowledge to the Christian West. As the Western scholars were not mature enough, their first attempts only resulted by an initial and preparatory phase for the main translation period. Although the translations of the tenth and eleventh centuries did not achieve to introduce the Arabic science in its entirety to the Western world, they did precede considerably the arrival of Arabian astronomy as a whole.²⁵⁹

In regard to the translations of the twelfth century;

- Differently than the fragmentary translations related to the Arabic texts of astrolabe, the translators of the twelfth century translated the Arabic books in their entirety. It may be due to the development of Latin translators' linguistic skills in Arabic i.e. they must have improved their level of understanding of Arabic. Also, it can be evaluated as their advancement in their search of knowledge. They should have recognized their deficiency of systematization and understood what represented the whole of the picture i.e. the deepness of the Arabic treasury of science and philosophy.
- Additionally, both Hermann and Robert wrote prefaces to their translations, mentioned their patrons, discussed the subject matter of the book translated, drew attention to the Arabic science, gave openly the original Arabic names of the book and its author and tried to contribute to its diffusion in sake of scientific and philosophical acquaintance.
- Another difference, some translators endeavored their own writings. Mostly, they were inspired from the sources that they translated or that were translated in their entourage. Sometimes, they openly

²⁵⁹ Haskins, *Studies in the History of Medieval Science*, p. 115.

acknowledged their alien sources while sometimes they did not mention their references. I find the translators own writings very indicative as it was a sign of assimilation of Arabic science by the Western scholars.

- Some translators reworked the translations made by other translators preceding them or by their contemporaries. Some of the re-worked translations were in the form of literal adjustments. Or they were additions of the parts that had been not translated in the previous versions. For example, the Euclid's *Elements*. Adelard of Bath was its first translator. After his translation, there were detected two other versions; one of them belongs to Hermann of Carinthia and the other one to Robert Chester who added the proofs in his version. Indeed, the bulk of the translations of the Toulouse center was re-made or reviewed by the translators of Toledo. It can be linked to the Western scholars and translators intellectual level. As far as they deal with the new coming subjects from the Arabic science, their understanding must have been improved to grasp more and more knowledge. Another motivation of Toledan translators to re-work on the previous translations was also due to their translation method. The translators of Toulouse endeavored to a task that was of an upper level. While the translators of the tenth and eleventh centuries managed only to translate some pieces of Arabic oeuvres, the Toulouse center attempted to translate big scientific oeuvres. Moreover, the translators of Toulouse worked separately from each other. Hermann and Robert worked together but it was not a collaboration to translate together, rather between them there was division of oeuvres to be translated. So, they were alone, not accompanied by a Mozarab or Jewish who knew Arabic well or by an intermediary who translated to the vernacular. Hermann, Robert and Hugo knew Arabic and they translated directly to Latin. The Toledan translators had associates that were usually a Mozarab or a Jew. Therefore, they were much equipped than the Group of Toulouse. Subsequently, they became more apt to make more exact translations.

- In the translations of the twelfth century, there was a tendency to replace the transliterations by Latin terms. For example, when Robert of Chester revised Adelard's translation he tried to adapt Latin words for the Arabic terms used by Adelard. Indeed, the translators of the twelfth century were more sensible to create a Latin terminology. Hermann and Hugo, in their writings on the astrological meteorology, used the same terms.

As far as the translations were ongoing, the Western translators and scholars found themselves dealing with a huge amount of knowledge. Indeed, this is typical for the disciplinary stage. As a result of the knowledge accumulation, the scholars needed to organize the non-organized body of knowledge. The organization of the knowledge is made by methods. By the help of the methods, the spheres of the problems or questions are delimited. The accumulation of knowledge is classified and organized within the aggregations of knowledge organized around the problems and questions by the methods. Once each aggregation is defined and delimited, it turns into a discipline. The discipline emerges by the end of the disciplinary stage. Once the discipline crystallizes, the science emerges. This is the beginning of the naming stage and also scientific era²⁶⁰. Indeed, these processes which take place in the disciplinary stage did not occur in the Western tradition. When the Western tradition reached to its disciplinary stage, the sciences were already in place. Since Aristotle, the different fields of sciences came up and each of them had their methodology. As Western tradition adopted its accumulation of knowledge from an external tradition that was the Islamic one and as all the sciences had already been crystallized among the preceding the civilizations, it would pass through its disciplinary stage differently than the Greek and Islamic traditions.

²⁶⁰ The description of disciplinary stage depends on different writings of Açıkgenç. For further details, see in the bibliography.

3.2.2.2. Assimilation of Translations²⁶¹

During the disciplinary stage, there were some attempts for the assimilation. According to Açıkgenç, the worldview is the guiding principles of a scientific tradition. The development of the stage of problems, disciplinary stage and naming stage occurs within the framework of the worldview. Therefore, the scientific activities that are pursued in a civilization must be in accordance with its worldview. In case of transmission of science from one civilization to another, the receiving one should pass by an assimilation process that enables the alignment between the received science and its worldview. The science that the Westerners adopted from the Islamic tradition was based on Islamic worldview, so not compatible with the Western worldview. Therefore, the translators and scholars recognized the incompatibilities between the Arabic science and their worldview that was based on Christianity. Indeed, these incompatibilities were considered as dangerous by the ecclesiastical entourage.

As a reminder, the Church was still dominating the education system and was involved in scholarly activities²⁶² during the twelfth century. Therefore, the Church and the translations (not only transmission of Arabic science into Latin world but also a part of scholarly activities) cannot be treated separately. That is to say, the schools of monasteries and the cathedral schools were also under ecclesiastical rule. The masters, secular or regular were the clerics dependent to the Church. Besides, almost all Christian²⁶³ translators and/or scholars up to the twelfth century were ecclesiastical or at least had relations with the church. For example, Hugo of Santalla was a canon in one of the cathedrals in Tarazona in 1145. Robert of Ketton occupied several ecclesiastical posts respectively archdeacon in Pamplona in 1143, principal chaplain

²⁶¹ The assimilation process of translations in the Western scientific process spread over centuries. Once the translations were achieved, it was received among the Western scholars at the time. The scholars grasped the Islamic science and then, they tried to adapt it in their mental structure. This adaptation started by the scholars who received firstly the translations and pursued by their pupils. The task was diffused among generations. Therefore, the scholars and the schools around which the pupils were gathered played a crucial role in the beginning of assimilation. Indeed, the Western scientific tradition would submit to the assimilation most strikingly starting by the thirteenth century. This phase is not included in the frame of this study. However, I intend to describe the first clues of assimilation of translations within the Western scientific process.

²⁶² By scholarly activity, I denote the activities that seek to acquire and produce science and philosophy. As the Western scientific process was still in its pre-scientific era and was not yet in the scientific phase, as described by Açıkgenç, I avoid intentionally the expression of “scientific activities” and use “scholarly activities”.

²⁶³ Some translators were Jews.

of the King of Navarre and canon in the church of Toledo in 1157. Dominicus Gundisalvi also worked for the church; archdeacon in the zone of Cuellar and canon in Segovia and Toledo. There are also some archival documents that prove Gerard Cremona's relation to ecclesiastic entourage. In Spain, despite the translators were in firm relations with the ecclesiastic organization worked more independently on the translations than the scholars who would attempt to assimilate the translated science and philosophy in France, most notably the masters in the *studium* in Paris. In Spain, the translations were held by the followers of the three religions i.e. Muslims, Christians and Jews. The translators of Toledo benefited from the multi-cultural context of their city which provided them a "*relative intellectual freedom and intercultural florescence.*"²⁶⁴ The Spanish Church's position was to defend and maintain the cultural plurality although the church of the northern France imposed conservative attitude towards the Islamic science. This conservation would be reflected most strikingly when the Church banned the Aristotelian oeuvres in 1215 in Paris. During this phase of the translations (twelfth century), the Church was very influential on the translations. While, at the beginning, it supported the translations for apologetic purposes, it changed its position as far as the Islamic philosophy began to penetrate to the extent that the restrictions were issued. Beyond the Church's official policy, the Christian faith influenced largely the assimilation phase of the translated science. The translators and scholars would attempt to adapt the translated science to their Christian worldview. This task would achieve its zeal by the thirteenth century however its initial tentative was seen already in the translators/scholars of the twelfth century. Before dealing with the first attempts of assimilation, it is required to explore the contribution of twelfth century translations.

The translations of the twelfth century reflect us how the Western scholars' inclination in the sake of knowledge evolved. During the first half of the century, the main fields of interest were astronomy, astrology, meteorology, geometry, arithmetic and alchemy. Among their translations, there was no philosophical oeuvre which was translated. In appearance, the first clues of the natural philosophy of Aristotle penetrated. But it was rather indirectly, by intermediary of Ab Ma'shar's oeuvre

²⁶⁴ Reichert, loc.cit., p. 50.

Introductorium Maius. Its translators, neither Hermann nor Jean of Seville did not translate it as a result of their awareness of its Aristotelian content or in the sake of natural philosophy. It was not beyond their interest of astrology. At this stage, astronomy was still studied together with astrology that was at its zeal in terms of scientific reputation. The translations of the first half of the twelfth century that were made by Hermann, Robert and Adelard of Bath spread quickly in France, especially to Chartres. Their translations already reached to the schools of France during the first half of the twelfth century. Hermann sent to the scholars of Chartres (Thierry and Bernard Silvestre) the translations that were made by Robert and himself. Also, Hermann sent to Bernard Silvestre an oeuvre called *Experimentarius*. Adelard who largely he made his translations in England taught also at the School of Chartres. So, he diffused himself the Arabic science inspiration through his teaching.

The translations coming from Spain and southern France created a demand in the Western schools. By Western schools, I mean the available cathedral and monastery schools especially at Paris and Chartres. Since, there was no Western-Christian school in Spain that had a liberal art curriculum. These schools were demanding both apologetic and philosophical oeuvres. The earliest translations of Plato of Tivoli, Adelard of Bath and the group of Toulouse had already produced its effects in Chartres. Hermann of Carinthia, Bernard Silvestre, Guillaume of Conches and Thierry of Chartres had already reshaped their teaching under the earliest translations. The works of these scholars had already inspired other scholars and students in France so that they were less demanding astronomical knowledge than cosmologies and systems that would lead them to metaphysical and abstract thinking.²⁶⁵

Meanwhile, Toledo came into scholarly live and gained the upper hand in terms of translation activities. The translators of Toledo were mainly working in the same fields as their predecessors: astronomy, astrology, geometry, arithmetic, medicine and alchemy. These translations produced some effects in Western scholars' approach to sciences. For example: they had been already familiar with mathematics, most notably

²⁶⁵ Lemay, loc.cit., p. 659-660.

arithmetic that they had been following from Boethius. However, the geometry and arithmetic that they adopted from the Arabs rendered them conscious in the role of mathematics to understand the nature. Therefore, they tried to grasp the mathematics that they inherited from the Muslims as a demonstrative supplementary science in service of the natural sciences. Another example is the Western natural approach. Before the penetration of Arabic science, the School of Chartres had been arguing about the Soul of the Nature. Their argumentation was inclined to mysticism and remained attached to the Bible. When the Muslims lost the sovereignty in Spain, they left behind them a treasury of science and philosophy that they carried from the preceding civilizations and developed since the second century of their civilization. The translation of this whole corpus of human culture could be gradually translated and assimilated. Western scholars' understanding of the translated oeuvres evolved through time. Due to their mental level at the beginning of the translation period, firstly they were only interested in the mystical aspects of the nature. When the first Hermetic oeuvres from Arabic were translated, it enabled some changes in Chartrain naturalism, this latter turned towards occultism i.e. gnosis was applied to the forces of Nature and to their relations with human's destiny.²⁶⁶ In the context of the twelfth century, experimentation was to search for the mysterious power over the supernatural forces or to predict the future of all beings. Indeed, that was what the Western scholars could infiltrate from the whole scientific ensemble coming from the Islamic tradition.

This filtered view would not change until the Western scientific tradition would assimilate the natural philosophy of Aristotle. However, there was no translation from Aristotle's philosophy until Gerard of Cremona, end of the twelfth century. In other words, within the translation period which started about the end of the tenth century, the Aristotelian translation came only towards the end of the twelfth century. Only the transmission of Aristotle to the Latin world would awaken the Western thought from its mystical apathy.²⁶⁷

The knowledge seekers of the twelfth century tried to adapt the translated science and philosophy to their worldview since the twelfth century. We see the first

²⁶⁶ Ibid., p. 656.

²⁶⁷ Ibid., p. 656.

attempt in that direction in Hermann's *De essentiis*. In his cosmology, he endeavored to make a synthesis of his Latin and Arabic learning. Another attempt of Hermann to assimilate the Arabic science can be seen in his approach to the classification and hierarchy of sciences. He was inspired from al-Fārābī's system that he described in his *Kitāb al-tahsīl al-sa'āda* (The Attainment of Happiness). First comes the mathematical science (arithmetic, geometry, astronomy and music), secondly physics and finally theology. Hermann established his approach on speculation upon this system. In his approach of speculation, there were three elements; reason can explain how the universe was put together, demonstration can explain the universe's disposition and the intellect can explain the governing cause. Each of them had their own method; reason works with plausibility, demonstration works with necessity and intellect works with intuition. In the method which he retained he took the reason as the method for physics and the demonstration for the mathematics while he left out the intellect.²⁶⁸ Another translator/scholar who tried to contribute to the organization of sciences is Gerard of Cremona. He was also inspired from al-Fārābī's system. Gerard did not only translate his oeuvre *On the Classification of Sciences*, but also followed the enumeration of sciences in this oeuvre. That was the way he determined what he should translate for a complete transmission of Aristotelian philosophy. Hermann and Gerard's works on the classification of sciences indicates us their attempts to organize the body of knowledge that was under the translation process. This was typical and appropriate to the disciplinary stage. However, it was not only a simple organization of knowledge. The classification had connotations with the way of reasoning which was also peculiar to the worldview. Therefore, this issue also required an assimilation. Hermann and Gerard tried to launch it but at this stage, their tentative was still premature.

In regard to the assimilation process, some of the translators (Hermann of Carinthia, Dominicus Gundassalinus etc.) composed their own writings. In these writings, they were inspired from their Arabic source (like Hermann) or used the translations of Arabic sources without citing their original authors. For example,

²⁶⁸ Burnett, Hermann of Carinthia, p. 391–392.

Dominic Gundassalinus copied a big portion from al-Fārābī's *Kitāb ihsā' al-'ulūm* and inserted in his *De divisione philosophiae*. He also used the oeuvres of Boethius, Ibn Sīnā and Al-Ghazālī without making the annotations. Today, this kind of annotations is condemned as plagiarism. L. Baur who edited Dominic's *De divisione philosophiae* notes,

“this working method in form of compilation of Gundassalinus is alien and inaccurate to us. However, this was, in general, the method of Late Ancient era and Medieval Ages. I believe that it must be considered within a very strict correlation between this kind of writing activity and the philosophical understanding of knowledge and doctrinale exercise that distinguishes the Ancient and Medieval Ages from the Modern times.”²⁶⁹

Also, in regard to the Medieval manner of thought, L. Baur states,

“There, we encounter a philosophy that accepts the existence of the knowledge of truth that is certainly and objectifly real and unchangeable. All scientific interest is concentrated on the truth that it takes as target and it seeks to reveal the truth that has absolute certainty. They (the knowledge of truth) were seen as common property, the question who found it was not esteemed.”²⁷⁰

The use of Arabic sources in a way that we take as plagiarism today was not limited to the translators. Other Western scholars adopted also this method. Contrarily, within the Islamic science, a tradition of annotation (*Sharh* and *Hashiye*) was achieved. Western translators got acquainted with this kind of methodology through the translations (example of Maslama's notes on *Planispherium* that was translated by Hermann). However, it seems that it would take time that the Western scholars became sensible in regard to annotations.²⁷¹

In the Western tradition, until the twelfth century, the sake of knowledge was based on authority. The introduction of the Arabic science began to challenge the minds of the scholars. Its first sign can be seen in Adelard and Hermann who questioned the supremacy of authority over reason. Both of them discussed the rule of authority in sciences and declared their position for the supremacy of reason. It can be evaluated as a small path in challenging the tradition of authority. Perhaps it did not produce important effects in short term, but at least the germs for sake of knowledge guided by reason were seeded. It was the first signs to leave the authority aside and to

²⁶⁹ Sezgin, *İslamda Bilim ve Teknik*. Vol. I., p. 141.

²⁷⁰ *Ibid.*, p. 142.

²⁷¹ I think that the roots of this dichotomy between Islamic and Western traditions should be inquired in the epistemology of the two traditions.

turn towards reason and experimentation in the sake of knowledge. Furthermore, the translations of John of Seville introduced the well-defined methods of Arabic astronomy to the Western world. He transmitted to the Western scholars the astronomy with its specific problems such as the movements of the eighth sphere, the construction of the astrolabe and the establishment of astronomical tables and also astrology with its questions such as the design of natural and supernatural causes. Indeed, the scholars had already got acquainted with these questions since the first translations. However, Jean of Seville's originality was to bring in the methods within the Arabic science that gave to this latter its exactitude.²⁷² However, the efforts of Adelard, Hermann and John to introduce the methods of the Arabic science remained merely as a premature attempt.

The pursuit of knowledge was not activated in the Western civilization until the Islamic science penetrated via the translations. That is to say, the translations were part of the Western scientific and philosophical tradition. In the medieval Europe, the Western knowledge seekers were ignorant of the ordinary methods to grasp knowledge such as observation, experimentation etc. Furthermore, their sources were limited to the compilations excerpted from the Roman Schools, especially infiltrated from Martianus Capella and Bede. In other words, the Westerners did not have means that would provide them new knowledge and stimulate their scientific interest. The status quo would not be challenged until the translations from Arabic to Latin became recurrent. The works of the translators provided the knowledge that was necessary to activate the Western minds. The accumulation of knowledge that was indispensable for Western scientific and philosophical achievement came from the labors of the translators. The accumulation of knowledge that is expected in the scientific tradition occurred by the translations from Arabic to Latin during the twelfth century. For this reason, it is convenient to consider the translations as a part of the scientific process in the West. As it was a part of the scientific process, its course could not be independent from the scientific process. As the process achieved i.e. the Western tradition passed from the stage of problems to the disciplinary stage, the translations evolved. Açıkgenç, epistemology of science depends basically to the human structures of the

²⁷² Lemay, loc.cit., p. 661.

mind. Among the mental structures, the knowledge structure is critical to the scientific process. This latter also evolved during the further achievements in the process. In the Western case, the knowledge structure should have developed to the extent to grasp more and more knowledge from the Islamic science. Therefore, along the translation period, the translations were intensified and the works of translators changed its form. The translations of the tenth century were fragmentary. The translators might not have been able to translate and grasp the entirety of the Arabic oeuvre. These translations, at the beginning, were only including the description of the astrolabe and its use. The texts on its construction came only latter. Then, the translations of the first half of the twelfth century were illustrative in terms of the development in the acquisition of knowledge. The translators managed to translate the totality of the oeuvres and they became sensible to write prefaces. In regard to the second half of the twelfth century, firstly, the translations increased in number. Secondly, the translators undertook the revision of the translations that had been done by their colleagues. Moreover, some translators began to compose their own books under the Islamic science influence. Another aspect that interconnects the Western scientific process and the translations; at the beginning the Western scholars were ignorant about the content of their Arabic sources. Their ignorance, initially, was due to the Arabic language. However, the Arabic language was not the only obstacle. When the literal translations were done, the Christian minds were not ready yet to absorb the knowledge. The evolution of technical vocabulary was its most striking indication. The initial translations contained more transliterations in the earlier translations although along the translation period the transliterations were replaced by Latin verbs. Therefore, the translations entered also into the process of assimilation. The oeuvres written by the translators were an important sign of assimilation. However, the essential assimilation would begin only in the thirteenth and fourteenth century.²⁷³

The translation period brought into the Western scientific process an immense accumulation of knowledge. Its role in the stimulation of the Western tradition is

²⁷³ I acknowledge the assimilation is an indispensable part of the translation period and the main assimilation took place in the thirteenth century. However, I do not include it in the frame of this study. Because the assimilation that would be achieved was based on a transformation in the Western tradition that was the rational sake of knowledge i.e. the transition to the scientific era. This issue cannot be treated within a short term Project such as a master thesis.

undeniable. However, the translators and scholars of the period still considered the rational study of nature as a stage in the pursuit of the knowledge of God. Thus, this period was rather a bricolage than a scientific achievement.²⁷⁴ Nonetheless, it was thanks to the translations that the Western scientific tradition got away from the pre-scientific stage and passed to the scientific era.

²⁷⁴ Jacquart, Danielle. "Quelle histoire des sciences pour la période médiévale antérieure au XIIIe siècle ?" *Cahiers de civilisation médiévale* 39, no. 153 (1996), p. 97.

CONCLUSION

The aim of this thesis was to argue that the translations from Arabic to Latin in the tenth, eleventh and twelfth centuries were part of the Western scientific process. It is crucial to bring forward this assumption as it allows us to posit the translations in the Western scientific process and respectively, to better understand the influence of the Islamic scientific tradition on the Western tradition. The available studies conducted in this field emphasize only one aspect of the translations (acquaintance, literal and assimilation) that avoids us to see the place of translations in the entire picture, that is the Western scientific tradition. Therefore, any attempt to better understand the impact of the translations on the Western scientific tradition should adopt a holistic approach. This approach inherently brings in the foreground France as a non-negligible actor in the translation process. By the help of the insights that are provided by a France-focused analyse of translations, a holistic view contributes to elucidate the place of translations in the Western tradition.

The first chapter has shown that the translations appeared in the ongoing scientific process in the West. In appearance, the process was in standstill as there were no new achievements in the scientific and philosophical fields. However, as stated by Açıkgenç, the Western tradition had already its worldview suitable for the knowledge activities and a knowledge structure in place before the Westerners met the Islamic science. When the diplomatic and cultural agents witnessed the Arabic accumulation knowledge, they got the first pleasure of Islamic science. This opened the way to prepare the Western minds for its reception. So, when the Arabic texts about the astrolabe, its use and construction were translated, there was already a scientific interest susceptible to recognize and perceive them. At that stage, the Christian scholars were not mature enough to grasp at once the astronomy and astrology that were offered them by the Muslims. Therefore, they infiltrated what they received accordingly to their intellectual level and practical needs. At the edge of the eleventh century, the cleric savants were unable to determine with exactitude the date of the Easter and times of night prayers. So, they undertook first the astrolabe and the texts about this instrument which would remedy their deficiency in practical monastic

timekeeping and calendrical issues. Moreover, they made a compilation on the first translations and on the Arabic astrolabe which enabled them to form the astronomical corpus. This corpus depicts us that Christian scholars had already a scientific interest that was animated by the earliest penetration of Islamic science's bits. It did not only activate the pursuit knowledge but also spread to a broader extent the Arabic learning inspiration.

The second chapter reveals us France's contribution to literal translations and its role on the Toledo centre of translations. Firstly, it explains us how the cultural barrier between the Western scholars and the Islamic science was overcome. By the beginning of the eleventh century, the Christian world was challenged by the Crusades. Meanwhile, Peter the Venerable, from the Cluny order of France origin headed a project to found the doctrinal apology against the religious rivals. This Cluniac abbot did not only encourage the translations of some religious Islamic texts, including the Qur'an but also motivated Raymond, Archbishop of Toledo to engage in a similar work in Toledo. Thus, Raymond eased the context for translations in Toledo and even, stimulated the philosophical translations from Arabic oeuvres. The actors from France pushed forward the activities of Arabic science transmission. In addition, the impulsive actors were not restrained by the high level clerics. The Frankish clerics interested in learning flocked towards Toledo and acted as the enthusiastic customers who would in turn carry the translations to the intellectual centres in France.

Besides, France gave birth to the Toulouse group of translators. This nexus of translators became active a little before Toledo, around 1130's. This group constituted a middle period between the fragmentary translations of the tenth century and dense transmission of the twelfth century. The translators of Toulouse worked mainly on astronomy, astrology, mathematics and alchemy. This group started to feed the School of Chartres with the Islamic science even before Toledan translations circulated. It was effective in diffusing the Arabic science influence in northern France. Furthermore, Hermann of Carinthia made the first attempts to adapt the Arabic science to the Western tradition. In that sense, he can be reckoned among the pioneers.

The translators of Toulouse were in contact with their counterparts in Toledo, especially with John of Seville who was their contemporary. The bulk of the translations from Arabic were completed in Toledo until the end of the twelfth century and beginning of the thirteenth century. Therefore, Toledo, as a translation centre, attracted attention among the modern academic environment. However, the labour executed in Toledo depended largely on the context in France. In turn, the translations of Toledo would pass very quickly beyond the Pyrenees and penetrated into the schools of France. In appearance, France's share in translations seems to be weak. But an inquiry including the circumstances preceding (acquaintance) and proceeding (assimilation) the translations can only reveal accurately France contribution to the transmission of Arabic science. This kind of approach is indispensable to improve our understanding of the whole transmission process.

The third chapter is an attempt to position the translations of tenth and twelfth centuries from Arabic to Latin in France within the Western scientific process. When Christians encountered the science in the hands of Muslims, they were in a standstill, there was no creative scientific or philosophical activity in the western world. Although they owned the Christian worldview and a knowledge structure suitable for scientific activities, their knowledge activities were fruitless. The evaluation of translations according to Açıkgenç's model shows us that the Arabic science transmission revitalized the scientific interest in the Western world. The inquiries in the field show that the number of translations in France was limited. However, the evaluation of translations by a holistic approach enables us to position the transmission phenomenon in the Western scientific process. The Western tradition was suddenly donated by an immense cultural inheritance. Firstly, the Western scholars were merely able to benefit from the Arabic science accordingly to their intellectual level and practical needs. They tended towards more sophisticated knowledge only by the 1130's. Their attempts to grasp the Arabic astronomy, astrology and cosmology remained rude. Afterwards, the later translations in Toledo were a considerable achievement in the sense that they ensured the reception of the Islamic science in the Western scientific process. Nonetheless, its assimilation would constitute another phase of the Western scientific tradition. The translators/scholars works were small

endeavours in that direction but they did not suffice. The Western scholars were still concentrated on the mystical aspects of the study of the nature.

This study extends our view on the place of the translations between tenth and twelfth centuries within the Western scientific process. It traces especially the acquaintance and literal phases of the translations and makes a short introduction to its assimilation phase. Differently than the generalistic works on translations, it adopts a holistic approach that reflects more accurately, appropriately and thoroughly how the Islamic Civilization's scientific process influenced the Western Civilization's scientific process. It emphasizes that the translations of scientific works from Islamic tradition to the Western tradition is not merely a literal task of knowledge transfer from one language to another or more broadly from one culture to another. As the scientific process of a civilization depends on the worldview which is peculiar to its own human epistemology, the translations between the Islamic and Western civilization involves also a filtration, adaptation and digestions process. The translations represent an acquisition of an immense body of knowledge for the Western tradition. Therefore, it is firmly linked to the Western epistemology. As explained, the omission of annotations in the Western tradition reflects a dimension of the epistemology that was current in the Medieval ages. The translation process was not independent from the Western epistemology. Thus, this subject needs further investigations. A comparison of Islamic and Western epistemologies from a perspective of the translation process can provide as more insights on how the Islamic tradition influenced the Western tradition. This kind of research will help us to solidiy the framework to study the translations of scientific and philosophical oeuvres from one civilization to another.

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