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EFFECTS OF THE ARAB-ISLAMIC WORLD ON THE
ENCYCLOPEDISTS OF MEDIEVAL BRITAIN

T.R.
AKDENİZ UNIVERSITY
MEDITERRANEAN CIVILISATIONS
RESEARCH INSTITUTE

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Department of Mediterranean Medieval Studies
Doctoral Thesis

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AKDENİZ ÜNİVERSİTESİ

AKDENİZ UYGARLIKLARI ARAŞTIRMA ENSTİTÜSÜ MÜDÜRLÜĞÜNE

Ramazan ÖZBAY'ın bu çalışması jürimiz tarafından Akdeniz Ortaçağ Araştırmaları Anabilim Dalı Doktora Programı tezi olarak oy birliği ☐ oy çokluğu ☐ ile kabul edilmiştir.

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T.C.
AKDENİZ ÜNİVERSİTESİ AKDENİZ UYGARLIKLARI
ARAŞTIRMA ENSTİTÜSÜ TEZ ÇALIŞMASI ORJİNALLİK RAPORU
BEYAN BELGESİ

AKDENİZ UYGARLIKLARI ARAŞTIRMA ENSTİTÜSÜ MÜDÜRLÜĞÜ'NE

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Prof. Dr. Arda ARIKAN

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ABSTRACT

Throughout history, the Mediterranean basin has served as a home for many civilizations. With the birth of Islam, it became a stage for more cross-cultural interactions. These interactions not only helped the advancement and sophistication of Islamic science but also set the course for the emergence of its traces in Europe. The aim of this thesis is to examine the influence of works written by Islamic scholars on encyclopedias written in 13th-century Britain and elucidate the channels through which it was transmitted. In order to conduct the research, the thesis employs multiple methods, such as comparative textual analysis, source criticism, philological analysis, and historical analysis to find identical or close parallels between Latin manuscripts and Arabic treatises. As for the limitations, this thesis is limited to 13th-century British encyclopedias and Islamic scholars' works. On the other hand, some manuscripts subject to the analysis are missing or incomplete, therefore the research also relies on the latterly translated versions, facsimiles or modernized transcriptions. Regarding the research questions, this thesis focuses on three questions. It probes whether information attributed to Constantinus Africanus in encyclopedias such as Bartholomeus Anglicus's *De proprietatibus rerum*, Roger Bacon's *Opus majus*, and Alexander Neckam's *De naturis rerum* originates from Islamic scholars, and if yes, what specific works they are. The analysis strongly suggests that the related attributions derive heavily from Ibn al-Jazzar's *Zād al-Musāfir*, Al-Majusi's *Kitab al-Maliki*, Hunayn ibn Ishaq's *Kitab al-Ashr Maqalat fil-Ayn*. Also, it investigates how these ideas travelled from Islamic lands to Britain, and these works route from Islamic centers, particularly Baghdad's and Kairouan's Bayt al-Hikmahs to Britain via Salerno, Monte Cassino, and travelling scholars, one of whom is Constantinus himself. By recording these transmission routes pertaining to the Mediterranean, the thesis achieves balance as it is neither Eurocentric nor fully Eastern. Rather, it reveals interdisciplinary medieval scholarship.

Keywords: Medieval Mediterranean History, Medieval British Literature, History of Science, Constantinus Africanus, Encyclopedism

ÖZET

Tarih boyunca Akdeniz havzası birçok medeniyete ev sahipliği yapmıştır. İslam'ın doğuşuyla birlikte bu bölge daha fazla kültürlerarası etkileşime sahne olmuştur. Bu etkileşimler yalnızca İslam biliminin ilerlemesine katkı sağlamakla kalmamış, aynı zamanda Avrupa'ya uzanmasının önünü açmıştır. Bu tezin amacı, İslam bilim insanları tarafından kaleme alınan eserlerin 13. yüzyıl Britanyası'nda yazılan ansiklopediler üzerindeki etkisini incelemek ve bu eserlerin hangi kanallar aracılığıyla aktarıldığını açıklamaktır. Bu araştırmayı yürütmek amacıyla tez, Latin elyazmaları ile Arapça risaleler arasındaki birebir veya yakın paralellikleri tespit edebilmek için karşılaştırmalı metin analizi, kaynak eleştirisi, filolojik analiz ve tarihsel analiz gibi çeşitli yöntemleri kullanmaktadır. Tezin kapsamı, 13. yüzyıl Britanyası'nda yazılan ansiklopediler ve İslam bilim insanlarının eserleri ile sınırlıdır. Öte yandan, analiz konusu olan bazı elyazmaları eksik veya kayıp olduğundan, araştırma ayrıca sonraki dönem çevirilerine, tıpkıbasım nüshalara veya modernleştirilmiş transkripsiyonlara da dayanmaktadır. Araştırma soruları ise üç temel soruya odaklanmaktadır. Öncelikle, Bartholomeus Anglicus'un *De proprietatibus rerum*, Roger Bacon'un *Opus majus* ve Alexander Neckam'ın *De naturis rerum* gibi ansiklopedilerinde Afrikalı Konstantin'e atfedilen bilgilerin kaynağının İslam bilim insanları olup olmadığı ve eğer öyleyse, hangi eserlerinden türediğini incelemektedir. Analizler, ilgili atıfların büyük ölçüde İbnü'l-Cezzâr'ın *Zâd al-Musâfir*, Ali bin Abbas el-Mecusi'nin *Kitâb al-Mâlikî* ve Huneyn bin İshak'ın *Kitâb al-Ashr Maqâlât fil-'Ayn* adlı eserlerine dayandığını güçlü bir şekilde ortaya koymaktadır. Ayrıca, bu fikirlerin İslam topraklarından Britanya'ya nasıl ulaştığı bu tezin diğer bir araştırma konusudur. Çalışma, söz konusu eserlerin özellikle Bağdat ve Kayrevan'daki Beytü'l-Hikme merkezlerinden hareketle Salerno, Monte Cassino ve Afrikalı Konstantin'in de dahil olduğu gezgin bilim insanları aracılığıyla Britanya'ya ulaştığını göstermektedir. Akdeniz'e dair bu aktarım güzergâhlarını belirleyerek bu tez ne Avrupa merkezli ne de tamamen Doğu odaklı bir yaklaşım benimsemektedir. Aksine, Ortaçağ bilim dünyasının disiplinlerarası niteliğini ortaya koymaktadır.

Anahtar Kelimeler: Ortaçağ Akdeniz Tarihi, Ortaçağ İngiliz Edebiyatı, Bilim Tarihi, Afrikalı Konstantin, Ansiklopedizm

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SYMBOLS AND ABBREVIATIONS

Arch.:	Archieve
Art.:	Article
C.:	Circa
Cat.:	Catalogue
Ch.:	Chapter
De Prop.:	De proprietatibus rerum
Disc.:	Discourse
Dist.:	Distinction
Fol.:	Folio
Fn.:	Footnote
K. al-Malikī:	Kitāb Kāmil al-ṣinā‘ah al-ṭibbīyah, al-ma‘rūf bi-al-Malikī
Maq.:	Maqala (Discourse)
MS:	Manuscript
MSS:	Manuscripts
N.:	Notes
No(s).:	Number(s)
Ibid.:	In the same place
Panteg.:	Liber Pantegni
Trans.:	Translation
Viat.:	Viaticum eregrinantis
Vol.:	Volume
Zād al-Musāfir:	Kitāb Zād al-Musāfir wa-Qūt al-Hādir

FOREWORD

The Mediterranean basin has hosted significant scenes in history. In this thesis, we explore once again the role of the Mediterranean as a bridge, molded and developed through the legacy of ancient civilizations, Islamic science, and English literature. There are various studies focusing on the brilliance of this geography in terms of scientific research; however, its journey influencing a far land, Britain, is not a common topic depicted. What made me choose this interdisciplinary thesis topic was actually the chronic cluster headache that I have suffered for years. While researching modern medical articles about the cause and treatment of this unresolved pain, I encountered works mentioning scholars such as Galen, Ibn al-Jazzar, and Bartholomeus Anglicus. When I read deeper, I found out that the similar or even identical definitions existed under the name of different scholars for the very same knowledge. At that moment, the idea of cultural transmission of knowledge and the influence of Constantinus Africanus emerged as an ideal topic to explore since he was the main citation emerging for what I searched for. Despite the late hour in the middle of the night, I texted to my supervisor, Prof. Dr. Arda Arıkan, informing him that I had found my thesis topic. My excitement resonated with him, and we began the study.

Hence, in this challenging study, I would first like to express my profound gratitude to my supervisor Prof. Dr. Arda Arıkan for his boundless support, for promptly reaching my aid whenever I struggled, for never letting my motivation wane, and for always believing in me. I feel truly fortunate to have had the privilege and honor of being his student, and I will keep this proud throughout my life. I would also like to express my heartfelt thanks to our department chair, Assoc. Prof. Dr. Ekin Kaynak İltar, from whose invaluable knowledge I have consistently benefited and who never withheld her support without a hesitation during my difficult times. And I would like to highlight my deep gratitude to Prof. Dr. Ömer Şekerci, who, from the very beginning to the very end, kept me feel secure and confident with his critical guidance and expanding my vision and strength in writing this thesis.

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Ramazan ÖZBAY
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INTRODUCTION

In the context of the historiographical perspectives labeled as biased toward either Western or Eastern orientations, the scholarly pursuit of the history of science necessitates a careful examination of resources in a comparative manner. Detached from a discriminatory approach, the most robust composition of the history of science involves historians tracking the course of events by documenting the truth while leaving open the possibility for all scenarios without overlooking the perpetual exchange among civilizations. Acknowledging that cultures do not exist in isolation but rather evolve in constant interaction with others is essential for serving the impartiality required by the discipline of history. Hence, there is observable evidence of historical narratives being approached with a biased lens, driven by nationalist sentiments or religious motives. Looking beyond the Eurocentric focus of these debates, a comprehensive examination of world history reveals that, contrary to the prevalent historiographic narrative, the Middle Ages represented a robust scientific exchange with the Islamic world that served as a resource bank for the medieval monk, the scientist.

The Mediterranean served as a hub for cultures and ideas throughout the process from the Ancient Age to the development of Islamic science and its transmission to Europe. The Mediterranean was and still is a region where cultures merge, as illustrated vividly by Fernand Braudel, the standing historian of Mediterranean. While civilizations were at the core of this area, its identity exists where different people are connected over periods of time. This perspective was stronger with regards to geographic features and environmental as well historical transformations of processes that built the societies of the Mediterranean.¹

¹ Within the frame of Mediterranean studies, Fernand Braudel (1902-1985) is considered to be the most remarkable historian, who is also the second-generation leader of Annales School. His “Long

With this context in mind, the Islamic civilization's integration of new ideas and knowledge was not self-contained events but rather a whole history of the Mediterranean region's unity of cultural integration and knowledge integration phenomena. From this viewpoint, the relationship between Europe and the Islamic civilizations at the Middle Ages is just one event in history where ideas circulated around the Mediterranean Sea rather than the world without Europe, which greatly benefitted from such interactions. Thinking of Mediterranean Sea together as space allows us to reason exchange of Islamic knowledge to Europe is not a particular event but rather part of a logically complex history irrespective of nationalistic or religious confines, guiding fundamental as well as changeable boundaries.

Within the Muslim community, the conquest of Alexandria in 642 under the command of Amr ibn al-As ibn Wa'il al-Sahmi made a turning point in scientific endeavors, propelling momentum. Islam's expansionist policies, manifested through military campaigns and triumphant conquests, facilitated the extension of Islamic civilization from North Africa to the Iberian Peninsula. The repercussions of Islamic dominion in Al-Andalus, lasting until 1492, significantly fostered interactions between Europeans and Arabs in art, literature, and science. To comprehend the genesis of this interaction, it is imperative to identify how this dissemination occurred as Islam started to spread.

In the wake of conquests and encounters with the Byzantines and Persians, a prevailing conviction emerged among Muslims that engaging with the works of preceding civilizations was imperative. Facing the Byzantines and Persians during the conquests, Muslims thoroughly examined the literary corpus produced by the civilizations that had previously held sway.² This endeavor was driven by the belief that assimilating the knowledge accumulated by these antecedent civilizations into their intellectual framework was essential.

Duration" (Longue Durée) theory moved focus from event-centered narratives toward the broader social, economic, and geographical structures that shaped the history of the Mediterranean region.

² Kaegi, W. E. (1992). *Byzantium and the early Islamic conquests*. Cambridge University Press, p.22.

While translation movements were present during the Umayyad period, it was during the Abbasid era that these endeavors assumed significant importance and were institutionalized as a state policy. With the advent of the Abbasids to power, concerted efforts were made to draw upon the intellectual and scientific accumulations of civilizations such as Mesopotamia, India, Greece, Egypt, and Assyria. Translation movements involved rendering the works of these civilizations into Arabic, initiating a process of shaping the existing knowledge base. During this process, works written by the Abbasids found their way to Europe as “What profoundly affected Europe was the literary and scientific richness of Islamic civilizations, especially during and after the Abbasid period.”³

Until access to Greek works was established, the influential treatise *Siddhanta* by Brahmagupta (598-668) served as a reference in Indian science. Subsequently, numerous Greek works, including Hippocrates’ *Aphorisms*, Plato’s *Republic and Laws*, Aristotle’s *Organon*, *Poetics*, *Physics*, *Meteorology*, *Animals*, *On the Soul*, *Euclid’s Elements*, *Ptolemy’s Almagest*, *Geography*, *Optics*, and Galen’s *Descriptions of the Living Animal*, *Descriptions of the Dead Animal*, *Uses of Organs*, *Composition of Medicines*, and *Mental Disorders*, were successively translated into Arabic, enriching Islamic science.

The influx of new sources naturally led to the intellectual enrichment of Muslim scholars, resulting in their recognition on a global scale. Numerous scholars emerged, and some became internationally renowned figures. Notable individuals such as Ibn al-Haytham (721-815), Al-Khwarizmi (780-850), Al-Kindi (801-873), Zakariya al-Razi (865-925), Al-Battani (858-929), Al-Farabi (872-950), Ibn al-Haytham (965-1040), Al-Biruni (973-1048), Ibn Sina (980-1037), Omar Khayyam (1048-1131), Ibn Zuhri (1072-1162), Ibn Rushd (1126-1198), Ibn Battuta (1304-1368), and Ibn Khaldun (1332-1406) were key figures in the Islamic scientific community, contributing works in diverse

³ Arikan, A. (2021). Felicia Hemans ve James Clarence Mangan’ın şiirlerinde Abbasi dönemi ve Bermekiler. *Anasay*, 17, 1-23.

fields such as mathematics, physics, astronomy, medicine, geometry, philosophy, zoology, chemistry, history, alchemy, and geography.

Within the scope of this thesis, it is essential to introduce a noteworthy figure from Islamic science who lived in the late 10th century, namely Ibn al-Jazzar, whose contribution will hold a significant place in this study. Ibn al-Jazzar, also known as “L’algizar” in some Western sources, resided in the present-day city of Kairouan in Tunisia. After engaging in studies of his time's religious and natural sciences, he embarked on research in medicine and pharmacy. As a peripatetic physician, he succeeded in enriching his knowledge through travels, addressing ailments such as abdominal and back pains, skin diseases, febrile illnesses, poisonings, etc. His notable works, including *Zād al-musāfir* (Provisions for the Traveler) and *Kuff al-Ḥādir* (Sufficient for the Present), along with *Tibb-ul-Fukarâ vel-mesâkîn*, aimed at enabling impoverished individuals without access to medication to be self-sufficient, thereby enhancing his recognition.⁴

In contemporary discourse, various debates exist concerning Islamic science's influence on medieval Europe. On one side, prominent Western philosophers such as Russell (1974) assert that Islamic science, except its acquisitions from ancient Greek sources, did not significantly contribute to the scientific realm. On the other side, Western historians of science like Sarton (1927) and Huff (1993) argue that Muslim scholars made substantial contributions to science during the medieval period.⁵ However, the position advanced by Muslim historians is that although science developed within the framework of Islamic civilization was influential, its advancement faced setbacks caused by the Crusaders and Mongol invasion.

With this motivation, researchers, especially in Islamic geography, have directed their efforts toward examining the influence of Islamic science on the West. For example, notable Turkish historians of science such as Aydın Sayılı (1913-1993), Fuat

⁴ Doğruyol, H. (2000). İbnu'l- Cezzar, Ebû Ca'fer. *TDV İslam Ansiklopedisi*, Vol. XXI, pp. 1-3.

⁵ Kocabaş, Ş. (1996). İslâm ve bilim. *Divan: Disiplinlerarası Çalışmalar Dergisi*. (1), 67-83.

Sezgin (1924-2018) have conducted numerous studies on the impact of Arab-Islamic and Turkish-Islamic science, particularly in the Western world. The primary motivation in their work is to ensure the recognition of the influence of Islamic civilization on the world of science. In this context, various historians and researchers are currently intensifying their efforts in this field. This study, prepared by avoiding dealing with the Middle Ages with a designated view, tried to present objectively how the influence of the Islamic world in the field of science was reflected in Europe.

i. Aim and Question of the Research

The problem addressed in this thesis centers on the underexplored yet significant influence of Islamic science on medieval Europe, especially in British literary tradition. Despite the well-documented advancements in science and intellectual thought within the Islamic world during the medieval period, the extent to which these contributions took place in European literature remains insufficiently examined. This oversight obscures a critical understanding of the historical flow of knowledge and cultural exchange between the Islamic and European worlds. By identifying and analyzing the transmission of scientific ideas from Islamic scholars to European writers, this research seeks to highlight the transformative impact of these moves on medieval European literature. Uncovering this influence enriches our comprehension of medieval literary works and challenges the conventional Eurocentric narratives that often dominate historical and literary studies discourse. In this context, tracing which medieval European scientist or author included the works of Islamic scholars who studied and documented Islamic science is a crucial method to reveal the influence of the East on the West. Therefore, within the limitations of this study, it is necessary to identify which works of Islamic scholars were utilized in the 13th-century British scientific encyclopedias, namely Bartholomeus Anglicus' *De proprietatibus rerum*, Roger Bacon's *Opus majus* and Alexander Neckam's *De naturis rerum*. Additionally, this study aims to resolve the question of which references were correctly made directly and

incorrectly cited. Hence, the research questions that guided this study are as follows:

- 1- Might the information in the 13th-century encyclopedias, where Constantinus Africanus is cited as a reference, originate from Islamic scholars?
- 2- If positive, which particular works of Islamic scholars are seen in the 13th century encyclopedias as part of the British literary tradition?
- 3- Through which channels and intermediaries might this knowledge transfer have occurred, and what roles did translation centers like Bayt al-Hikmah and key figures such as Constantinus Africanus play in this process?

ii. Method and Materials of the Research

Research Method

This thesis includes a few approaches to study how knowledge of Islamic scholars was conveyed and modified in medieval European works, with special emphasis on Bartholomeus Anglicus's *De proprietatibus rerum*. The core methods applied are comparative textual analysis, source criticism, philological analysis, and historical analysis which provide different but interrelated perspectives of the multifaceted nature of authorship, citation, as well as the concept of ownership in an intellectual setting.

Comparative text analysis is the main area of focus in order to systematically examine the language and themes existing between *De proprietatibus rerum* and Arabic texts. It examines the knowledge adaptation such as its medical and philosophical concepts but this method would also notice distortions during the knowledge integration. In general, textual analysis can be justified whenever a wider comparative analysis across languages and cultures is done. Hence, this goes another step further to assist in the investigation of the overlap within the texts. Therefore, this allows scholars to ascertain whether Anglicus kept the original material, modified his understanding of it, or reinterpreted its meaning.

Along with textual analysis, source criticism is also useful when evaluating the reliability of Anglicus' references. A common theme in this research is the fabrication of sources. For example, Anglicus sometimes attributes medical knowledge to medieval European scholars, such as Constantinus Africanus rather than an Arabic source, which in turn misrepresents the nature of these scholars. In this case, one attempts to meticulously examine the sources provided, showing discrepancies in attribution and attempting to understand the possible reasons for the distortion of such information. Howell and Prevenier (2001) argue that source criticism is highly relevant in historical research for it helps scholars pursue the sources of knowledge claims and evaluate the evidence of historical narratives.⁶

The philological analysis method is also implemented in this study in order to examine in detail the linguistic, stylistic aspects of the British encyclopedic writings of the 13th century. It examines the text from several angles such as verbal and semantic, compositional and structural aspects. It shows the ways in which works such as *De Proprietatibus Rerum* and *Opus Majus* assimilated Islamic scientific knowledge and its specialized terms and the forms of its organization and philosophy. With the help of this method, the research explains the meanings of words and ideas in historical and cultural contexts and investigates how these meanings have changed with translation and adaptation. At the same time, the main research questions highlight the linguistic aspects of the problem by considering the processes of incorporation, alteration or reinterpretation of Islam-stemmed scientific terms. It can also be said that Islamic scholarship had certain implications on the literary works of medieval Britain. Understanding this however, does not impair ones understanding of broader processes of cross-cultural contact.⁷

⁶ Howell, M. C., & Prevenier, W. (2001). *From reliable sources: An introduction to historical methods*. Ithaca, NY: Cornell University Press, p. 88.

⁷ Popova, E. I. (2022). The Principle of Philology and Philological Analysis of the Word. *International Journal of Social Science Research and Review*. 5. 165-169.

The results will be easier to understand when historical analysis is at the same time utilized, which provides a better understanding of the results. This approach brings into focus *De proprietatibus rerum* set against the backdrop of the historical realities of the medieval period and the intercultural contact that characterized the Islamic world and Christian Europe. This research also demonstrates how Arabic sources influenced medieval European society by examining the historic conditions under which science and medicine knowledge were transferred or restricted.

The combination of these research methods seems compelling in analyzing how Islamic ideas were integrated and articulated in medieval European literature. Comparative textual analysis, on the other hand, breaks down how similar or different the text is of some documents to that of others, and text evaluation, such as source criticism, checks the claims and the reasons for the claims Anglicus makes; the historical context is embedded within the study to locate the cultural and intellectual context of the period in question, and intertextuality sheds light on the web of text that is behind the activities of the medieval authors. This integrative approach expands the understanding of the role of the authorship, the transfer of knowledge, and the integrative processes within the text *De proprietatibus rerum*. This is one more example showing both striking and often neglected the role of Islamic science and medicine in shaping European views.

Research Materials

In order to conduct the analysis, modernized version of Ibn al-Jazzar's "Zād al-Musāfir wa-qut al-ḥaḍir"⁸ of which the original manuscripts are found in separate pages or volumes in several libraries around the world⁹ and the middle English translation of

⁸ The modernized facsimile was prepared by Dr. Mohamed al-Suwaysi, Dr. Radi al-Jazi, Dr. Jum'ah Sheikhah, and Dr. Farouq al-Asali (1999).

⁹ Berlin 252 (Qu683); Judaeo-Arabic; 150 fol.; Dresden 209:339 fol.; Oxford, Bodleian Huntington 32:191 fol.; Teheran Malik 4486; Copenhagen 1 9:184 fol.; Paris 2884:339 fol.; MS Wellcome A 463; MS Tarim, al-Ahqaf Library 2643; Algiers 1476 fol.; Cairo VI; Rabat 1718 fol.; Izmir National Library 50/470.

Bartholomeus Anglicus's *De proprietatibus rerum* by John Trevisa¹⁰ from the 14th century are used. Cross-research is also conducted with the work *Viaticum* written by Constantinus Africanus, who translated several works of Islamic science. Other primary sources that are mainly studied in this research are Ali ibn al-Abbas al-Majusi's (Haly Abbas) work *Kitāb Kāmil al-Şinā'a al-Ṭibbīya al-Ma'rūf bi-al-Malikī* (*The Complete Book of the Medical Art / Kitab al-Maliki / The Royal Book*) (980)¹¹. Also several Muslim scholars' works have been investigated.

To conduct the textual analysis, Arabic and Latin language experts have been consulted, and in some instances, additional support has been obtained from artificial intelligence applications for necessary translation aid or manuscript letter identifying¹², ultimately verified by expert review again. In terms of reaching the findings, 13th century encyclopedias and multiple Islamic works have been investigated through key word search and, if found, further investigation has been implemented to verify whether the information roots back to Islamic works written formerly or not. Then the findings are demonstrated giving the matching parts written in both original and translated versions.

¹⁰ Firstly, John Trevisa (1342-1402) translated *De proprietatibus rerum* in middle English in the 14th century and followingly in the 16th century Stephen Batman (c. 1542-1584) wrote the expansion of Trevisa's work printed as *Batman vppon Bartholome* (1582). In this study Batman's version is used as the research material.

¹¹ The original manuscripts are found in several libraries such as; British Library, Bibliothèque nationale de France Bnf Arabe 2964, Bodleian Library MS Bodl. Or. 106, Wellcome Library MS 585 Arabe 1370, Vatican Library Vat. Ar. 309, National Library of Medicine (Bethesda, USA), Universitätsbibliothek Leipzig MS 765. In this study, the digital MS version preserved by Yale University is used. (Medical Historical Library in the Harvey Cushing/John Hay Whitney Medical Library, Yale University.) Also, a modern digitized version is used which was created by Dr. Ashfaque Ahmad (2022) with his team. See <https://www.ccras.res.in/kamil/>

¹² Transkribus <https://www.transkribus.org/> and Open AI ChatGPT <https://chatgpt.com/> applications.

iii. Limitations of the Research

This research has certain limitations that are rooted in its methodology and its scope. One of the limitations is temporal in nature, as the research only covers the 13th century. More specifically, this study deals with the British encyclopedic literature of this period, especially the works of such authors as Bartholomeus Anglicus (*De proprietatibus rerum*), Roger Bacon (*Opus majus*) and Alexander Neckam (*De naturis rerum*). This narrows down the focus of the study to these works and the possible allusion to Islamic sciences within them.

Yet another restriction is the lack of resources. The research focuses on Medieval British materials written during the 13th century and on modernized versions of these materials. The dependence on the available sources suggests that certain manuscripts that are probably lost or destroyed over time are left out. To overcome that, they turn to Arabic manuscripts of Islamic scholars, among them Ibn al-Jazzar (*Zād al-Musāfir*), al-Majusi (*Kitāb al-Maliki*), and others, and the Latin manuscripts by Constantinus Africanus (*Viaticum* and *Pantegni*). Nevertheless, as the case may be, there are significant drawbacks to using translated and secondary sources; some of the accurate interpretations of the Arabic originals are lost and sometimes misconstrued. For instance, these discrepancies would impact the reliability and validity of this study's implications when looking at the Arabic texts. Hence, Arabic Language experts have helped to reach the right translation outcome.

There are also other primary limitations as the language issue. This problem may be standing out considering that this study relies on modern Arabic facsimile versions of the original treatises and Middle English translation of original Latin texts. There are some layers of complexity inherent in these translations and in the ways that scholars have interpreted these texts throughout the ages which makes it challenging to reconstruct the original facts and ideas accurately. This further makes it difficult to comprehend the role that Islamic science had on British literature in the medieval times and how it was able to transcend different languages and cultures.

On the other hand, the scope of this study serves as a constraint as well. The present work focuses on the impact of Islamic science on British culture; it however does not define the larger European context. The Islamic scientific knowledge spread beyond the boundaries of the Britain that diffused into other European countries with possible remarkable effects.

On the other hand, the scope of this study also serves as a constraint. The present work focuses on the impact of Islamic science on British culture; it, however, does not define the larger European context. Islamic scientific knowledge spread beyond the boundaries of Britain and diffused into other European countries, possibly with remarkable effects. Last but not least, this study will also have to deal with the issue of how to handle secondary references. At times, the factors that turn out to be the Islamic influences in medieval British literature may not be so direct because they are not a few scholars or a single text but rather a whole host of scholars or texts that were instrumental in the process. Secondary accounts tend to conceal the original idea. Therefore, the elements that are characteristic of examining international interactions in that knowledge must be considered because they serve as serious problems in disappearing the exact characterization and the pathway of this knowledge transfer.

It is necessary to remember that while this thesis seeks to underline the importance of Islamic science in the context of medieval British literature, it is essential to point out and note these shortcomings. Recognizing these limitations, the research will be able to focus on a more valid and detailed description of the scientific development of the period under discussion and elucidate how the original texts were received in the medieval European context.

iv. Literary Works Depicting the Influence of Islamic Science on Europe

The medieval Islamic world witnessed the most luminous period of science. Scholars in fields such as science, philosophy, astronomy, medicine, and mathematics

flourished, offering both the accumulations of previous civilizations and their own contributions to the Western world. Figures like Avicenna (Ibn Sina), Averroes (Ibn Rushd), Al-Khwarizmi, and Al-Biruni translated their works into other languages, enriching European scientists and philosophers with these valuable studies. This transfer of knowledge reshaped Europe's philosophical and scientific foundations, expanding the boundaries of knowledge and laying the groundwork for modern science.

The dynamics and forms of this interaction, as well as its effects, continue to be incrementally added to contemporary literature. Especially with the digitization of manuscripts, it is no longer necessary to travel from country to country to trace manuscripts as in the pre-internet era. Many universities and libraries worldwide now share manuscripts with researchers through open access.¹³ Notable historians of science such as George Sarton (1884-1956), Aydın Sayılı (1913-1993), Fuat Sezgin (1924-2018), and David C. Lindberg (1935-2015) produced impactful works before the advent of digitization. Although the widespread use of the internet and advances in technology have made access to information easier, the perspectives, interpretations, and techniques of these scientists continue to enlighten contemporary historians of science. In today's digital age, many academics are conducting various studies to trace the intercultural interactions of the Middle Ages. Some focus on the interactions among European civilizations, while others concentrate on the developments regarding the influence of Eastern civilizations on the West and within themselves. As the core focus of this thesis, it is necessary to mention some significant studies on the influence of medieval Islamic science on the West.

Followingly given institutions are some examples to those providing open access to manuscripts; British Library, Walters Art Museum, Schoenberg Institute, the Pierpont Morgan Library, Trinity College, Durham University, University of Cambridge Digital Library, Stanford University Libraries, The Morgan Library & Museum, Bibliotheca Alexandrina, National Library of Spain, Princeton University Library, National Library of Israel, Leiden University Libraries, Bayerische Staatsbibliothek, Vatican Library, Bibliothèque nationale de France, Bodleian Libraries, National Library of Wales and so on.

George Sarton, considered the founder of the discipline of the history of science, aimed to provide researchers with complete knowledge of the timing within each subject area using both an analytical and synthetic research method in his three-volume work *Introduction to the History of Science* (Vol.1: 1927, Vol. 2: 1931, Vol 3: 1948). According to Sami Hamarneh (1925-2010), Sarton sought to synthesize the increasing knowledge accumulated in the East and West regarding medieval science and technology into a single explanation. Sarton succeeded in documenting the scientific contributions of the Islamic world, bringing to the forefront a legacy that is often overlooked in Western science history. He emphasized that the interaction between the East and West was not limited to the transfer of scientific knowledge and techniques but also shared an understanding that highlighted the universality of science and thought. Furthermore, Hamarneh notes that Sarton was the first and most dynamic person to give significant place to Arab-Islamic science and technology in both this and his other works.¹⁴

After the establishment of the history of science as a discipline, Turkish historian of science Aydın Sayılı, who was a student of George Sarton and the first to receive a doctorate in this field, similarly focused on Turkish scientists in his works. In his book *The Observatory in Islam – and its Place in the General History of Observatory* (1960), he examined the observatories in the Islamic world and compared them with their counterparts in the West. He analyzed the antithetical approach to Aristotle's view that perpetual motion is not possible within a finite line, as proposed by El-Kuhi (d. 990-1000), and demonstrated that the first similar approach in the West was made by the 16th century mathematician Giambattista Benedetti (1530-1590) in his work *Demonstratio proportionum motuum localium* (1554).¹⁵

¹⁴ Hamarneh, S. (1978). Sarton and the Arabic-Islam Legacy. *Journal for the History Arabic Science*. Vol. 2, p. 309.

¹⁵ “Kuhi's short Arabic article, from the second half of the 10th century AD, is located within a collection of treatises in the library of the Hagia Sophia Museum. The collection's number is 4830, and the article is found on pages 18ob to 18ia of this volume. Brockelmann mentions this article in his work (History

Turkish historian of science Fuat Sezgin is another standing scholar in the field, who also dedicated his entire career to studying Islamic science. Through his significant works such as *Geschichte des Arabischen Schrifttums* (GAS/History of Arabic Literature) (1967)¹⁶ and *Science and Technology in Islam*, he not only contributed facsimiles of some scientists' works to the literature but also demonstrated the impact of scholars from the Islamic world in fields like mathematics, astronomy, medicine, philosophy, and geography on the West with evidence. An important aspect of his research includes his stance on Constantinus Africanus, who translated Arabic works into Latin in the 11th century and introduced to Europe. Although Sezgin viewed Constantinus as somewhat of a "plagiarist," he acknowledged his crucial role in transmitting Islamic science to the West. In this regard, he also noted that Islamic astronomy reached Europe through Byzantine versions of Persian and Arabic sources.

In the field of mineralogy, among the elements of his research, Sezgin examined the works of other scientists such as Alexander Neckam's (1157-1227) *De naturis rerum* and Roger Bacon's (1220-1292) *Opus majus*,¹⁷ especially considering Ibn Sina's (980-1037) contributions to science and literature regarding minerals. He pointed out that while Neckam did not mention a significant number of stones, Bacon referred to some mineralogical information sporadically. However, in Albertus Magnus's (1193-1280) work *De mineralibus et rebus metallicis*, he found traces of works translated from Arabic to Latin through Constantinus Africanus. The classification and diversification of stones in Ibn Sina's "Kitab al-Shifa" were among the clearest pieces of information

of Arab Literature, Vol. I, p. 399)" as stated; Sayılı, A. (1957). Kûhî'nin Sınırlı Zamanda Sonsuz Hareket Hakkındaki Yazısı. *Belleten*. Vol. 21, p. 489-495.

¹⁶ GAS is a broad series, the first of which was written by Fuat Sezgin in 1967. Over the years, Sezgin widely developed this collection, addressing a wide range of subjects within Arabic literature such as literary works, linguistics, Islamic theological studies, and both the natural and practical sciences. The series consists of 17 volumes, starting with the first one published in 1967, followed by additional volumes published until 2015.

¹⁷ Sezgin did not provide the names of the works by these two authors, but the subject he mentioned is discussed in both works.

conveyed. Sezgin also stated that the works of Jabir ibn Hayyan and Abu Bakr al-Razi in the field of chemistry reached Europe during the Latin translation period.

In the realm of medicine, additional insights can be offered within the same context. The Andalusian Abulcasis (Abbas al-Zahrawi) (936-1013), highlighted by Sezgin for his pivotal role in the advancement of medical science, is a distinguished physician. His compilation, *Kitab al-Tasrif*, spanning 30 volumes, is acknowledged as the first surgical encyclopedia.¹⁸ Sezgin notes that not all surgical instruments devised by al-Zahrawi were originally his, also showcasing al-Zahrawi's significant influence on Europe. According to Sezgin, al-Zahrawi's fame significantly rose two centuries later with the Latin translation by Gerard of Cremona (1114-1187). Shortly after this translation, around 1275, the Italian William of Saliceto (Guglielmo da Saliceto) (1210-1277), a professor at the University of Bologna, authored *Cirurgia* (1275); followed by the French Guy de Chauliac (c.1300-1368) in the next century with *Chirurgia magna* (1363), both contributing to surgical literature. Sezgin identifies al-Zahrawi's work as a foundational source that enriched the medical landscape in Europe starting in the 13th century, through its detailed descriptions and illustrations of surgical tools.¹⁹ On the other hand, regarding the anatomical drawings, there is still no clarity on which anatomical drawings Arab physicians adopted from the Greeks. According to Sezgin, only three eye anatomy drawings taken by Hunayn ibn Ishaq (808-873) from Galen are known. At this point, the anatomical information in the work of Al-Majusi (Haly Abbas) (d.982-994), *Complete Book of the Medical Art* (*Kitāb Kāmil aṣ-Ṣinā'a aṭ-Ṭibbiyya*, later known as *Kitāb al-Malaki* – *Royal Book* in English), which Constantinus Africanus brought with him to the Medical School of Salerno, has been attributed to Constantinus

¹⁸ His work named *Kitab al-Tasrif* is considered the first encyclopedia written on surgery. For his work and contributions in surgery, he is considered as "the father of surgery." See Ahmad, Z. (2007) p. 83.

¹⁹ In Europe, numerous libraries contain translations of *Kitab al-Tasrif*, with the first edition printed in 1497. Also the research into Arabic studies and the history of medicine related to Al-Zehrawi started with Johannes Channing's *Albucasis on Surgery* (Oxford 1778). For more examples until 19th century, Sezgin, F. (2008). *İslamda Bilim ve Teknik*. Vol 3, p. 4-5.

for two centuries. Robert von Töply stated that this book was fundamental to the emergence of “Salerno’s Anatomy.”²⁰

Details on the architectural pieces even offer clues to investigate the background of the works. Christian Etheridge, in his research on the figures on the astronomical clock located in Lund Cathedral in Sweden, suggest that two of the figures on the clock might be the proof of Islamic science in medieval Scandinavia.²¹ He claims that, similar to clocks made earlier in other cities of Europe, two of the four people depicted on the mentioned clock are Muslim astronomers (Al-Rijal and Albumasar). In another example, he notes that although the names of Islamic astronomers do not appear in some works, the earliest presence of Arabic words in a Scandinavian source emerged in the Old Norse translation of the work titled *Algorismus*, the Old Norse translation from the Latin *Carmen de Algorismo*, written by Alexander of Villeadieu (c.1170–c.1240).²² The words are specifically in the glossary of GkS 1812 IV, 4th section where star names are listed among astronomical terms. These words are *Aramec* (ar-rāmiḥ), *Wega* (wāqi), *Alakol* (“Algol” as from an abbreviation; “ra’s al-ghūl”) and Al<ca>ph (al-Kaf).

²⁰ Von Töply, R. R. (1898). Studien zur Geschichte der Anatomie im Mittelalter as cited in ibid. Sezgin, F., p. 9.

²¹ In the 2nd century CE, Claudius Ptolemy from Alexandria made his mark with the *Almagest*, an expansive guide on astronomy that, after disappearing in the West by the 6th century, was preserved and greatly esteemed in the Islamic world from the 9th century as al-Majisṭī or *The Great Work*, before being reintroduced to the Latin West. The reign of Alfonso X of Castile was marked by significant contributions to astronomical and astrological writings, notably the *Tabulae Alphonsinae*, or *Alfonsine tables*. Another key figure, Haly Abenragel (Abū l-Ḥasan ‘Alī ibn Abī l-Rijāl al-Shaybanī), who worked as a court astrologer for the Zirid dynasty in Kairouan after 1037, authored the *Kitāb al-bārī ‘fī akhām an-nujūm* (Book on the Judgement of the Stars), which was translated into Latin in 1254 at Alfonso X’s court. Furthermore, Albumasar’s role as an astrologer and astronomer at the Abbasid court in Baghdad had a significant impact, especially his works on astrology’s philosophical aspects, influencing Western thinkers such as Adelard of Bath, Albertus Magnus, and Roger Bacon. This underscores the rich intercultural exchange of astronomical and astrological knowledge through the ages. See Etheridge, 2015, p. 52.

²² *Carmen de Algorismo* presents, in Latin hexameter, the methods for using the Indo-Arabic numeral system. This work traces its lineage back to 12th century Latin translations of a treatise from the 9th century, authored Al-Khwārizmī (c. 780–c. 850). See Slougher, 2021, p.73.

The role of physicians of the Islamic era are emphasized in the history of science by more scientists. Sami Hamarneh is one of the prominent figures who focused mainly on the history of Islamic medicine. In his research, he describes the influence of an Islamic medical scholars on development of sciences in Europe. He mentions al-Razi, Ali ibn al-Abbas al-Majusi, and al-Zahrawi as ones who made essential contributions to medieval medicine through their new techniques in therapy and pharmacology. These were translated to Europe by Constantinus Africanus and Gerard of Cremona who were instrumental in the transfer of Arabic medical practices to Europe. His research puts emphasis on the relevance of the application of Arabic scientific concepts in Europe especially in medicine and surgery as evidence of the impact of Islamic science on the west's rational ideas.²³

Moreover, Monica H. Green has also put a significant amount of work into tracing the flow of medical knowledge from the Islamic civilization to Western Europe during the medieval period. For instance, in her piece *The Transfer of Ancient Ideas of Female Physiology and Disease into the Early Middle Age*, published in 2002, she was able to establish links between various texts containing Islamic medicine and practices in Europe. Green depicted available translations of the works of the scholars Al-Razi and Ibn Sina, and demonstrated how the texts were acquired by European medical schools. Her investigations point to how these epistemic communities interacted profoundly.²⁴

In the same regard, George Saliba, in his publication *Islamic Science and the Making of the European Renaissance*, published in 2007, is concerned with the pervasive ramifications of Islamic science on the European medieval world. Saliba

²³ Hamarneh, S. (1972). Development of Arabic medical therapy in the 10th century. *Journal of the History of Medicine and Allied Sciences*, 27(1), 65-79. Oxford University Press. See also Rizzo, G. (2013). Le traduzioni scientifiche dall'arabo al latino in, area mediterranea. *Uomini, luoghi e tracciati europei a partire dal secolo XI. Palaver*, 2, 7-36.

²⁴ See, Green, M. H. (2002). *The transmission of ancient theories of female physiology and disease through the early Middle Age. In Women's Healthcare in the Medieval West: Texts and Contexts*. Aldershot: Ashgate.

charted the flow of information and knowledge in mathematics, astronomy and medicine from the Islamic to the European world claiming that Western civilization owes its impetus to the achievements which marked the Golden Age of Islam. His in-depth survey of manuscripts as well as technical writings established that Islamic scholars contributed directly to the Western world.²⁵

Within the same frame, Charles Burnett is concerned with the spread of Arabic scientific and philosophical literature in the Latin world during the 12th and the 13th centuries. The most important of his works are *The Introduction of Arabic Learning into England* (1997) and *Arabic into Latin: In The Middle Age The Translators and Their Intellectual And Social Context* (2009). Burnett illustrates how the translations into European languages of philosophers' writings by Ibn Rushd and Ibn Sina reshaped the development of European philosophy and science, thus demonstrating the unity of medieval intellectual traditions and the importance of Islamic civilization for the development of the European.

Thoroughly explaining the connection between Islam, philosophy, and science, Seyyed Hossein Nasr's book *Science and Civilization in Islam* (1968)²⁶ offers a thorough account of Islamic science as part of an Islamic civilization and an intellectual tradition rather than an appendage to the history of western science. In this regard, through presenting the historical narratives and engaging in critical analysis, supplemented with excerpts from the texts of plenty of Muslim scientists and philosophers, Nasr furthers the working environment of the Islamic science and establishes the relationship of Islamic science with the wisdom that gave birth to it. He cites the translations undertaken by the Muslims, for example, al-Haytham for optics and al-Farabi in medicine. Of importance, Nasr stresses that these scholars were crucial to the development of European science during the Renaissance engineer.

²⁵ Saliba, G. (2007). *Islamic Science and the Making of the European Renaissance*. Cambridge, MA: MIT Press.

²⁶ Nasr, S. H. (1968). *Science and Civilization in Islam*. Cambridge, MA: Harvard University Press.

As mentioned before, David C. Lindberg is one of the standing scholars seeking to answer the question about the integration of the Islamic world into the orbit of Western civilization. In his treatise, *The Beginnings of Western Science* (1992)²⁷, he explains how the books and commentaries of the Islamic scholars found their way into the libraries of Eurocentrism which actually resulted in the growth of sciences in the West. He depicts a broader perspective of the place of Islam in the history of science in Europe and the assimilation of achievements and concepts created by Islamic scientists into Western science 's activities.

There is no doubt that scholars in the East worked heavily on the works of earlier Greek scholars which shaped their intellectual treasure. Within this line, translation movements kept a significant place and while looking deeper into the the translation movement and the influence it had, Dimitri Gutas sheds more light on the transition from Greek thinking into Arabic thinking. In his book *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbasid Society (2nd-4th/5th-10th c.)* (1998)²⁸, Gutas identifies how Greek manuscripts were transformed into Arabisation and interest into the containment of those works into Europe. He particularly mentions the figures of Hunayn ibn Ishaq and Al-Kindi and the impact of their translation on the development of medieval Europe's science.

Islamic scholars have played an important role in the development of science and technology throughout the ages. This is captured in the works of historian Donald Hill, prominent for his studies in the intersection of science and technology. This assertion loads his book *Islamic Science and Engineering* (1993)²⁹ as he mentions the unique role that Muslim scientists played in safeguarding the works of earlier, intiqued in Greek,

²⁷ Lindberg, D. C. (1992). *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, 600 B.C. to A.D. 1450*. Chicago: University of Chicago Press.

²⁸ Gutas, D. (1998). *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbasid Society (2nd-4th/8th-10th centuries)*. London: Routledge, p.125.

²⁹ Hill, D. (1994). *Islamic Science and Engineering*. Edinburgh University Press <https://doi.org/10.1515/9781474469135>.

Persian, and Indian institutes. In Hill's view, this was one of the most remarkable contributions to the development of medieval European science. Hill mentions the creation of such devices as water clocks and various types of automata, although they were later improved by Europeans, which developed as a result of Islamic engineers' creative efforts. He, in particular, presented algebra and advanced trigonometry by Islamic mathematicians like Al-Khwarizmi who prepared the ground for the development of mathematics in Europe. Moreover, he discusses the Islamic contributions to the development of astronomy, starting with Islamic engineers' work on developing Ptolemy's models which later led to development of astronomical works in Europe. Hill pointed out that another important development was made through that of Al-Haytham in optics – in the sphere of the eye and light which had far reaching effects this was a Muslim scholar whose contribution greatly benefited European scholars. Moreover, Jabir ibn Hayyan and Al-Razi have contributed enormously onto the areas of chemistry and medicine whereby these scholars' works became the first reading created in the European dominated universities. In his research, Hill demonstrates the influence that Islamic science had on Europe particularly the medieval Europe in terms of ideas and technology in the world.

To give another example to the research, John Freely's work demonstrates how medieval Islamic scientists were able to be at the forefront of European scientific development. In *Light from the East* (2010)³⁰, Freely demonstrates how the Islamic scientists during the medieval period made valuable contributions during the Renaissance and the Scientific Revolution. Among these amazing contributions include the growth of mathematics and astronomy whereby scholars such as Al-Khwarizmi set the base for the field of algebra. His *Zij al-Sindhind* translated into al-Andalus and later into Latin and this reached out to Europe including Copernicus. The Islamic World influenced Europe with a great deal of medicine where works of physicians, particularly

³⁰ Freely gives a wide range of examples of those who grew in Islamic science and made significant contributions to the West. For more examples, see Freely, J. (2010). *Light from the East: How the Science of Medieval Islam helped to shape the Western World*.

Ibn Sina's Canon of Medicine gained a tremendous impact on Europe. Through translators like Constantine the African, who translated a lot of Arabic writings into Latin, Islamic knowledge on anatomy, pharmacology, and diseases permeated to Europeans and medical schools in places such as Salerno Medical School. Engineering works from the Islamic World also left a strong impact to the modern world. Inventions of Al-Jazari, who invented complex machines such as water-lifting devices were recorded in engineering books that became widely used in Europe and became critical hubs. Also, the inventions of Ibn al-Haytham were critical since his *Book of Optics* advocated for a series of light and vision theories that were fundamentally new outlooking in nature establishing a different light and vision scientific approach which gained attention among European scientists during the renaissance. The introduction of these notions into Europe was made possible through the efforts of translators such as Gerard of Cremona and Adelard of Bath who translated many works of Islamic science for the European universities. Such a crosscultural transfer of knowledge did not only safeguard the accomplishments of Islamic science, but it also played a significant role in Europe's scientific renaissance by emphasizing the importance of Islamic approaches and ideas in the development of European civilization.

Similarly, Faruqi (2006)³¹ emphasizes the role played by Islamic scholars during the movement of the Scientific Revolution in Europe. In his view, these scholars were not only a passive body that only held the ancient Greco-Roman thought, but they were active novel creators. Faruqi also emphasizes that this approach towards nature endorsed observation and experimentation leading to progress in mathematics, astronomy and medicine.

These evolving studies still aim to understand how these links had emerged. Darek Hans (2023)³² in his treatise *The Golden Age of Islam and Its Impact on European*

³¹ Faruqi, Y. (2006). Contributions of Islamic Scholars to the Scientific Enterprise. *International Education Journal*, 7, 391-399.

³² Hans, D. (2023). The Golden Age of Islam and Its Impact on European Technology: A Historical Analysis. *ENDLESS: International Journal of Futures Studies*, 6(3), 218-227.

Technology: A Historical Analysis investigates the significance of the Golden age of Islam on medieval technical development in Europe. He explains the processes through which, innovations and knowledge possessed by Islamic countries, especially during the 8th to 14 centuries, were brought to Europe and ‘became part’ of European societies. Hans notes several math, astronomy, engineering, and medical practices that were developed by Islamic scholars that were fundamental in the advancement of Europe. Examples are the use of Arabic figures and the introduction of the zero which greatly improved Europe’s numeric ability. Works by Islam’s Avicenna or Al Razi, Islamic scholars were translated into Latin and were used as standard texts in Europe’s universities. Buildings and engineering practices, especially in irrigation and time measuring, that were common in the Islamic world were transferred to Europe and altered the continent’s architecture and engineering. Al-Andalus translation movement and the Crusades contributed to the flow of these nuances. Hans advocates for a broader understanding of these attributes to help overcome the Eurocentric framework of technological history and encourage the creation of a more rounded perspective on the history of science in the world. His examination emphasizes the importance of cross-cultural transfer of knowledge to the progress of technology and calls for a reconsideration of history so as to include major achievements of the Islamic civilization.

Within the concept of architectural advancements, for building Gothic style architectural works, no doubt mathematics and geometry were highly necessary to have acquired; therefore, Euclid’s *Elements* was one of the implemented sources. During the translation movements, *Elements* was translated into Arabic, then Latinized as well. De Young (1982) offered a critical finding about the earliest translation of *Elements*. His study³³ investigates the Arabic translations of Euclid’s *Elements*, particularly focusing on books V and VII-IX, and aims to reassess the established understanding of the Euclidean tradition in the Islamic world. This points to the presence of two different

³³ De Young, “The Arabic Textual Traditions of Euclid’s *Elements*,” *Historia. Mathematica* 11 (1984), pp. 147-160.

versions which belong to Ishaq ibn Hunayn and later edited by Thabit ibn Qurrah, which have not been recognized before in the usual literature. The research shows that, as one may expect, other, later found copies of the manuscript explain some of these differences and imply that they could have originated from al-Hajjaj's lost translations. Eventually he indicates significant differences in the textual families of the Arabic translations, notably in vocabulary, style, and the ordering of definitions and propositions. These differences raise questions about the historical transmission of the text and the relationship between the various versions. For instance, the manuscripts reveal that while the first translations made by al-Hajjaj were heavily edited, the revisions by Ishaq and Thabit also introduced new terminology and structures that aligned better with philosophical discussions found in book X, particularly concerning incommensurable ratios. Within the same motive there is another study to be considered; Elior (2018)³⁴ focuses on the textual differences between the medieval Arabic manuscripts of *Elements* and the versions preserved in the Latin translation by Adelard of Bath and the Hebrew translation attributed to Rabbi Jacob. The study indicates that both the Latin and Hebrew translations share significant similarities, suggesting they descend from a common Arabic tradition that diverges from the Ishaq/Thabit tradition. The study also posits that these textual differences may reflect the methods used by al-Hajjaj in revising his translation of Euclid's work.³⁵

³⁴ Elior, O. (2018). The Arabic tradition of Euclid's *Elements* preserved in the Latin translation by Adelard of Bath and the Hebrew translation by Rabbi Jacob. *Historia Mathematica*, 45, 111–130. <https://doi.org/10.1016/j.hm.2018.01.001>

³⁵ In order to prevent any reason of a bias; both Young's and Elior's studies reassess the Arabic textual traditions of Euclid's *Elements*, but they focus on different branches and aspects of these traditions. De Young emphasizes the complexities within the Arabic tradition itself, highlighting the distinctions between the Ishaq/Thabit version and the Hajjaj tradition. He explores how recent discoveries have illuminated the existence of multiple Arabic versions and their influences on later translations. Elior's research provides a comparative analysis between the Arabic manuscripts and later translations, specifically examining the types of textual differences and their implications for understanding the transmission of Euclid's work. While De Young's findings suggest that there may have been a single translator responsible for both the Ishaq/Thabit version and the Hajjaj version, Elior investigates how the revisions made by al-Hajjaj may have been incorporated into the Latin and Hebrew traditions, suggesting a layer of systematic editing that enhances the accuracy of the mathematical content.

On the journey of Islamic Science spreading in Europe, Jewish scholars played important roles as well. Lavey (1952) discusses the contributions of Abraham Savasorda, a Spanish Jew mathematician who lived around 1136, at a time when various transformations were active in Europe with regard to culture and science. In Lavey's opinion, Savasorda was instrumental in the Latinization of Muslim scientists' books and also wrote some texts in different, especially in mathematics, astronomy, and philosophy. Savasorda's *Encyclopedia*, which was composed in Spain in the beginning of 12th century, is another meaningful impact that he had in developing of mathematical systems. This work synthesizes mathematical techniques from the Greeks and from the Muslims creating a logical structure to the teaching and understanding of mathematics. Savasorda devoted considerable effort to fostering the integration of arithmetic, geometry and music, the latter being a novel idea in that epoch. His approaches to number consummation offer new classifications which later on may well distinguish it from the Greek mathematicians, and offer a unified approach to number manipulations that can be used for commercial computations. For Savasorda in the geometry, there were no more abstract concepts; instead, more definitions were given to more closely correspond to the range of observation. Levey claims that Savasorda also had great impact on Leonardo Fibonacci and he believes that it was Savasorda who made it possible for Fibonacci to contribute in European mathematics later on. Ultimately, the *Encyclopedia* was an important link for transmission of the Greek mathematical tradition to the Arab world and is the earliest attempt by a single European thinker to integrate these two rich legacies. Levey concludes that the work of Savasorda's owes much to the development of mathematics properly, the distinguishing feature of this work is its systematization and the closing up of theory and practice which opens up a new era of development of mathematics in Europe.³⁶

³⁶ A brief information should be given for Savasorda, also called Abraham bar Hiyya (1070–1136), was perhaps the most distinguished Israeli mathematician, astronomer and philosopher of Spain in the Middle Ages. He is well known mainly for his contributions to science and astronomy, one of which includes the book, *Hibbur ha-Meshiḥah ve-ha-Tishboret*, among the first works to make Islamic mathematics better known in Europe. Savasorda acted as a major facilitator in the transfer of Arabic

In the same way, Randel (1976)³⁷ examined the impact of Al-Farabi's musical theory onto the scholarship of medieval Europe. In Randel's view, al-Farabi's works particularly the *Kitab al-Musiqā al-Kabir* (the Great Book of Music) contained detailed subdivisions of music into its practical and its theoretical components. His efficient classification which appears in the texts rendered into Latin in the 12th and 13th centuries could have shaped some of the outstanding medieval figures like Vincent of Beauvais, Roger Bacon and Jerome of Moravia. Despite some biases and challenges of translation, Al-Farabi's focus on the more core aspects of the issues, that is, a more apothegmic character of music theory and a more scientific view of music, contributed greatly to the development of medieval European music theory and practice. His ideas contributed to the embedding of the scientific approach into music's evolution in a time where the prevailing empirical and rationalist philosophies advanced the wider acceptance and incorporation of Arabic science into the West's intellectual stream.³⁸

Another interesting view is from Dosett, who shows how the idea of why schooling is needed, or the fundamental principles of Western humanistic education, has its roots in medieval Islamic scholarship and that these connections substantially influenced the genesis of the European Renaissance. The humanities and the art of writing letters, the *Studia humanitatis* and *Ars dictaminis*, respectively, are features that

science into the Latin West and in the processes of evolution of mathematics and science in Europe in later periods.

³⁷ Randel, D. (1976). Al-Fārābī and the Role of Arabic Music Theory in the Latin Middle Age. *Journal of the American Musicological Society*, 29(2), 173-188 p.178.

³⁸ *Kitab al-Musiqā al-Kabir* (The Great Book of Music) is one of the most important, if not the most important, treatises dealing with music theory developed by the famous Islamic philosopher and scientist Al-Farabi (872–950/951 CE). It covers many aspects concerning music, including the theory of sound, musical intervals, scales, the structure of different pieces, and the effects they can have on the listeners. Al-Farabi adheres to the Plato-Pythagorean theory of harmonic ratios, while simultaneously integrating elements from Islamic philosophy. Such a division of the treatise allows the reader to understand the systematic and straightforward evolution of music: the first part creates the theoretical and logical basis of music and studies the ways in which sounds can be produced; while the second takes the theories to practical application where partitions of songs of different types are addressed. The contents of *Kitab al-Musiqā al-Kabir*, constitutes an essential chapter through which the East and Western world views on music were interchanged during the Islamic Golden Age. See: https://en.wikipedia.org/wiki/Kitab_al-Musiqā_al-Kabir

were enhanced by the scientific and scholarly activities that characterized the medieval Islamic world. Noticeably, Ibn Rushd played an important role in Western civilization by reconciling the two concepts of reason and faith in interpretation of Aristotle's texts, a reconciliation that greatly impacted Thomas Aquinas and the entire Western scholasticism for the rest of the Middle Ages. Moreover, the Islamic dialectical method of exposition, which is of paramount importance in the study of Islam and the Islamic law, encouraged other nations to study rhetoric and logic. Dossett asserts that this exchange of ideas between the civilizations of Islam and the West was not merely an academic undertaking; it engendered respect that aided in overcoming cultural barriers. In this regard, the history presented here implies that understanding these historical relations can provide a framework for East-West intercultural dialogue which could alleviate the current ideological struggles.³⁹ This viewpoint highlights the significance of the impact of Islamic scholars on the development of medieval Europe as it shows that the western ways of education and learning had a heavy reliance on the contributions made by Arab-Islamic civilization.

In addition to the studies implementing investigations upon the scientific information's transmission in medieval Europe, it is important to note researches focusing on the 13th century British authors' encyclopedias within the scope of Islamic science signs. There are various studies investigating the roots of the information in these encyclopedias. For example, Seymour (1969) focuses on *De proprietatibus rerum*; however, he highlights the medical references of Constantinus Africanus claiming the original roots not the Islamic science but Ancient Greek's. Surely the findings rooting back to medieval Islamic scholars' time may not be the core source of the information and should be taken into a further investigation, but it seems that Seymour skipped the transmission period.⁴⁰ In a similar vein, another example could be offered in terms of the

³⁹ Dossett, R. (2014). The Historical Influence of Classical Islam on Western Humanistic Education. *International journal of social science and humanity*, 4, 88-91.

⁴⁰ Here are the sources according to Seymour. "Viz. Constantinus Africanus (d. 1087), who translated Hippocrates' *Aphorismus* and compiled the *Pantegna (De communibus medico cognitu necessariis locis)* and the *Viaticum (De morborum cognitione et curatione)*; Galen (d. 199 A.D.), whose

musical developments, Nagy (2023) investigates medieval music and the treatise *De proprietatibus rerum* and she emphasizes the great impact made by the Islamic culture on medieval music in Europe. She remarks that Antiquity and 16th century Western works are more academic in format and on the surface, while the Medieval Arabic and Persian treatises on instrument making are rich in photographs and works. influence of Islamic scholarship on medieval European music. She notes that Western works are relatively more abstract while the Medieval Arabic and Persian treatises on instrumentation are filled with detailed illustrations. She acknowledges the absence of such information in the latter. Nagy exposes some musical instruments of Arabic descent, which were late comers to European music world, including the canon which is a type of psaltery, the guitarra and the rabe which is a form of fiddle. She goes on to point out that when Jean Corbechon and Vicente de Burgos translated a number of composed musical works reproduced in Latin, they resorted to the use of Arabic and Germanic rather than Latin names for instruments. The outlining of these elements bears testimony to the introduction and use of Arabic concepts and ideas in the music of Europe during the medieval period, which was part of a larger interplay between cultures.⁴¹

commentary on Hippocrates is cited as Amphorum and Comenturo, author of *Ars Parva*; Plato (d. 348 B.C.), author of *Timseus*, imperfectly extant in the commentary of Chalcidius; Dioscorides (d. 47 B.C.), author of *De materia medica*. See Seymour, M. (1969). A Middle English Abstract of Bartholomaeus, *De proprietatibus rerum*. *Anglia*, 87(1), 1-25.

⁴¹ Drawing from classical sources like *Etymologiae* (of Isidorus) and *De institutione musica* (of Boethius), Anglicus conveys their perspectives. Originally written for educating monks, the work quickly reached a secular audience and was translated into various European languages. Nagy not only focuses on the Arabic origins but also claims that in translations into European languages, the names of certain instruments were localized or replaced with more contemporary equivalents. For example, the term “symphonia” was translated in some French and Spanish versions as “zanfona,” referring to the hurdy-gurdy, a more familiar instrument in Europe. Similarly, cithara was translated as “çítola” in Spanish, and lyra was rendered as “vihuela.” These translation choices illustrate the translators' efforts to adapt the text to the musical understanding and instruments of their cultures. These variations reflect how the spread of the work fostered differing meanings and uses for musical instruments across each culture. See, Nagy, E. B. (2023). Il trattato di musica nell'enciclopedia *De proprietatibus rerum* di Bartholomaeus Anglicus. *TranScript*, 2(1), 7-32.

CHAPTER I

SCIENCE IN THE MEDIEVAL ISLAMIC WORLD AND ITS JOURNEY TO EUROPE

1.1. Science in the Medieval Islamic World

Before the birth of Islam, the Arabian Peninsula was a society that was primarily oriented around oral traditions, practical knowledge, and local expertise. People relied on empirical understanding in navigation, herbal medicine, and astronomy, which were crucial for survival in desert life.⁴² Knowledge of the stars guided traders and travelers across the deserts⁴³, while plant-based remedies were the primary means for treating illnesses. However, things changed drastically about the esteem in which knowledge and learning were held when Islam spread in the 7th century. The knowledge that emanated from the teachings of the Qur'an and encouragement by the Prophet Muhammad (s.a.v.) regarded learning highly as learning about God's creation and greatly benefitting humanity.

The period preceding and especially the 8th century, following the Abbasids' ascendance to authority until the 15th century, saw nothing short of unbridled intellectual and scientific advancement. Most of the time in history books, this phase is termed the Islamic Golden Age; it is said that Islamic science flourished remarkably during this phase. Advances in astronomy, medicine, mathematics, and chemistry, among others, made significant and enduring input to today's global scientific practice. Such Islamic scholars' contributions from the period were instrumental in defining the progress of science within and across civilizations, even in the Medieval Age and much later.

One particular feature of the advancement of science within the Islamic world was the importance given to the policy that prioritizes practicality. Science was not just

⁴² Varisco, D. (2000). *Islamic Folk Astronomy*. 616, 618

⁴³ Bailey, C. (1974). *Bedouin star-lore in Sinai and the Negev*, 580.

an academic issue; it had many ties with practice.⁴⁴ Scholars mainly focused on the beneficial outcomes. They explored, influenced, and tried to create a world for people's needs. Turning lead into gold through alchemy or forecasting weather by star charts in astrology; even in medicine and chemistry, there were sufficient ambitions to prolong life and enhance health due to intellectual and social engineering. These aspirations formed part of a broader perspective within which science was relevant individually and collectively.

The costs associated with scientific research in this age were relatively high, especially in areas like alchemy, medicine, and astronomy, which required significant resources. For example, alchemy depended on some materials and equipment that were difficult to obtain, and astronomy development included building and provision of facilities like observatories and other instruments. Consequently, science was associated with the rich and/or ruling class patrons who played an essential role in its financiers and institutional support.⁴⁵ This interdependence between the scientists and the patrons influenced the nature of scientific work and allowed different scholars to engage in sophisticated concepts.

The scientific community in the Islamic world was predominantly active through the madrasas, libraries, and observatories. These bodies had other functions as they hosted more than books and equipment, but also gave scientists struggling a safe space to conduct research with potential patrons. Scholars could meet in these spaces, creating an intellectual ecology with a more decadent atmosphere for channeling ideas that could be discussed, fought over, and enhanced. Similarly, many of the madrasas and other schools of learning advanced the cause of scientific endeavors and learning. They guaranteed the transmission of knowledge through time and generations, creating a basis for formal education and research.

⁴⁴ Muslimah, M. et. al. (2020). The science in Islamic perspective, 68.

⁴⁵ Sayılı, A. (1985). *Ortaçağ Bilim ve Tefekküründe Türklerin Yeri*, 179.

The emergence of the Bayt al-Hikmah (House of Wisdom) located in Baghdad during the reign of the Abbasid caliphate is a classic example of such institutional development. The House of Wisdom became the center of scholars from diverse fields and encouraged inter-discipline cooperation, unprecedented in history.⁴⁶ Here, scientists, philosophers, and translators joined efforts and translated into Arabic texts about Greek, Persian, and Indian civilizations and developed them further. This institution fostered a translation movement that helped conserve and enrich knowledge from ancient cults, paving the way for future scientific innovations.

Islamic science reached methodological heights, including applying empirical observation and experimentation, a notable shift from the theoretical pillars of the ancient traditions. During this time in the Islamic eras, scholars began to view science as a discipline that required structured approaches with a lot of observation, measurements, and confirmation. As an illustration of this change, several practitioners, including Ibn al-Haytham (Alhazen), started performing controlled experiments to learn about the mechanics of optics, light, and vision. He established empirical practices that would lead to scientific protocols in future studies and thus became a basis for further scientific explorations.

Medicine science in the Islamic world evolved as a synthesis of the Greco-Roman traditions and the inventive capabilities of Islamic scholars. Medical practitioners such as Al-Razi (Rhazes) or Ibn-i Sina (Avicenna) contributed to the corpus of professional medicine through their works, which discussed a range of subjects such as anatomy, pharmacology, and diagnostics. Their literary efforts, especially the Canon of Medicine by Ibn Sinah, were examples of ideal physicians' texts. These ideal textbooks determined the structure of medical education and practice for centuries in the Islamic world or Europe. Hospitals, medical instruments, and

⁴⁶ Chandio, A. R. (2021). The house of wisdom (Bait Al-Hikmah): A sign of glorious period of Abbasids caliphate and development of science. *International Journal of Engineering and Information Systems (IJEAIS)*, 5(3), 1-6, p.2.

sanitary measures were also created – the ‘treating the person’ idea became ‘building a healthy society.’

Pioneering achievements of Islamic mathematics scholars have formed the basis of subsequent scientific and mathematical progress. Al-Khwarizmi developed algebra, and adopting the Hindu-Arabic numeral system made number-crunching convenient. This numeral system, which gradually replaced Roman Numerals in Europe, further stimulated trade, astronomy, and mechanisms development. Research by Islamic scholars in geometry and trigonometry also increased the limits of the mathematical knowledge available and provided the necessary means and precision for astronomical calculations and navigation.⁴⁷

The Islamic world significantly contributed to astronomy, as scholars improved previous works and made new star tables and observatories. People like Al-Battani and Nasir al-Din al-Tusi worked on the Ptolemaic model, altering its features to address its inaccuracies.⁴⁸ Their achievements not only enhanced star charts but also prepared the way for the changes in astronomy that would take place in the Renaissance. The revisions that Muslim scholars brought to the design of devices, for example, in the astrolabe's improvement, improved the capabilities of measurements and expanded the application of astronomy in navigation.

The disciplines of chemistry, at the time known as alchemy, got a fresh approach from the Islamic scholars who embraced the practice mystically and experimentally. Some historians even trace the development of some branches of early alchemy to the distinct chemists' practices of Jabir ibn Hayyan (Geber).⁴⁹ He applied himself to tasks such as the design of processes of distillation and crystallization, which represented a

⁴⁷ Toomer, Gerald J. (1970–1980). “al-Khwarizmī, Abu Ja'far Muḥammad ibn Mūsā”. In Gillispie, Charles Coulston (ed.). *Dictionary of Scientific Biography. Vol. VII. Scribner*. pp. 358–365.

⁴⁸ Nallino, C. A. (1987). “al-Battānī”. In Houtsma, M. T.; Arnold, T.W.; Basset, R.; Hartmann, R. (eds.). *Encyclopaedia of Islam. Vol. 2* (1st ed.). Brill. doi:10.1163/2214-871X_ei1_SIM_1392.

⁴⁹ Sezgin, F. (1971). *Geschichte des arabischen Schrifttums, Band IV: Alchimie, Chemie, Botanik, Agrikultur bis ca. 430 H.* Leiden: Brill. pp. 132–269.

more organized viewpoint towards chemical changes, thereby fusing mystic alchemists with experimental ones that developed modern chemistry. Alchemy, even when frequently connected to philosophy or some religious interpretation, thanks to the Islamic scholars' inductive methods, moved the area's comprehension towards understanding the more physical properties of matter.

As such, the Islamic empire's political, social, and ethnological diversity created a fertile ground for the dissemination and interaction between the cultures. Prominent cities: Baghdad, Cairo, Kairouan, and Cordoba gathered an audience of diverse religions and ethnicities, which helped develop a positive intellectual climate. Because of this, it was possible to integrate various forms of knowledge since Jews, Christians, and representatives of other nations worked closely with Muslims. The circulation of ideas and practices 'over languages and culture' perspectives further contributed to the advancement of science during the Islamic civilization, making it a global revolutionary movement that was not limited to specific regions.⁵⁰

In the Islamic World, education was necessary to maintain and extend the scope of scientific works. The madrasa system established instructional methods and gave access to the means of scholars, patrons, and textbooks covering technical subjects. Political leaders and wealthy patrons who appreciated knowledge and education encouraged the development of scientific research. The scriptures accumulated in libraries, which safeguarded the documents and aided the passage of ideas and expertise across people and time. In this case, the educational institutions ensured the sustainability and expansion of scientific scholarship for sustenance.⁵¹

Muslim scholars are not limited to merely religious perspectives on the nature of reality; they integrate philosophical concepts with practical investigation to form a

⁵⁰ Brockopp, J. E. (2017). Between memory, sermon, and sacred space: 'Abd al-Malik's transformation of Jerusalem's Haram. *MAVCOR Journal*, p. 8.

⁵¹ Makdisi, G. (1981). *The rise of colleges: Institutions of learning in Islam and the West*. Edinburgh University Press, p. 45.

comprehensive vision. This approach allowed for the development of a scientific culture that appreciated logic and how things worked in practice. Knowledgeable people were inspired to look and do experiments to understand events. This kind of practice provided a direction that would later shape the progression of science as scholars from Islam connected the old civilization's understanding to the new world of science.

The scope of medieval Islamic science did not limit itself to the Islamic World as European scholars began familiarizing themselves with Arabic literature and ideas through Latin translations. This process of assimilation, usually accomplished through translators based in Spain and Sicily, helped to foster the intellectual revival that led to the European Renaissance. The wide circulation of Arabic texts on medicine, mathematics, and astronomy changed the views of the Europeans regarding science and set the stage for many fundamental advances in these branches.

The historical accomplishments of the Islamic Golden Age are still evident in many contemporary achievements in science and technology. Words like “algebra” and “alchemy” originate in Arabic, confirming the deposit of Islamic civilization in these sciences. Scientific devices such as an astrolabe and processes such as distillation, which were brought and improved by Islamic scientists, were integral to development. In this respect, these contributions to the advancement of science highlight medieval Islamic science's impact on the modern world.

The expansion of Islamic science was also reminiscent of an outlook toward the world that was permissible and compatible with Islamic philosophy. For these Islamic thinkers, science was considered a means of understanding God's creations. Such reconciliation of scientific inquiry and religious mission provided extra impetus to scholarship and ensured the uniqueness of Islamic science. It was a worldview where knowledge and faith did not only exist but complemented one another.⁵²

⁵² For discussions on how Islamic intellectual traditions balanced scientific inquiry with religious principles, see George Saliba, *Islamic Science and the Making of the European Renaissance*

Aside from purely intellectual interests, other more concrete requirements from practice also stimulated scientific research in the Islamic culture. There were medical studies aimed at enhancing people's welfare, astronomical studies meant to assist in navigation and organizing the Islamic calendar, or mathematics necessary for promoting and managing economic activities. The scientific understanding of the problems was, henceforth, so deeply integrated into society that it covered a wide array of activities, from the profound to the surface issues. The Islamic Golden Age, therefore, provides a case where theory and practice were in harmony.

Islamic science in the medieval period was underpinned by and couldn't be analyzed outside the social, political, and economic systems at the time. The support from the rulers, the security of the trade routes, and the establishment of the network of scholars throughout the Empire contributed to the advancement of sciences. This situation enabled a lot of movement of scholars, thoughts, materials, and methodologies. Thereby, Islamic science developed gradually over the centuries.⁵³

Eventually, however, Islamic science of the medieval period combined past knowledge and fresh ideas with practical aspects and a lot of theory. Many scientific developments in this period were the beginnings of new disciplines and methods that have survived. Using the combination of sight, experimentation, and teamwork, Islamic scholars possessed a respectable scope of knowledge, indicating that science is not an activity that has a specific period but can be practiced anywhere.⁵⁴

(Cambridge, MA: MIT Press, 2007), 45–47; and Seyyed Hossein Nasr, *Religion and the Order of Nature* (New York: Oxford University Press, 1996), 89–90.

⁵³ For an overview of how scientific endeavors in the Islamic world were closely tied to sociopolitical and economic frameworks, see George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007), 72–79; and Toby E. Huff, *The Rise of Early Modern Science: Islam, China, and the West*, 2nd ed. (Cambridge: Cambridge University Press, 2003), 90–95. These works discuss the role of patronage, trade security, and intellectual networks in fostering scholarly exchange and gradual development in Islamic science.

⁵⁴ For discussions on how medieval Islamic science drew upon earlier traditions while introducing innovative methods, see Toby E. Huff, *The Rise of Early Modern Science: Islam, China, and the West*, 2nd ed. (Cambridge: Cambridge University Press, 2003), 85–88; and George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007), 90–92.

When looking at the scientific advances made during the medieval Islamic period, it is clear that it was a time of incorporating numerous information streams. Besides translating and conserving ancient works, Muslim scholars did additional work, developed some concepts, and improved others. The responsive and creative nature of Islamic science complements the global heritage, showing the contributions of those Islamic scholars towards the development of science even in the medieval age.

Within this context, it is possible to explore the beginnings of Islamic science in the Umayyad period, a foundational phase that set the stage for the intellectual flourishing that followed under the Abbasid caliphate and beyond.

1.1.1. The Umayyad Period (661-750)

With the caliphate takeover from Ali bin Abu Talib in 661 by Muawiyah bin Abu Sufyan, the Umayyad Caliphate was established, marking the beginning of the enlightenment process of Islamic science. Before and during the century-long rule, an understanding of knowledge based on the sayings of Prophet Muhammad (s.a.v.)⁵⁵ existed. According to this, knowledge was divided into two categories: the first, related to religion, and the second, related to the body. During this period, knowledge was pursued through the sayings of Prophet Muhammad (s.a.v.) and translating works from Greek and Eastern civilizations into Arabic.

While there is a general belief that the first translation movements began after the establishment of the Umayyad Dynasty, there was already an interest in translation during the tenure of the first ruler, Muawiyah.⁵⁶ Despite introducing teachings from pre-Islamic cultures such as Hermes, Ancient Greece, Hellenistic thought, Indian thought, and Sassanian thought, which led to some conflicting ideas, various works were

⁵⁵ Tibb'un Nebi (The Prophet's medicine) cupping, bloodletting, honeying etc. See Hitti (2002).

⁵⁶ The manuscript on Arabic alchemy that has reached the present day appears as an Arabic translation written in 658, of a treatise by the Greek alchemist Zosimos (350-420). See Sezgin's *Geschichte des arabischen Schrifttums*, Vol. IV. p. 75 (1971).

translated into Arabic during the Umayyad period.⁵⁷ Supported by the Umayyad caliphs, works of prominent Greek philosophers such as Aristotle and Plato, as well as works in Indian mathematics and Greek astronomy, played a significant role in the momentum gained by science in the Islamic world during this period. The works of notable figures in Ancient Greek and Roman medicine, such as Hippocrates and Galen, also contributed to advancing science in the Islamic world in this period.

During the reign of Caliph Al-Mervan I (623-685), a significant enlightenment began in medicine, and translations related to astronomy and medicine were made.⁵⁸ In the year 720, the Harran Medical School was established under the patronage of Omar ibn Abd al-Aziz (680-720), whose influence would rise during the Abbasid period. In light of these developments, the first scholars of science in the Islamic world were recorded in history. Among the most important figures were Jabir ibn Hayyan (Geber) (721-815), known as the “Father of Chemistry,” who experienced his real rise during the Abbasid period, and Khalid bin Yazid (668-704), an Umayyad prince who gained fame in the fields of mathematics and astronomy.

1.1.2. Abbasid Period (750-1258)

The Abbasids, descendants of Abbas bin Abdulmuttalib, the uncle of Prophet Muhammad (s.a.v.), brought an end to the Umayyad era with the Abbasid Revolution in 750 and became the new custodians of the caliphate. Following the first Abbasid caliph, Al-Saffah, who ruled for four years, his brother Al-Mansur took over. Science received significant support during the reigns of subsequent caliphs such as Harun al-Rashid, Al-Mamun, and Al-Mutawakkil.

⁵⁷ Aslan, F. B. (2013). *İslam Öncesi Dönemden Emevi Döneminin Sonuna Kadar Tercume Faaliyetleri*. p. 170.

⁵⁸ *Pandects*, written by Aaron of Alexandria (7th century) was translated into Arabic by the Jewish physician Maserceveyh el-Basri. Ptolemy's *Book of the Fruit* (Kitabu's Semere) is another work translated during the same period. See Sezgin (2016) *Tanunmayan Büyük Çağ*, p.19.

The Islamic world, which spanned a vast geography, provided an ideal environment for developing various branches of science by translating and advancing ancient knowledge, ultimately transferring it to the West. Through translations, disciplines such as astronomy, mathematics, and medicine from Mesopotamia; medicine, geometry, astronomy, logic, and philosophy from Greek-Roman teachings; chemistry from Egypt; and medicine and mathematics from Iran and India were almost entirely conveyed and developed in the Islamic world during this period.⁵⁹

There was little need for additional effort to establish scientific thinking during this era because when cities like Damascus, Baghdad, Egypt, and Mesopotamia were settled, the works of Greek philosophers had already been translated into local languages in these regions.⁶⁰ Additionally, in the 7th century, during the time of the Sassanian Empire, scientists expelled from the Eastern Roman Empire and leaving Alexandria were welcomed by Khosrow Anushirvan. This led to establishing an institute known as the Academy of Gondishapur in Khuzestan, which became a medical school. Apart from medicine, religious and philosophical studies were also conducted in this place.⁶¹

One of the most significant developments in knowledge transfer coincided with the spread of paper in Islamic territories as a new profession, “varâkkûn,” developed. Those who practiced this profession, called “varrâq,” were involved in papermaking and printing activities. Undoubtedly, this development contributed to the increase and promotion of written works.⁶² On the other hand, scholars traveled from city to city to

⁵⁹ Tez, Z. (1986) *Bilim ve Teknikte Ortaçağ Müslümanları*; p.3.

⁶⁰ There was also a thousand-year gap between the Greek and Islamic science. Ibid. p.3

⁶¹ In this institute, not only local Muslim physicians but also Iranian, Indian, and Greek physicians used to work. This institution, which provided education in Aramaic, laid the groundwork for the formation of Muslim medical culture. Famous physicians like Jurjis ibn Jibril and Jurjis ibn Bukhtishu worked here. In fact, the work he wrote in Syriac, called 'Kunnash,' was later translated into Arabic by Hunayn ibn Ishaq, and it is claimed that Al-Razi drew inspiration from this work. See also Sezgin, F. (1970). *Geschichte des Arabischen Schrifttums, Band III*. p. 163; Doğruyol, H. (1992). Buhtîşû. Türkiye Diyanet Vakfı İslâm Ansiklopedisi, 6. 88-90.

⁶² Varrâqs played a valuable role in the sharing of information. They were also engaged in the profession of book selling. They were involved in the reproduction, sale, and even ornamentation of works. In their shops, which served as a kind of meeting point for the intellectual class, writers and enthusiasts

reach the source of knowledge. As a result, the increasing number of itinerant scholars traveling across a vast geography played a role in arousing curiosity towards science in the eyes of society.

Scientific meetings were among the most effective activities for developing science during the Abbasid period. Scholars representing different trends gathered and presented themselves before the caliph and engaged in scientific discussions. These meetings, particularly intensified during the era of Harun al-Rashid and organized in the era of Al-Ma'mun, were aimed at bringing forth the most suitable and productive ideas, especially regarding religious conformity. Therefore, renowned scholars in Islamic intellectual history, including al-Merisi and Ahmed bin Abu Duad, were appointed as advisors. Environments that prioritized the comfort of scholars and allowed them to express their ideas freely led to the sharing of knowledge, the exchange of ideas, and, consequently, the emergence of a culture of collective progress.

The first significant strides were observed during Al-Mansur's reign (754-775). Al-Mansur was very interested in science and aimed to bring together the most famous scientists of the time under a single roof. His most important contribution in this regard was initiating efforts to establish an academy named "Beyt'ul Hikmah" (House of Wisdom) in Baghdad.

1.1.3. Bayt al-Hikmah (House of Wisdom) and the Translation Movements

The medieval Islamic civilization stood out for its dedication to knowledge, and one remarkable expression of this commitment was the creation of the Bayt al-Hikmah.⁶³ Known for its scholarly translations, the Bayt al-Hikmah played a role in translating classical Greek works into Arabic across various disciplines, such as science,

could gather to engage in discussions on knowledge. See Arifoğlu, Y. (2020). *Abbasiler Döneminde Bilgi, Teknik ve Urun Nakli (11. Yüzyıla Kadar)*.

⁶³ Riyadi, F. (2016). Perpustakaan Bayt al Hikmah, The Golden Age of Islam. *Liraria; Jurnal Perpustakaan*, 2.

medicine, philosophy, mathematics, and astronomy.⁶⁴ It also incorporated contributions from cultures and fields.⁶⁵ The impact of this institution went beyond the Arabic-speaking world. Reached Western Europe thanks to Arabic translations. This led to a rediscovery of heritage.⁶⁶

Founded by the idea and preparations initiated by Al-Mansur, Bayt al-Hikmah was established by Al-Ma'mun in 830 by expanding the library named "Khizanah al-Hikmah" from the era of Harun al-Rashid. This academy, which became the most important center for translation movements, translated and interpreted various works from other cultures into Arabic. This process aimed to train new students, thereby ensuring the development of science in the Islamic world. Translation movements were not carried out under a specific discipline before Ma'mun, but they gained a systematic structure by establishing Bayt al-Hikmah. While the motivation for the education given to students was to learn and disseminate sciences that should be included according to the utilitarian approach, another motivation was to ensure a good understanding and recognition of ancient accumulations to prove the superiority of Islam.⁶⁷ Many works brought from Gondishapur were translated and developed at this center.⁶⁸

The Bayt al-Hikmah had library, translation, and observatory departments.⁶⁹ In the library section were ancient and newly acquired books. The personal libraries of the caliphs were also consolidated here under one roof. In the translation department, translations from other languages to Arabic were carried out. With the acceleration of translation movements, this section, where scholars worked as translators, editors, and researchers according to their fields, conducted intensive work. The observatory

⁶⁴ See Hitti, P. K. (2020). *Siyasi ve Kültürel İslam Tarihi*, trans. Salih Tuğ p. 423.

⁶⁵ Ibid. Hitti also mentions that apart from the scientific fields, literatural Works like poems, Greek dramas and such were also translated.

⁶⁶ Lyons, Jonathan (2010). *The House of Wisdom: How the Arabs Transformed Western Civilization*.

⁶⁷ Kaya, M. (1992). *Beytu'l Hikme*. Türkiye Diyanet Vakfı İslâm Ansiklopedisi, 6: 378.

⁶⁸ Ullmann, M. (1978). *Islamic Surveys II, Islamic Medicine*, p. 16.

⁶⁹ Al Hasani, S. M. (2023). *Bait al-Hikmah (House of Wisdom) of Baghdad: A name of the beautiful management*, p. 86.

department was established due to the emerging desire for in-depth research. In this section, the accuracy of the research and findings was tested, and new studies were even conducted for improvement.⁷⁰

The first translation activity in the Islamic world essentially began before the Abbasids, during the Umayyad period, under the command of Khalid ibn Yazid (635-734). He ordered translating some ancient Egyptian and Greek alchemical works into Arabic due to his interest in the field.⁷¹ The Iranians, by enhancing their trade networks with the Byzantines, Chinese, and Indians, sold commercial products in a vast geography, extending to Western civilizations. From the places they visited, they also acquired new knowledge. The most significant gain in terms of science was the Greek education obtained from Antioch and Alexandria. They facilitated the development of these new scientific teachings in schools in Gondishapur and Harran.

Translation activities accelerated during the Abbasid period, reaching their peak in the 9th century. Works of Aristotle, Ptolemy, Galen, and Euclid were translated into Arabic, particularly in the 9th century. The translation of Aristotle's *Organon* and Porphyry's *Isagoge* marked the beginning of the first logic studies in the Islamic world. The initial translations were carried out by Ibn al-Muqaffa (723-759). The Sanskrit fable *Panchatantra*, a part of Indian mythology, was translated into Pahlavi literature as *Kalila and Dimna* and later translated into Arabic by Ibn al-Muqaffa. Among Iranian translators, Ibn al-Muqaffa was the most popular. In addition to him, Ibn Nawbah, responsible for the Baghdad School, the Jewish scholar Masha'allah, and Ibn al-Masawayh were notable translators. Thanks to Ibn Nawbah, translations in the field of astronomy were made from Pahlavi to Arabic and contributed to the Islamic world.⁷²

⁷⁰ Demirci, M. (2019); *Beytu 'l-Hikme Kuruluşu, İşleyişi ve Etkileri*. p. 89.

⁷¹ Khalidi, H., Dajani, B. A. S. (2015). *Facets from the Translation Movement in Classic Arab Culture*, p. 2.

⁷² Gutas, D. (1998;147).

The introduction of Greek philosophy into the Islamic world necessitates examining the influence of Christian Nestorian and Jacobite monasteries in Syria and Iran in the 7th century. Plato and Aristotle's works were first translated into Syriac in close association with Christianity.⁷³ During the translation movements that continued between the 4th and 8th centuries, these works were studied exclusively in monasteries as a part of their work on religious matters rather than as scientific materials.

Another translator, Sergius of Rashaya (466-536), a Mesopotamian priest well-versed in Alexandrian science, passed away in Constantinople in 536 at 70. He delved into theology, ethics, and mysticism and extended his translations to encompass physics, medicine, and philosophy.⁷⁴ Jacob of Edessa (Yakup of Urfa) (633-708) contributed to disseminating knowledge by translating Greek theological writings. Notably, Sergius of Rashaya generally maintained faithfulness to the original work to keep its logical and scientificity. Despite their role in transmission, some argue that Syrians did not significantly contribute to generating new content through translation.⁷⁵ Muslims predominantly drove the scientific and philosophical advancements in the Islamic world, and even the highly knowledgeable Syrians of that period did not produce individuals comparable to figures like al-Farabi, Ibn Sina, al-Biruni, and Ibn Rushd.

Translation movements have not been carried out under a strong discipline during the Umayyad period; however, it can be said that they strengthened with the establishment of Bayt al-Hikmah during the Abbasid era. After Baghdad became the state's center, translation movements gained momentum during the reign of Caliph al-Mansur. They were subsequently placed under a strong discipline during the Harun al-

⁷³ During the 7th and 8th centuries, Greek was still widely known among the Syriac elites. The cultural tradition known as "Syriac" was predominantly, though not entirely, bilingual, blending both Greek and Syriac influences. Most leading scholars were proficient in both languages. Although some texts were translated for those less familiar with Greek, bilingual scholars had access to both Greek and Syriac manuscripts, and not all of the material they studied or understood was translated. See, Watt, J. (2013). *The Syriac Aristotle Between Alexandria and Baghdad*, p.29.

⁷⁴ Arzhanov, Y. (2024). *Sergius of Reshaina, Commentary on Aristotle's »Categories«: Critical Edition and Translation*. Berlin, Boston: De Gruyter, p. 5.

⁷⁵ Ibid.p. 34

Rashid and al-Ma'mun periods. Al-Mansur appointed Yuhanna ibn Masawaih, who was proficient in the Greek language and had written books in Syriac and Arabic, as the head of Bayt al-Hikmah.⁷⁶

During the era of al-Ma'mun, some of the most renowned translators emerged. Among them were Hunayn ibn Ishaq, members of the Bactrian family, Masarjawaih, Thabit ibn Qurra, Christian Kusta ibn Luqa, Iranian ibn-Muqaffa, members of the Nawbakht family, and al-Kindi, who were among the most important. Hunayn ibn Ishaq took over the leadership of Bayt al-Hikmah during the time of Caliph al-Mutawakkil. Translators who received substantial salaries from the state could engage comfortably in scientific research and translation movements.

Translations into Arabic were carried out using two main methods. In one method, the Arabic equivalent of each word in the work was found, and the work was translated word by word until the end. The other method was the original and explanatory translation. The first of these methods posed some challenges; for example, not every word had an equivalent in Arabic, and the syntactic structures in the source language could differ from Arabic.⁷⁷

Hunayn ibn Ishaq (Johannitus) (809-873)

Born into a Christian family under the Eastern Roman Empire, Ibn Ishaq, a Syriac Arab physician, is best known in the Islamic world especially for his works and translations in the field of medicine. Thanks to his talents during his youth, he received education at one of the prominent medical schools in Baghdad. This period coincided with Baghdad's rise as the center of science and culture in the Arab world after

⁷⁶ Sarton, G. (1927). *Introduction to the History of Science, Volume I. From Homer to Omar Khayyam*; p. 574

⁷⁷ For the methodology and further details of this period, see El Ghazi, O. (2021). Arabic Translation from Bait Al-Hikma to Toledo School of Translators: Key Players, Theorization and Major Strategies. *International Journal of Arabic-English Studies*, 21(1), 45-60.

becoming the state's capital, significantly influencing his career. Ibn Ishaq is renowned for translating works written in languages such as Greek, Syriac, and Persian into Arabic. Among his translations are significant works in medicine, mathematics, astronomy, and other scientific disciplines.

One of Hunayn ibn Ishaq's most notable contributions is his effort to preserve not only the words but also the original meaning and spirit of the works he translated. This approach enhanced the accuracy and richness of content in his translations, providing access to original works in the Arabic-speaking world. Particularly in the field of medicine, Ibn Ishaq's translations facilitated the transfer of knowledge from Ancient Greek, Indian, and Persian medicine to the Arabic world. His translations played a crucial role in the adoption and development of scientific and medical knowledge from the West in the Arab world. Additionally, he made significant contributions to scientific progress by guiding and encouraging scholars of his time.

His translations included works by Hippocrates, Galen, Dioscorides, Plato, Aristotle, Ptolemy, Archimedes, and Euclid. Collaborating with his son Ishaq ibn Hunayn, his nephew Hubais ibn Hasan, and his student Isa Ibn Yahya, Ibn Ishaq formed a translation group. The completion of translations was supervised by students, and the credit for a translation was attributed to the one who put more effort into it. Generally, the father focused on medical translations, while the son engaged in philosophical translations. He compiled the translation of Galen's seven books on anatomy in a work called "Al-sina'a al Sagira."

One negative incident known about Ibn Ishaq is that Caliph al-Ma'mun, in exchange for the weight of the books he translated, gifted him as much gold, causing financial strain on the treasury. Subsequently, Caliph al-Mutawakkil appointed him as

the palace physician. However, Ibn Ishaq spent a year in prison for refusing to prepare poison for an enemy.⁷⁸

Ibn Ishaq was also a traveling physician who enhanced his medical knowledge and Greek language skills in Syria, Palestine, and Alexandria. In addition to his work in medicine and mathematics, he translated Aristotle's "Categories," "Physics," and "Magna Moralia," as well as Plato's "Republic," "Laws," and "Timaeus." His translation of Hippocrates' "Aphorisms" became an important source in subsequent periods. Other notable translations included Aegineta's "Seven Books," Oribasius's "Synopsis," and Dioscorides' "Materia Medica." Among Arabs and Iranians, his most famous works were "Questions on Medicine," based on Galen's studies, presented in a question-and-answer format, and *Kitāb al-‘Ashr Maqālāt fī al-‘Ayn* (Ten Treatises on the Eye) (See Appendix 8), the oldest systematic handbook on ophthalmology which is a classic book on the treatment of eyes.⁷⁹ It comprehensively examines, in a sequence, the physical structure, functions, pathologies and their interventions of the eye by fusing theoretical concepts of Greek medicine and practical inventiveness. This book became a base for both Islamic and European medicine and for many hundred years determined the development of two branches of medicine, which were ophthalmology. In addition,

⁷⁸ For details on the contributions and controversies surrounding Ibn Ishaq's life, including his role as a translator and palace physician under Caliphs al-Ma'mun and al-Mutawakkil, see Saliba, G. (2007). *Islamic science and the making of the European Renaissance*. MIT Press, pp. 105–107; and Nasr, S. H. (1968). *Science and civilization in Islam*. Harvard University Press, pp. 123–124. These sources discuss the anecdote of his reward for translations, his appointment as palace physician, and his imprisonment for refusing to prepare poison.

⁷⁹ For details on Ibn Ishaq's travels, translations, and medical contributions, see Nasr, S. H. (1968). *Science and civilization in Islam* (pp. 135–138). Harvard University Press. His translations of Aristotle, Plato, Hippocrates, and other classical authors, as well as his original works like *Kitāb al-‘Ashr Maqālāt fī al-‘Ayn*, are discussed extensively as foundational contributions to both Islamic and global scientific traditions. For a detailed analysis of his ophthalmological work, refer to Gutas, D. (2001). *Greek thought, Arabic culture: The Graeco-Arabic translation movement in Baghdad and early ‘Abbasid society*. Routledge, pp. 45–47.

some of Galen's works, whose original Greek manuscripts are lost, have reached the present day through Ibn Ishaq's Arabic translations.⁸⁰

Other Translators

One of the other essential translators who should be mentioned after Ibn Ishaq is Thabit ibn Kurra (826-901). Also, as a mathematician and astronomer, Thabit ibn Kurra gained renown as a scholar in the field of mathematics during the Abbasid Caliphate. Due to his early aptitude for mathematics, he received an education in Baghdad and commenced his studies in mathematics and astronomy. His mastery of Greek mathematics and translations into Arabic played a crucial role in developing Islamic science. His works on trigonometric ratios and functions contributed to advancing mathematics in Europe. In optics, he developed theories on light's reflection and refraction principles, and his studies became a significant source for later scientists in this field.

Costa ibn Luka (820-912), born into a recognized Christian family and known in the field of contemporary psychotherapy, wrote over 60 works in various fields such as philosophy, arithmetic, geometry, astronomy, logic, and politics. He also translated seventeen works. He was a strong scientist in medicine, comparable to Ibn al-Nadim and Hunayn ibn Ishaq. His medical works are believed to be references for Razi and Ibn al-

⁸⁰ There are numerous translated works in Bayt'al Hikmah; in addition to "Kalila and Dimna," translations from Persian include "Hudayna," "Mazdek" (Ibn Nadim, 2019, p. 364). Translations from Hindi include "Siddhartha," "Kitabu Samum," "Kitabu'l-Mawalid" (Demirci, 2019, p. 123), "Kitabu Asma'i Akakiril-Hind," "Istankaru'l-Jami," "Muhtasaru'l-Hind fi'l-Akakir" (Ibn Nadim, 2019, p. 952-954). From Hebrew, "Efäru't-Tevrat" has been translated (Demirci, 2019, p. 126). Works translated from Nabatean include "Tardu'sh-Shayatin," "Sihri'l-Kebir," "Esraru'l-Kawakib," "Karabin" (Ibn Nadim, 2019, p. 978). Translations from Greek are more abundant compared to translations from other languages. It is known that works by Plato, Aristotle, Ptolemy, Hippocrates, and Calinus have been translated. For example, Plato's "Al-Siyase" (The Republic), "Nawamis" (Laws) (Ibn Nadim, 2019, p. 800); Aristotle's "Makulat" (Categories), "Nafs" (On the Soul), "Ahlak" (Nicomachean Ethics) (Ibn Nadim, 2019, p. 808-818); Ptolemy's "Majisti," "Mawalid" (Ibn Nadim, 2019, p. 860-862); Hippocrates' "Ahd Hippocrates," "Fusul," "Kitabu Takdimeti'l-Marife" (Ibn Nadim, 2019, p. 914); Calinus' "Firak," "Ustukussat," "Mizac" (Ibn Nadim, 2019, p. 918) are among the translated works.

Jazzar. Among his surviving works are important ones such as Heron's *Mechanica*, Aristarchus's *De ortu occasione siderum inerrantium*, Hypsicles's *De ascensionibus*, Theodosius of Bithynia's *De sphaeris*, and *De habitationibus*.

In addition, Jacob of Edessa (c. 640-708), known for the surviving works "Rabies in Dogs" and "Book of Treasures," compiled an encyclopedic work on philosophy and natural sciences in Baghdad. Almost all Greek philosophical and medical works on religious science were translated into two translation schools led by Jacob.⁸¹ Yahya ibn Bitrik (770-810) translated Plato's "Timaeus," Aristotle's "Meteorology," and "Book of Animals"; al-Himsi translated Aristotle's "Sophistical" and "Physics." Gabriel ibn Bakhtishu translated Dioscorides's "Materia medica" from Greek to Syriac, and later, Stephen ibn Basil translated it from Syriac to Arabic.⁸²

Through translation activities, the works of other civilizations were introduced to the Islamic world, and studies were conducted on these works. This led to the development of knowledge and practice, strengthening science and laying the foundations for its spread to Europe. When examining translation activities in medieval Europe, it is generally known that Arabic works were translated into Latin while ancient works were translated. Translating the works of Greek philosophers required more than just knowing the source language; thus, learning about the knowledge and views of Islamic science and scholars who had moved to the West was necessary. In brief, Islamic science paved the way for scientific activities in medieval Europe.

In addition to these well-known figures in translation and scientific scholarship, Bayt al-Hikmah hosted a valuable scientist whose influence extended to the West. Al-Kindî (801-873), also known as "Alchindus" in medieval Europe, served at Bayt al-

⁸¹ Wright (1872) Part III, p24.

⁸² For an overview of Costa ibn Luka's (820–912) contributions to various scientific fields and his influence on later figures such as Razi and Ibn al-Jazzar, see Nasr, S. H. (1968). *Science and civilization in Islam* (pp. 145–147). Harvard University Press. For further details on the translation movement and the roles of Jacob of Edessa, Yahya ibn Bitrik, al-Himsi, and Gabriel ibn Bakhtishu, see Gutas, D. (2001;52-56).

Hikmah, was an Arab philosopher, mathematician, astrologer, and physician who played a significant role in the intellectual developments of the Islamic Golden Age. He is also considered the first Islamic philosopher. He is listed among the twelve distinguished scholars and philosophers globally, along with Jabir ibn Hayyan, as the Italian philosopher Girolamo Cardano (1501-1576) acknowledged in his work “De Subtilitate.”⁸³ While Al-Kindi may not have prominently stood out as a translator, he organized the philosophical concepts in Arabic corresponding to those in translated works from Greek, ensuring adherence to language and grammar rules.⁸⁴

According to Ibn Nadim, Al-Kindi wrote around 242 works. Of these, 29 were on astrology, 23 on geometry, 22 on philosophy, 22 on medicine, 20 on logic, 17 on dialectics, 16 on astronomy, 12 on politics, 11 on meteorology, seven on music, five on psychology, and the rest covered various subjects.⁸⁵ He categorized sciences into theoretical and practical, with physics, metaphysics, and psychology falling under theoretical sciences and ethics and politics under practical sciences. Additionally, he founded the Meşşai School as a practitioner of the school, and among his students were Serahsi, al-Bahli, al-Bayhi, and al-Husayni. His work *Risālah fī ḥudūd al-ashyā’ wa rusūmihā* as a philosophical dictionary had a significant impact on scholars like Harizmi, Ibn Sina, and Jurjani.⁸⁶ In the field of medicine, his important works include *Kitāb al-Adwiyah al-Mumtahānah*, *Risālah fī ‘izāḥ al-‘illah fī’s-samā’im al-qātilah*, *Risālah fī’l-Lughah*, *Risālah fī ma’rifat quwwat al-adwiyah al-murakkabah* (translated into Latin as *De medicinarum compositarum*), and *Risālah fī’l-Bāḥ*. These works have been translated

⁸³ Giavina, D. (2013). *Il de Secretis Liber Primus* di Girolamo Cardano. p.69.

⁸⁴ Demirci, (2019); p. 161.

⁸⁵ İbn Nedîm (2019). *el-Fihrist*. çev. Ramazan Şeşen, İstanbul: Türkiye Yazma Eserler Kurumu Başkanlığı Yayınları.

⁸⁶ Kaya, M. (2002). Kindî, Ya’kub b. İshak. Türkiye Diyanet Vakfı İslam Ansiklopedisi. 26: 88-90. İstanbul: TDV Publications. Also *Kitab ii’l-telseteti’l-ula*, *Risâle fī’l-fâ’ili’l-ḥakki’l-evvel et-tâm ve’l-fâ’ili’n-nâkış ellezî huve bi’l-mecâz*, *Risâle fī izâḥi tenâhî cirmi’l-‘âlem*, *Risâle fī mâ’iyyeti mâ lâ yumkinu en yekûne lâ nihâyete leh ve me’llezî yukâlu lâ nihâyete leh*, *Risâle fī vaḥdâniyyeti’llâh ve tenâhî cirmi’l-‘âlem*, *Risâletu’l-ibâne ‘an sucûdi’l-cirmi’l-aqşâ ve tâ’atihî li’llâhi te’âlâ*, *Risâle fī enneḥû tûcedu cevâhiru lâ ecsâme*, *isâle fī kemmiyyeti kutubi Aristotâlis ve mâ yuḥtâcu ileyhi fī taḥşîli’l-felsefe*, *el-Cevâhiru’l-ḥamse* are other significant works of him.

by Western scholars or consulted in their studies.⁸⁷ It is possible to consider that Al-Kindi, as a scholar who lived in Kairouan and developed his works there, led scholars like Ibn al-Jazzar on the journey of Islamic science to be known and studied in Europe.

1.2. The Journey of Islamic Science from Mashriq to Maghrib

During the Umayyad period, as a result of the conquest-oriented approach, Umayyads gained control over a vast geography ranging from Talas, Tashkent, Samarkand, Kabul, and Sind in the East; Tbilisi and Khwarazm in the North; Yemen in the South; to North Africa and the Iberian Peninsula in the West. While not reaching the same level of scientific achievements as the Abbasids, as mentioned in the previous section, the Umayyads played a crucial role in facilitating the transfer of scientific advancements to Europe, particularly in the regions they conquered, such as North Africa and the territories of Al-Andalus, where Muslim dominance had been established.

With the fall of the Umayyads, the Umayyads of Al-Andalus (756-1031) established their state, and areas outside this region gradually came under Abbasid control. Especially in North Africa, the emirates of the Idrisids (788-985), Aghlabids (800-909), and Tulunids (868-905) emerged during this transitional period. Before the establishment of these emirates, there were newly migrated Arabs and Berbers who had embraced Islam in North Africa. The Berbers played a significant role in establishing the Umayyad State of Al-Andalus and preserving Islam in their region.⁸⁸

⁸⁷ It is believed that Roger Bacon and his mentor Robert Grosseteste were influenced by al-Kindi's thoughts on existence (Lindberg, D. C. (1983)). The explanation of the formation and direction of the wind is intertwined with the modern explanations of George Hadley (1685-1744) and Immanuel Kant (1724-1804), who are recognized as pioneers of this explanation. See, Schneider-Carius, K. (1955). *Wetterkunde, Wetterforschung*, Munich. Pp. 82-87, as cited in Sezgin, F. (2008). *İslam'da Bilim ve Teknik*, Vol. 1. p. 14.

⁸⁸ Byzantine Empire's approximately century-long struggle for dominance in North Africa was eliminated with the support of the Berbers. In the year 670, they completely eradicated Christian rule in the Maghreb. Kaya, S. (2019). *The Aghlabid State and Its Activities in the Mediterranean (800-909)*.

Before examining the journey of science from east to west, it is necessary to explore the Maghrib and Mashriq. Mashriq is the term used to describe the region covering the east of Egypt and the Arabian Peninsula. On the other hand, Maghrib refers to the part that spans from Egypt to the Atlantic Ocean, encompassing the southern Mediterranean coasts and the North African region. Especially during the rule of the Aghlabids in the Ifriqiya region, relations between Mashriq and Maghrib gained momentum, and along with social and cultural interactions, scientific developments began to be transferred to this region.

During the Aghlabid period, when the center moved from Kairouan to Raqqa, many scholars from Baghdad traveled to this region. Eventually, Raqqa became a significant center for science in Maghrib. The Aghlabids looked up to the Abbasids in terms of science, leading to the establishment of an academy in Kairouan named Bayt al-Hikmah, similar to the one in Baghdad. The Aghlabi Bayt al-Hikmah, the region's first academic institution, conducted religious and intellectual sciences studies and opened its doors to people of all Muslim and non-Muslim classes.⁸⁹ This center consisted of four sections: the copying section, where books were duplicated; the lending section, where books were borrowed; the section where scholars conducted their studies; and the section where books and astronomical instruments were kept.⁹⁰ In terms of translation activities, it is believed that philosophy, medicine, mathematics, geography, and logic were the preferred fields.⁹¹

Emir Ibrahim II, while annually sending envoy delegations to Baghdad to present collected taxes and loyalty to the caliph, also allocated additional funds to the delegation

⁸⁹ Öztürk Kocabıyık, N. (2021), p.7. At the same time the mosque libraries were actively used. In al Qayrawan the education system had a connection, with the participation of women in seeking knowledge. Scholars, rulers and men, from backgrounds wholeheartedly supported the library situated in the mosque of their town. See, Sibai, M.M. (1987). *Mosque Libraries: An Historical Study*. Mansell Publishing Limited: London and New York. p 58.

⁹⁰ Demiralay, (2018); p. 110.

⁹¹ Al-Rammah, M. (1995). The Ancient Library of Kairouan and its methods of conservation, in *The Conservation and preservation of Islamic manuscripts, Proceedings of the Third Conference of Al-Furqan Islamic Heritage Foundation* (1995), pp 29-47, p. 32.

to purchase science books of his interest. He even persuaded scholars from Iraq and Egypt to come to Bayt al-Hikmah.⁹² After the Aghlabids, Bayt al-Hikmah could not continue its activities due to the plunder during the Fatimid period. However, during its brief existence, it managed to attract the attention of Mashriq and hosted visits from various scientists. Over time, it became a meeting and interaction point for scientists from the Umayyad territories in Andalusia and the East. It played a crucial role in transmitting Islamic science to the West.

In the mid-9th century, the Abbasids weakened due to internal turmoil, leading to the declaration of independence by some regions. On the western side, the Tulunids seized this opportunity and separated from the Abbasids. Although they expanded their borders quickly, the Abbasids regained strength and brought the regions that had declared independence back under their protection.⁹³ Incorporating the Tulunids' territories by the Abbasids was a crucial turning point in Islamic history because, after the Tulunids, the Abbasids made efforts to strengthen their relations with the Western emirates.

Following the decline of Tulunid rule, the relations with Maghrib, which had weakened, were attempted to be normalized. However, the transfer of science to the

⁹² Ma'rûf, N. (1969). *Asâletu'l-hadâratî'l-'Arabiyye*. Matbaatu't-tedâmun; as cited in Sarıkaya, M. (2021).

⁹³ The Tulunids, also known as the Tolunids, served as governors of Egypt under the Abbasid Caliphate. Led by the Governor of Egypt, Ahmad ibn Tulun, the Tulunids effectively made Egypt independent during a period when the influence of the Abbasid Caliphate waned. Establishing their rule in Egypt with a government based on their own family, the Tulunids solidified their independence. During this period, the Tulunids acting independently from the Abbasid Caliphate changed the political dynamics in the region. The independence of the Tulunids weakened the authority of the caliphate and encouraged other Muslim states in the region to gain more autonomy. However, the Tulunids' independence was short-lived. Caliph al-Mutawakkil launched a campaign to regain control of Egypt. The leader of the Tulunids, Ahmad ibn Tulun, died in the year 870, and his son Abbas ibn Tulun took his place. However, Abbas ibn Tulun could not sustain his father's successes and was defeated by Abbasid forces. Thus, the independent rule of the Tulunids came to an end, and Egypt once again came under the direct control of the Abbasid Caliphate. See Ayaz, F. Y. (2012). *Abbâsîler'den Mısır'da Kurulan Hanedanlara Vezirlik Muessesesi. İslâm Araştırmaları Dergisi*. 28: 117-149. This incident is a precedent for the problems the Abbasids faced with the other emirates under their control.

West continued more through the efforts of scholars than through state initiatives. After the Aghlabids, the Fatimids took control, sustaining themselves as a principality under the Abbasids from 909 to 1171. During this period, characterized by narrative sectarianism, the enthusiasm for scientific activities was not comparable to that seen during the Aghlabids era. They even plundered Bayt al-Hikmah, burned libraries, and showed almost no mercy in any written records related to the Aghlabids.⁹⁴ However, despite all these adversities, the efforts of Islamic scholars persisted.

A significant figure associated with the Aghlabid Bayt al-Hikmah was Ishak bin Imran (born around 903-909). Originally from Baghdad, he was a distinguished physician known as *Semmu Sa'a*. His accomplishments in medicine earned him significant recognition within Baghdad's scientific community. According to Ibn Jullul and other scholars, Ishak bin Imran was instrumental in advancing medical and philosophical knowledge dissemination in the Maghrib region. Additionally, Ishak's expertise in pharmacology and melancholy is emphasized. His work on melancholy, titled *Kitâb fi'l-mâlîhulyâ*, was translated into Latin as *De melancolia* in the Western medical world, contributing to Ishak's recognition. Among Ishak bin Imran's other works are *Kitâbu's-Şimâr*, *Kitâbu'l-'Unşur ve't-tamâm fi't-tıbb*, *Kitâb fi'l-faşd*, *Kitâb fi'n-nabz*, and a treatise on food.⁹⁵

Another remarkable figure is Ishaq bin Suleyman al-Isra'ili (born around 953). Originally a Jewish Egyptian, al-Isra'ili started his medical career as an ophthalmologist. He later moved to Kairouan, became a student of Ishaq bin Imran, and participated in the court of Aghlabid ruler Ziyadatullah III. However, he found these gatherings unremarkable and did not appreciate them. After the fall of the Aghlabids, he served as the personal physician to the first Fatimid caliph, Abu Muhammad Ubaydullah al-Mahdi. Although al-Isra'ili authored philosophical and logical works, he is mainly recognized for his medical contributions. Kindi served as an influence in philosophical

⁹⁴ Ibid. Sarıkaya, M. (2021).

⁹⁵ Şahin, H.; Cihan, A. K. (2000). İshâk bin İmrân. Türkiye Diyanet Vakfı İslâm Ansiklopedisi, 22. p 535.

literature and is therefore associated with the first wave of Neoplatonism. His medical writings, particularly *Kitābu'l-Ḥummeyât*, considered a valuable work on fevers, were translated into Latin by Constantine the African, and to this day, these works have been preserved. Other medical works include *Kitābu'l-Ağziye*, *Kitābu'l-Bevl*, and *Maḳāle fi'l-kuhl*.⁹⁶

In addition to these two crucial figures, Abu'l-Yusr Ibrahim al-Shaybani (839-911), originally from Baghdad, served as the head of the Aghlabid Bayt al-Hikmah. He made significant contributions to the fields of culture and thought and, after going to Cordoba, shared his knowledge and expertise as a poet and scholar. Another critical scholar of the period is Ismail bin Yusuf. Having received education in language and religious sciences in Egypt, the Hijaz, and Baghdad, he conducted studies in astronomy and chemistry. Furthermore, he learned the art of dyeing, initiated pigment production upon his return to Kairouan, and taught chemistry.⁹⁷

1.2.1. Ibn al-Jazzar (898-979)

Abū Ja'far Aḥmad ibn Ibrāhīm ibn Abī Khālīd ibn al-Jazzār al-Qayrawani, known as Ibn al-Jazzar, was born in Qayrawan during the reign of the Aghlabid Emir Ibrahim II in a family renowned for medicine. As Ibn Abi Usaybi'ah mentions, “he was a physician, the son of a physician, and his uncle Abu Bakr was a physician” who had met and accompanied Isaac Israeli. Ibn al-Jazzar mentions his uncle in his book *Nasaih al-Abrar*, describing him as a knowledgeable physician who treated dignitaries and the affluent, whose treatments he later practiced and praised. Isaac ibn Sulaiman came from Egypt during the Ziyadat ibn Al-Aghlab era and was tutored by Abu Ja'far. He was a descendant of the authentic Qayrawan school established by Isaac ibn Imran. He stayed in Africa and didn't travel to the East for pilgrimage or to meet other medical leaders,

⁹⁶ Şahin, H.; Cihan, A. K. (2000). İshāk bin Suleyman el-İsrâîlî. *Türkiye Diyanet Vakfı İslâm Ansiklopedisi*, 22. p 545.

⁹⁷ Ibid. Demiralay, M. (2018). p. 98.; Ibid. Sarıkaya, M. (2021)

nor did he travel to Al-Andalus, though he longed to do so. Instead, he focused on treating patients and teaching medicine, encouraged by his uncle and teachers.⁹⁸ Solomon ibn Hassan, known as Ibn Juljul, in his *Ṭabaqāt al-aṭibbā' w'al-hukamā* (Generations of Physicians and Wise Men), mentions that Ibn al-Jazzar had an apprentice named Rashiḡ who assisted patients with medicines after they consulted Ibn al-Jazzar. Yaḡut al-Hamawī notes his generosity in distributing medicines to the poor. Ibn al-Jazzar treated the son of Judge Nu'man, who thanked him with gifts, but Ibn al-Jazzar accepted only the gratitude, reflecting his independence and dignity. Al-Jazzar was a scholar who acknowledged the merits of earlier physicians. He attributed every quote in his books to its original author. He wasn't just a compiler; he critically evaluated and tested the treatments he mentioned. He was notably critical of Galen's works, seeking to verify and test medical knowledge.

Despite his significant contributions, the exact dates of his birth and death are uncertain for some researchers; for others, he lived between 898 and 979. His works, however, remained influential not only in the Islamic world but also in Europe, where they were translated and studied extensively. Ibn al-Jazzar's works cover various aspects of medicine, many of which survive in manuscripts or have been published. His contributions to the medical field are extensive and diverse, reflecting his role as a pivotal figure in the history of medicine. He was fundamentally motivated by a desire to discover and continually seek out the true nature of drugs and herbs as described in the books of earlier scholars, searching for them in their natural habitats and teaching people about them so that they could benefit from them while avoiding confusion.

He had a vast collection of primary and significant sources, amounting to twenty-five qintars of medical books and others.⁹⁹ When we focus on the ancient Greek sources Ibn al-Jazzar relied on, we can see numerous references to Galen, Dioscorides,

⁹⁸ Rosenthal, F. (1975). The Qayrawān School of Medicine and its Legacy. *Journal of Islamic Studies*, 18(2), 121-140.

⁹⁹ Bos, G. (1993). Ibn al-Jazzar on women's diseases. *Medical History*, 37(3), 296-312.

Hippocrates, Pythagoras, Aristotle, Paul of Aegina, Rufus of Ephesus, Andromachus, Philumenus, Porphyry, and Theophrastus.

In another of his works, *Al-I'timad Fi'l-Adwiya Al-Mufrada* (The Reliance on Simple Medicines), al-Jazzar focuses on the use of simple, natural remedies made from plants, animal products and minerals to treat a wide range of ailments. It serves as an important contribution to pharmacology, highlighting the single-ingredient medicines rather than complex formulated ones, as they were more accessible and practical for daily use. Al-Jazzar meticulously collected therapeutic properties of cosmetic substances from Greco-Roman sources including Dioscorides and Galen as well as his own observations. The classic has emphasized the importance of empirical observation and systematic classification in medicine which acts as a bridge from ancient traditions to advanced Islamic science.¹⁰⁰

On the other hand, the famous medical books of the Mashriq during Ibn al-Jazzar's time, like those of Abu Bakr Muhammad ibn Zakariyya al-Razi (died c.925), did not seem to have a direct impact on medicine in Africa and the western wing of the Arab world. Ibn al-Jazzar never mentioned al-Razi's *Al-Hawi* or any of his other works. This might suggest a period of diminished contact between the East and the West, a topic of debate among scholars. However, Ibn al-Jazzar's reputation extended beyond the Islamic world, with his works influencing European medicine significantly. His name and the titles of his works were often translated into various forms, sometimes close to the original Arabic and sometimes not. The details of his death are also somewhat unclear, with different sources suggesting multiple dates. *Kitab Siyasat al-Sibyan wa Tadbirihim* (On the Education and Regimen of Children) was published with verification by Muhammad al-Habib Hila in Tunis in 1968 and reprinted in 1983. It is also possible that Ahmad ibn Muhammad al-Baladi (d. ca. 990) might have benefited

¹⁰⁰ Ben Mrad, I. (Ed.). (2019). *Kitāb al-I'timād fī al-adwiyah al-mufradah* (The Reliable Book on Simple Drugs). By Abū Ja'far Aḥmad Ibn Ibrāhīm Ibn Al-Jazzār (369 AH/979–980 CE). London: Al-Furqān Islamic Heritage Foundation, Centre for the Study of Islamic Manuscripts. (Edited Texts Series, 1090 pp).

from Ibn al-Jazzar's book in his work *Tadbir al-Hubala wa-al-Atfal wa-al-Sibyan* (The Management of Pregnant Women, Children, and Boys, Preserving Their Health and Treating Diseases that Befall Them) (published by Dar al-Hurriyya for Printing in Baghdad in 1980).¹⁰¹ *Kitab al-Mi'adah aw fi al-Mi'adah wa Amraziha wa Madawatiha* (The Book of the Stomach / On the Stomach and its Diseases and their Treatment) is mentioned by Brockelmann, Ullmann, and Sezgin, who note that Constantine the African translated it into Latin and attributed it to himself. Salman Qattaya verified it, stating, "This book is the initiation of specialization (diseases of the digestive system) and is a compilation, refinement, correction, and addition to the medical information related to this specialty at that time."¹⁰² In this book, he mainly relied on Galen, citing him 37 times. He also referred to Hippocrates, Rufus, Aesculapiades, and others, as well as more contemporary sources like Yahya ibn Masawaih and his uncle, Muhammad ibn Ahmad, the physician.¹⁰³ His approach wasn't just about quoting; he critically evaluated and commented on what he quoted, praising it after selecting and testing it or expressing caution about it. He added many medicines he formulated himself, which he tested and praised. He noted the errors and misconceptions his predecessors or contemporaries made, relying more on experience and observation than what the transmitted texts offered to the reader. *Kitab Tibb al-Fuqara' wa al-Masakin* (The Book of Medicine for the Poor and the Destitute) is, in all respects, one of the manuscripts concerning an Islamic medical legacy. Likewise, this work is authored by Ibn al-Jazzar; it is focused on the poor and deprived and contains medical knowledge and therapies that are needed and affordable. The work identifies the social and economic barriers to health care and suggests examples of low-tech, inexpensive alternatives. The text discusses nutrition, ways of living, and treating different diseases using available plants and affordable

¹⁰¹ Van Dalen, E. (2020). Pediatrics in Medieval Islamic Theoria. *Journal of the American Oriental Society*, 140(1), 5; Shihadeh, A. (2005), *From al-Ghazali to al-Razi: 6/12th Century Development in Muslim Philosophical Theology*; pp. 141-179.

¹⁰² Suwaysi, M., al-Jazi, R, al-Asali, F. (1999). *Zād al-Musāfir wa-Qūt al-Hāḍir* by Ibn al-Jazzar, Vol 1 p.44.

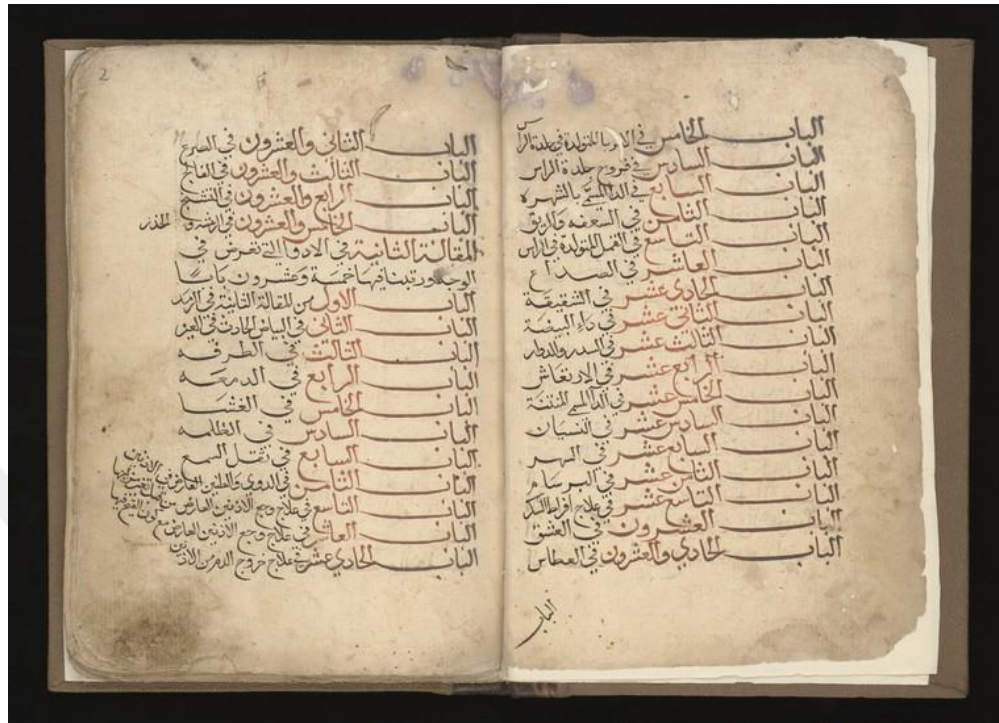
¹⁰³ Dine, K. (2023). Ibn al-Jazzār al-Qayrawānī and his Book "On Stomach Medicine". *Majallat 'Uşūr*, 22(Special Issue), 171–195.

materials. It indicates a deep concern for public health and social responsibilities, observing the principle of “do not harm” significantly. There is an aspect of Ibn al-Jazzar’s humanitarian vision in which he explains how medical services would be accessible for all community members and get across the need for care and fairness in medicine.

Kitab Zād al-Musāfir wa Qūt al-Hadīr (The Book of Provisions for the Traveler and Nourishment for the Sedentary) stands as a principal work by Al-Jazzar (see Figure 1), explored in this research as one of the fundamental works. Regarded as an extensive and engaging medical guide, it targets a broad readership, encompassing doctors, medical trainees, and even laypersons, regardless of whether they are on the move or settled. Renowned for its straightforward accessibility and plain language, the book offers a concise yet ample overview of disease symptoms, causes, indications, diagnoses, and differentiations, alongside treatment strategies and effective medications, paralleling it to modern, succinct medical references known as memory aids.¹⁰⁴ The work also ranks among Western medical heritage's most pivotal medical texts. Translated into Latin in the 11th century by Constantinus Africanus as *Viaticum*, it broadened its reach, significantly impacting Western medical practice and education. The translation is revered as a crucial historical medical document. The text has undergone rigorous analysis and has been reissued, reflecting its persistent pertinence and sway in the medical history and educational spheres.

¹⁰⁴ Bos, G. (2015). *Ibn al-Jazzar's Zād al-musāfir wa-qūt al-ḥādīr, Provisions for the traveller and nourishment for the sedentary, Book 7 (7-30): critical edition of the Arabic text with English translation, and critical edition of Moses ibn Tibbon's Hebrew translation (Ṣedat ha-derakhim)*, Brill.

Figure 1. A page from the *Zād al-Musāfir* MS; content page showing articles and chapters.¹⁰⁵



Source: MS Arabic 406. Attribution 4.0 International (CC BY 4.0). Wellcome Collection.

The book has received critical editing, with the initial Arabic manuscript being translated into English, accompanied by an introduction and commentary. Such endeavors are intended to maintain and enhance the accessibility of this vital medical document for modern researchers and healthcare professionals. These concerted efforts highlight the lasting importance and influence of *Zād al-Musāfir wa-Qut al-Hadir* in medical literature and history.¹⁰⁶ The book, which also constitutes an extensive portion of this thesis, consists of two books whose focus areas are as follows:

- Article 1: Ailments occurring in the head
- Article 2: Ailments occurring in the face
- Article 3: Ailments occurring in the respiratory organs
- Article 4: Ailments occurring in the stomach and intestines

¹⁰⁵ For the other content pages see Appendices I, II, III, IV, V.

¹⁰⁶ Bos, G. & Käs, F. (2022). *Ibn al Jazzar Zād al Musāfir*, Books 1,2. Leiden, The Netherlands: Brill.

- Article 5: Ailments occurring in the liver and kidneys
- Article 6: Ailments occurring in the reproductive organs
- Article 7: Ailments occurring inside the skin and fevers

In addition to his numerous medical works, some of which have been lost over time and others in manuscript form in several libraries or have been published, Ibn al-Jazzar's legacy in medicine remains significant and far-reaching. Ibn al-Jazzar's bibliography is extensive, with many of his works on different subjects, particularly in the medical sciences. Some of these works have been lost, and only their names remain, while others exist in manuscript form and have been published across several libraries. A list of these works is compiled most of the existing books are manuscripts and are primarily concerned with medical sciences. The names of the lost books are as follows¹⁰⁷;

- “Qut al-Muqem” (Sustenance for the Resident)
- “Kitab al-Uddah li Toul al-Muddah” (The Book of Preparation for Prolonging Duration)
- “Mujarrabat fi al-Tibb” (Experiments in Medicine)
- “Kitab al-Mukhtabarat” (The Book of Tests)
- “Kitab fi Na’t al-Asbab al-Muwallida lil-Waba’ fi Misr wa Tariq al-Hilah fi Daf’ Dhalik wa ‘Ilaaj ma Yutakhawwaf Minhu” (The Book on Describing the Causes of Epidemics in Egypt and Ways of Preventing It and Treating What Is Feared from It)
- “Al-Bulghah fi Hifz al-Sihhah” (The Reach in Preserving Health)
- “Al-Bughyah fi al-Adwiyah al-Mufradah” (The Desired in Simple Medicines)
- “Kitab al-Khawass” (The Book of Properties)
- “Risalah fi Ibdal al-Adwiyah” (Treatise on Substituting Medicines)

¹⁰⁷ The mentioned books are partly or completely lost. Regarding the researches where they are mentioned, see Suwaysi, M., al-Jazi, R., al-Asali, F. (1999). *Zād al-Musāfir wa-Qūt al-Ḥādir by Ibn al-Jazzar*, Vol 1 p.39,40.

- “Risalah fi al-Zukam wa Asbabih wa ‘Ilajih” (Treatise on Colds, Their Causes, and Their Treatment)
- “Risalah fi al-Muq’adah wa A’rajih” (Treatise on Hemorrhoids and Their Pains)
- “Risalah fi al-Tahdhir min Ikhrāj al-Dam Min Ghayr Hajah Da’at ila Ikhrājih” (Treatise on Warning Against Bloodletting Without Necessity)
- “Risalah fi al-Nawm wa al-Yaqazah” (Treatise on Sleep and Wakefulness)
- “Kitab fi al-Farq Bayn al-’Ilal allati Tashtabih Asbabih wa Tukhtalif A’rajih” (The Book on Differentiating Between Illnesses with Similar Causes and Different Symptoms)
- “Maqalah fi al-Hammamat” (Article on Baths)
- “Kitab al-Sumoom” (The Book of Poisons)
- “Kitab Nasaih al-Abrar” (The Book of the Advice of the Righteous)
- “Kitab al-Nasih” (The Book of Advice)
- “Risalah fi al-Nafs wa Dhikr Ikhtilaf al-Awwalyn fiha” (Treatise on the Soul and the Discussion of the Differences Among the Early Scholars About It)
- “Risalah ila Ba’d Ikhwani fi al-Istihana bi al-Mawt” (Treatise to Some of His Brothers on Taking Death Lightly)
- “Usul al-Tibb” (The Principles of Medicine)
- “Al-Ahjar” (The Stones)
- “Al-’Itr aw al-’Utur” (Perfume or Perfumes)
- “Kitab al-Mukallal fi al-Adab” (The Book of Garnished in Literature)
- “Kitab Akhbar al-Dawlah,” mentioning the emergence of al-Mahdi in the Maghreb
- “Al-Ta’rif bi Sihhah al-Tarikh” (Identifying the Accuracy of History)
- “Al-Fusul fi Sa’ir al-’Ulum wa al-Balaghah” (Chapters on All Sciences and Eloquence)
- “Maqalah fi al-Judham wa Asbabih wa ‘Ilajih” (Article on Leprosy, Its Causes, and Its Treatment)
- “Tabaqat al-Qudat” (Classes of Judges)

- “Ajaa’ib al-Buldan” (Wonders of the Lands/Countries).

1.2.2. Al-Majusi (Haly Abbas) (932- c.994)

Born in the 10th century in Ahvaz, Persia, Ali ibn al-Abbas al-Majusi, also known as Haly Abbas in the West, emerged as a significant figure in the history of medicine and science during the Islamic Golden Age. His early life was profoundly influenced by his upbringing in a Zoroastrian family, which instilled in him a deep respect for nature and the pursuit of knowledge. The teachings of Zoroastrianism¹⁰⁸ emphasized moral integrity and the interconnectedness of all living beings, principles that shaped his approach to health and healing. This holistic worldview allowed him to integrate ethical considerations into his medical practices, promoting the idea that medicine is not merely a profession but a moral responsibility.

From a young age, he displayed a keen interest in various scientific disciplines, including philosophy, astronomy, and mathematics. His intellectual curiosity led him to engage with the rich body of knowledge available from earlier scholars, particularly the works of Greek physicians such as Hippocrates and Galen. These classical figures laid the groundwork for medical practice and significantly influenced his understanding of human anatomy and the principles of medicine. This synthesis of ideas allowed him to develop a comprehensive medical framework that incorporated both empirical observation and theoretical knowledge.¹⁰⁹

¹⁰⁸ Zoroastrianism, recognized as one of the earliest monotheistic faiths, is based on the teachings of the prophet Zoroaster and focuses on the veneration of one supreme deity, Ahura Mazda. Its foundational principles include the duality of good and evil, a moral obligation expressed through the tenet of “good thoughts, good words, and good deeds,” as well as the emphasis on purity and caring for the environment. Adherents believe in an afterlife in which individuals are evaluated according to their actions, highlighting the importance of ethical conduct throughout life. For more, see Boyce, M. (1979). *Zoroastrians: Their Religious Beliefs and Practices*, p.23; Rose, J. (2011). *Zoroastrianism: A guide for the perplexed*, p.46.

¹⁰⁹ Sarveravan, P., & Amalsaleh, E. (2013). Al-Majusi: The great Moslem physician of Buyid dynasty era. *Research on History of Medicine*, 2(3), 87–90, p.88,89. Also see, Zargaran, A., Zarshenas, M. M.,

The most notable contribution to the field of medicine is his comprehensive encyclopedia, *Kitab al-Maliki*, or *The Complete Book of Medicine*.¹¹⁰ This monumental work covers a wide range of topics, including anatomy, physiology, diagnosis, treatment, and pharmacology. The organization of the text is systematic and thorough, providing invaluable insights for both practitioners and scholars. In its pages, he emphasizes the importance of clinical observation and practical experience, advocating for a scientific approach to medicine that laid the groundwork for future advancements. In the opening chapters, the text outlines the fundamental principles of medicine, highlighting the ethical responsibilities of physicians. He implies that knowledge alone is insufficient; rather, a physician must also possess moral integrity and compassion.¹¹¹ This ethical framework is deeply rooted in his Zoroastrian background, reinforcing the notion that effective healing requires a balance of knowledge and character. By establishing these principles, he set a standard for medical practice that resonated with practitioners throughout the centuries.¹¹² As the book progresses, detailed discussions of human anatomy and physiology emerge, showcasing careful observation and thorough documentation of bodily functions. His anatomical descriptions reached to a greater

Ahmadi, S. A., & Vessal, K. (2013). Haly Abbas (949–982 AD). *Journal of Neurology*, 260(8), 2196–2197, p. 2196.

¹¹⁰ It is also known as *The Royal Book (Kitāb Kāmil al-Šināʿa al-Ṭibbīya)* in English editions, and *Liber Regius* in Latin.

¹¹¹ In the opening chapter of the *Kitab al-Maliki*, the al-Majusi focuses on the ethical issues of physicians. He requires from doctors to: submit only to God and His orders; Develop a sense of honor and feelings towards their educators and regard them as their parents; Nurture and appreciate their teachers and share their belongings with them as family members; Instruct their teachers' offspring about medicine free of charge if they are willing to become doctors; Exclude from practice medicine any miserable looking or less worthy practitioners; Practice on patients with the intention of goodwill and imploring God, not for earning; Practice reproductive control, refrain from recommending or to using unsafe abortives; Preserve fidelity, be God-fearing and keep oneself away from any form of sinfulness or defilement; Honor the privacy of patients and do not tell any third parties about their affairs. See "Advice to a Physician," Encyclopedia of Bioethics. Retrieved July 10, 2024 from Encyclopedia.com: <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/advice-physician>

¹¹² Hosseini, M., & Ganji, S. (2021). Health and Medical Regulations in Iranian Law: Pre-Islamic and Contemporary Era. *Res Hist Med*, 10(2), p. 97.

understanding of the human body¹¹³, providing a foundation for future medical studies. The emphasis on empirical methods and clinical practice in these sections highlighted the importance of observation in the medical field, reflecting a departure from more dogmatic approaches prevalent at the time.

In the chapter dedicated to pathophysiology, it includes entries on various diseases and their symptoms, along with diagnostic methods. He underscores the importance of clinical observation and thorough patient interviews, promoting a more scientific methodology in medicine. This approach not only enhanced the understanding of diseases but also improved the accuracy of diagnoses, making it a pivotal aspect of his medical philosophy. One of the most significant sections of the work is dedicated to treatment methods and pharmacology. Here, he presents a comprehensive guide to various medicinal substances, detailing their properties and applications. The extensive documentation of herbal remedies and their effects reflects a profound respect for nature, a key tenet of Zoroastrian philosophy. By advocating for the use of natural remedies and empirical evidence, he enriched the medical literature of his time and provided valuable knowledge for future practitioners. The influence of this significant work extended far beyond the Islamic world as it played a crucial role in the transmission of medical knowledge to Europe. His texts were translated into Latin, facilitating the integration of Islamic medical insights into European curricula.

The translation by Constantinus Africanus, who rendered *Kitab al-Maliki* into Latin as part of his compilation *Pantegni*, was particularly important. This translation introduced his ideas to a broader audience, shaping the medical education of the time and allowing his teachings to permeate the intellectual landscape of medieval Europe. The process of translating his works was part of a larger movement during the medieval

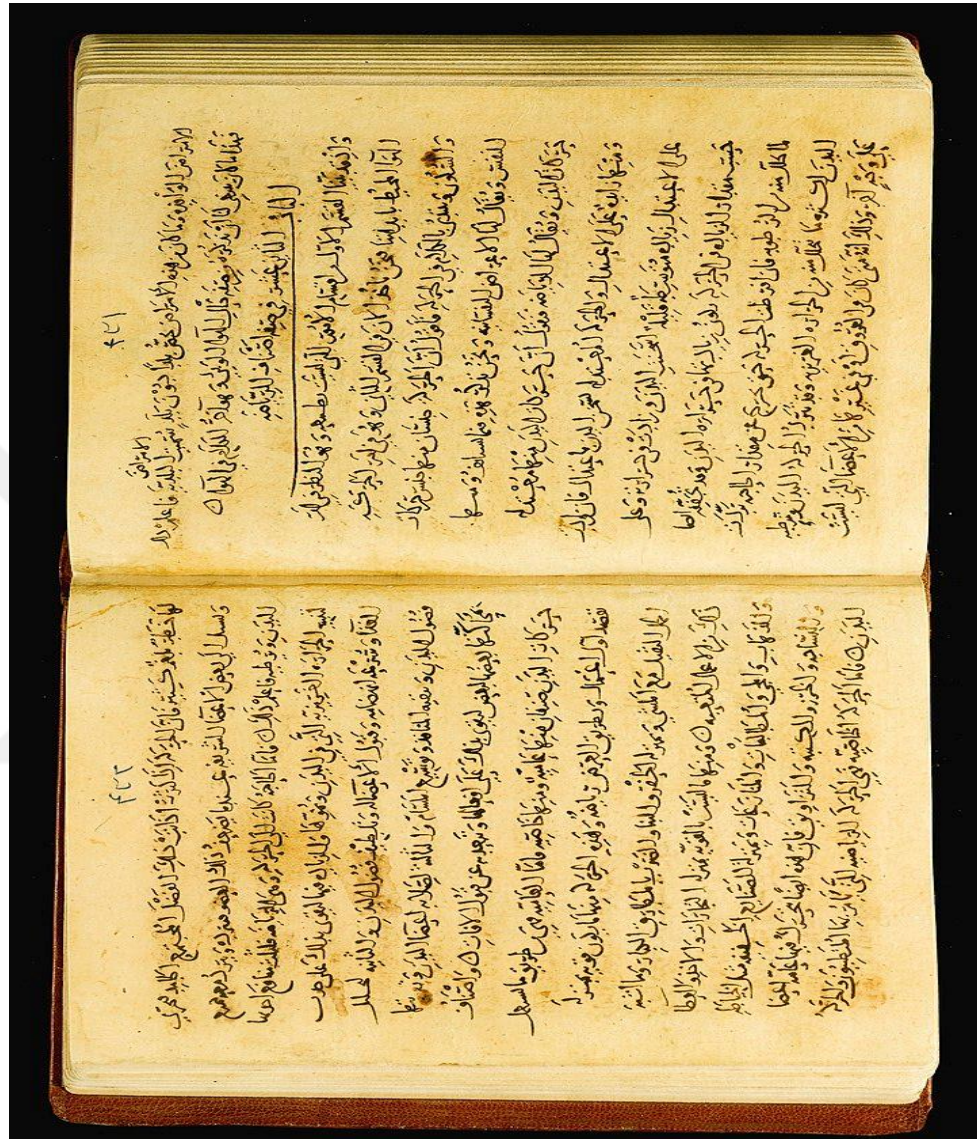
¹¹³ In Physiology, systemic blood movement was described by Al-Majusi around 994, 6 centuries before Harvey's in 1628. Capillaries discovery by Al-Majusi and Ibn Al-Quff (1233-1286) existed 4 centuries before M. Malpighi's discovery in 1661. He provided detailed pulmonary circulation as described by Ibn Al-Nafis (1211-1288) about 3 centuries before Michael Servetus report in 1543. See Al-Fallouji, M. A. R. (2019). Arab-Islamic origin of modern medicine. *Journal of the British Islamic Medical Association*, 1(1), p. 1.

period where scholars sought to recover and disseminate ancient texts. The translations, often carried out in culturally rich areas like Sicily, where Islamic and Christian scholars collaborated, fostered an environment of intellectual exchange that benefited both cultures. This cross-cultural dialogue not only preserved valuable medical knowledge but also facilitated the evolution of medical practices in Europe.

The comprehensive nature of *Kitab al-Maliki*¹¹⁴ (see Figure 2, 3) allowed it to serve as a foundational text for medical education in both the Islamic world and Europe. Its organization and depth of information established it as an authoritative source, referenced by scholars for centuries. The integration of ethics, empirical research, and practical application provided a model for medical practice that resonated across cultures and time periods. Even in modern medicine, the legacy of his contributions is evident in the continued emphasis on ethical practices and holistic care. The principles of compassion, integrity, and the integration of natural remedies into treatment remain relevant in contemporary discussions about medical practice and patient care. His call for a balanced approach to healing, combining knowledge with moral responsibility, aligns with current trends toward more patient-centered and holistic healthcare.

¹¹⁴ The Bodleian Library holds seven copies of the work, none of which are complete, and their dates range from 1161 to 1535 (see E. Savage-Smith, *A New Catalogue of Arabic Manuscripts*, volume I, Oxford, 2011, pp.193-206, entry no.50). One copy, written in Baghdad and dated 1590, is located in the Museum of Islamic Art, Doha (MS.575.OL). Another copy, dated 1437, includes the contents of books I and II in Arabic and is part of the Haddad Collection, WMS Arabic 409 (see N. Serikoff, *Arabic Medical Manuscripts of the Wellcome Library: A Descriptive Catalogue of the Haddad Collection*, Leiden, 2005, pp.66-94). The Wellcome Library also holds eight copies, ranging from 1303 to 1855 (see A. Iskandar, *A Catalogue of Arabic Manuscripts on Medicine and Science*, London, 1967, pp.119-124). Seven copies from 1145 to the 14th century are kept in the Chester Beatty Library (see A. Arberry, *A Handlist of the Arabic Manuscripts*, Dublin, 1959, p.83, no.3995). Additionally, a copy from 1726 is found in the Army Medical Library (see Schullian and Sommer, *A Catalogue of Incunabula and Manuscripts*, New York, n.d., pp.305-306, no.A26). Finally, the British Library contains seven copies from 1153 to the 18th century (see C. Baker, *Subject Guide to the Arabic Manuscripts*, London, 2001, M.3, pp.364-365). See also Brockelmann: GAL, i. 237 (273) and S., i. 423. All of these manuscripts are later than the current tenth-century copy.

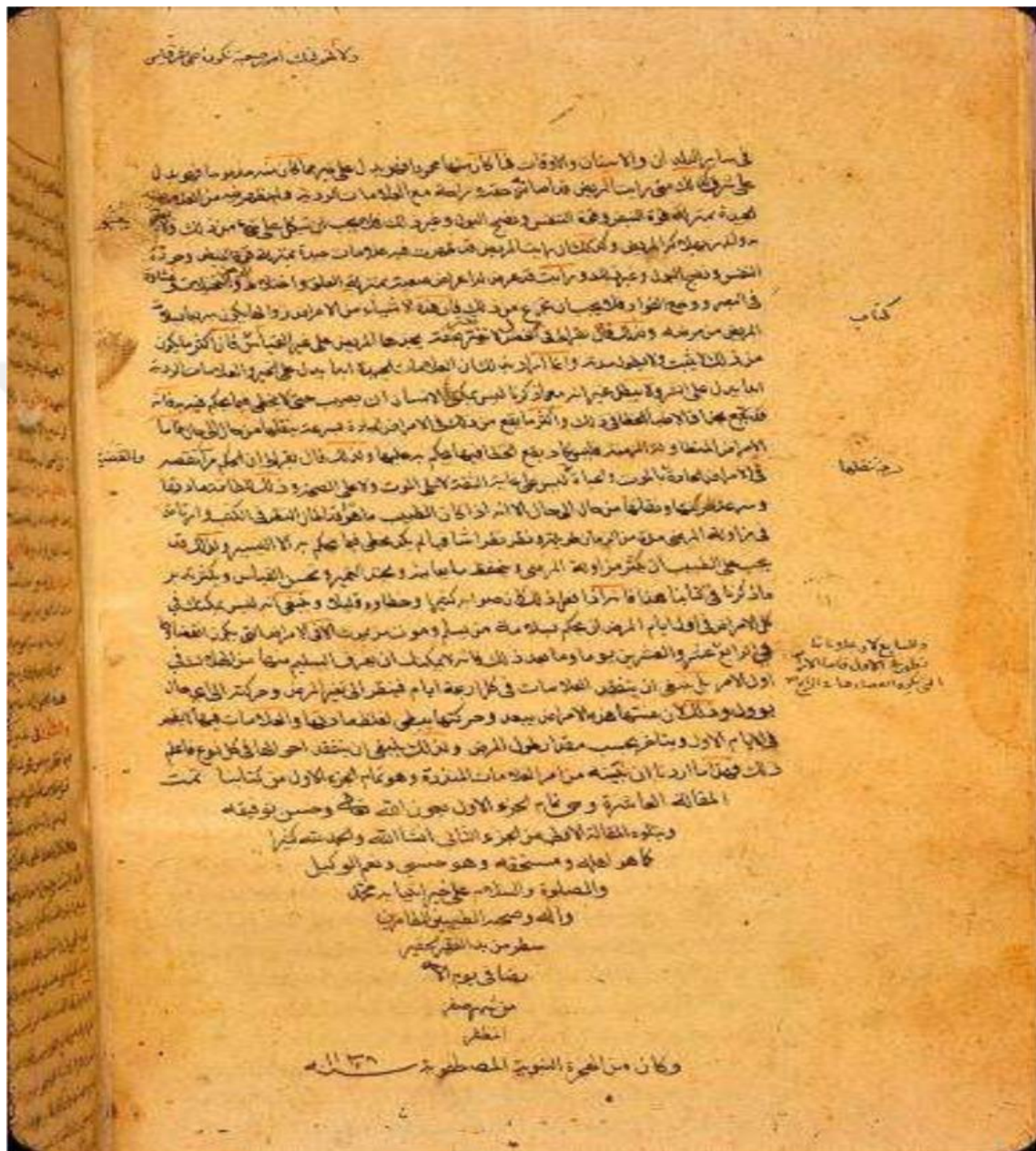
Figure 2. A page from the *Kitab al-Maliki* MS.



Source: Wikipedia.¹¹⁵

¹¹⁵ “Arts of the Islamic World 34 'Ali Ibn al-'Abbas al-Majusi (latinised as 'Haly Abbas', d.circa 995 AD), *Kitab kamil al-sina'ah al-tibbiyah* (The Complete Book of the Medical Art), Iraq or Western Persia, Fars, probably Shiraz, last quarter 10th Century AD”. Sotheby's. Retrieved 11 October 2019. [https://en.wikipedia.org/wiki/List_of_most_expensive_books_and_manuscripts#/media/File:%E2%80%9898Ali_Ibn_al-%E2%80%9898Abbas_al-Majusi_\(latinised_as_'Haly_Abbas',_d.circa_995_AD\),_Kitab_kamil_al-sina%E2%80%99ah_al-](https://en.wikipedia.org/wiki/List_of_most_expensive_books_and_manuscripts#/media/File:%E2%80%9898Ali_Ibn_al-%E2%80%9898Abbas_al-Majusi_(latinised_as_'Haly_Abbas',_d.circa_995_AD),_Kitab_kamil_al-sina%E2%80%99ah_al-)

Figure 3. Another page from a copy of the *Kitāb al-Malikī*¹¹⁶



Source: (Courtesy US National Library of Medicine) MS A 26, fol. 177b¹¹⁷

tibbiyah ('The Complete Book of the Medical Art'), Iraq or Western Persia, Fars, probably Shi
raz, last_quarter_10th_Century_AD.jpg

¹¹⁶ Belonging to the 1725 MS. The demonstrated version below was completed by a physician
Muḥammad 'Āḍil al-Ṭabāṭ abā'ī.

The enduring relevance of his work highlights the rich intellectual heritage of the Islamic Golden Age and its profound impact on the development of Western medicine. The transfer of knowledge facilitated by the translations of his texts illustrates the importance of cross-cultural intellectual exchange in shaping the practices of both Eastern and Western medicine. His ability to synthesize diverse ideas and present them in an accessible format contributed significantly to the advancement of medical science across cultures. Through the translations and dissemination of his works, he played a critical role in the movement of knowledge from the Islamic world to medieval Europe. His contributions not only enriched the medical landscape of his time but also paved the way for future advancements in the field. His writings continue to be studied and referenced, serving as a testament to the enduring impact of Islamic scholars on the history of medicine. His comprehensive understanding of medicine, grounded in ethical considerations and a respect for nature, has left a lasting legacy in both Eastern and Western medical traditions. His beliefs and scholarly pursuits provided a significant perspective that influenced the trajectory of medical knowledge and practice for generations to come.¹¹⁸

1.3. The Transition from Maghrib to Europe and Latinization of Arabic Works

During the Aghlabid period, while Greek, Sanskrit, Syriac, and Persian works were being translated into Arabic and Arabic works were also being translated into Greek and Latin.¹¹⁹ Due to the Muslim rule in Sicily from 827 to 907, governors serving there were proficient in Latin, and this language continued to be spoken by the Afro-Tunisians in Tunis. Therefore, the interest of a leader like Ibrahim al-Asghar in Latin led to the translation of Latin books into Arabic growingly in this period.¹²⁰

¹¹⁷ Retrieved from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4411919/figure/F1/>

¹¹⁸ Sarveravan, P., & Amalsaleh, E. (2013; p.88,89)

¹¹⁹ Ibid. Sarıkaya, M. (2021).

¹²⁰ Ibid. Sarıkaya, M. (2021).

One of the significant developments that paved the way for the transmission of knowledge to the European continent was the emergence of a new medical school in Kairouan. A new school, known as the Kairouan school, emerged in the field of medicine,¹²¹ and important studies were conducted that would influence Europe. Scholars such as Ibn Jumay and his followers, Ibn Abi Usaybia, and Ibn Fazlullah al-Umari, mentioned that Ishak bin Imran, appointed as the physician of the emirate from Baghdad, played a pioneering role in the development of medicine and philosophy in the Maghrib.¹²² It is believed that thanks to his studies in medicine, pharmacy, and philosophy, and the students he trained and the professors who gave lectures, Islamic medicine developed in North Africa and later spread to Europe particularly through the Monte Cassino Monastery established for medical studies in the Norman Kingdom.¹²³ Another important figure of this period is Ibn al-Jazzar (898-979). Just like Ishak bin Imran's works, the studies of Ibn al-Jazzar were translated into Latin by Constantinus Africanus, who would later lead Monte Cassino.¹²⁴

¹²¹ Bûnâr, R. (1968). el-Mağribu'l-'Arabî ve târîhuh ve sekâfetuh. eş-Şeriketu'l-vataniyye; as cited in Sarıkaya, M. (2021).

¹²² Ibid. Şahin, H.; Cihan, A. K. (2000).

¹²³ Ibid. Sarıkaya, M. (2021).

¹²⁴ Constantinus Africanus Latinized the work of Ishak bin Imran's *Kitâb fi'l-mâlîhulyâ* as *De melancolia*; Ibna'l Jazzar's works *Kitâbu'l-İ'timâd fi'l-edviyeti'l-mufrede* as *Liber de gradibus*; *Zâdu'l-musâfir ve kûtu'l-hâzîr* as *Vitaicum*; *Mudâvâtu'n-nisyân ve tûruku takviyeti'z-zâkire* as *Liber de oblivione*. See Sezgin (1970). GAS, III, 304-307. Also, in terms of the transmission of the knowledge from the Arabian lands to Europe, Ghazanfar (2011) explains how Arab-Islamic scholarship profoundly influenced the intellectual growth of Latin-Europe, laying the foundations for both the Medieval and Italian Renaissances. For Ghazanfar, major channels of knowledge transfer included extensive travel by European scholars to Islamic lands, where they studied Arabic texts and methods; large-scale translation projects that rendered key Arabic and Greek texts into Latin; and oral traditions, through which ideas spread informally between Islamic and European scholars. Additionally, trade and commerce facilitated intellectual exchange, with Islamic business practices and scientific advancements reaching Europe via established trade routes. The Crusades also played a complex role, as prolonged contact between Europeans and the Islamic world led to cultural exchanges, while other institutions, such as monasteries, cathedral schools, royal courts, and even missionary work, fostered a blend of Islamic and European learning. For more, see Ghazanfar, S. (2011). *Civilizational Connections: Early Islam and Latin-European Renaissance*, 01, 01-34.

1.3.1. Constantinus Africanus (1020-1087)

Constantine Africanus played a significant role as a translator who gained prominence by translating Arabic medical texts into Latin, making him a key figure in the revival of scientific medicine in the Western world. The only well-documented biographical information available about him includes his birth in Carthage in 1020, his arrival at the Salerno Medical School in 1077, and his death between 1098 and 1099 at the Italian Benedictine monastery, Monte Cassino Monastery. There is a view that he was born as a Muslim Arab but later converted to Christianity.¹²⁵

Constantinus, as a Muslim Arab, undertook travels to the Mashriq and learned grammar, dialectic, rhetoric, geometry, arithmetic, mathematics, astronomy, necromancy, music, as well as Chaldean, Arabic, Iranian, and Saracen medicine. He also traveled to Baghdad, India, and Abyssinia (Ethiopia), learning Hebrew, Syriac, Chaldean, Greek, Abyssinian, and Indian languages in the process.¹²⁶ After conducting medical studies in Egypt and Iraq, he moved to Salerno, bringing numerous medical books with him.¹²⁷ During this period, he embraced Christianity and, as a Benedictine monk, translated more than twenty-five Arabic medical works into Latin at the Monte Cassino Monastery.¹²⁸ One of the monks of Monte Cassino, Leo Ostiensis, referred to Constantinus as the “Magister Orientis et Occidentis,” (Master of the East and the West). However, according to the historian of science Fuat Sezgin, despite his dedication and the praises, he was criticized as a “plagiarist” figure, dispraised as a “mad monk”, and even claimed most of the works he translated as his own, emphasizing their originality over their Greek sources.¹²⁹

¹²⁵ Ibid. Sezgin, F. (2016).

¹²⁶ Bloch, H. (1986). Monte Cassino in the Middle Age, Volume I (Parts I-II), Roma. p.127.

¹²⁷ Sezgin, F. (2015). *İslam'da Bilim ve Teknik. Vol. 1*. Ankara: Türkiye Bilimler Akademisi Yayınları.

¹²⁸ Durmaz, S. (2019). İslam Tıbbını Avrupa'ya Tanıtan Mutercim: Constantinus Africanus (Afrikalı Konstantin). *Kırıkkale Üniversitesi Sosyal Bilimler Dergisi (KUSBD)*. Vol. 9: 113-132.

¹²⁹ Ibid. Sezgin, F. (2015).

Among the most influential writings of Constantius was the *Viaticum Peregrinantis*, a translated and adapted work from *Zād al-Musāfir wa Qut al-Hādir* by Ibn al-Jazzar. It was in fact a medical handbook for travelers describing the diagnosis and treatment of numerous diseases. The manual was also arranged in such a way as to cover various diseases according to body parts starting from the head at the top and respiratory system, digestive system, limbs, eyes and ears, at the bottom. The Latin version of Constantine (See Appendix 7), which focused on food, sanitation and herbal remedies, assured the books relevance in the European context. It was simple and straight forward, thus was an essential book for practitioners in medieval Europe.

Figure 4. An index page from *Viaticum* showing the ailments occurring on the head which is identical in Ibn al-Jazzar's *Zad al-Musafir*.¹³⁰



Source: Constantinus Africanus (1015-1087) Constantinus Afircans, cc. 1087 Date: Late 14th century

Reference: MS.209; Constantinus Africanus (1015-1087). Wellcome Collection.¹³¹

Viaticum also had medical practices that were in the work such as bloodletting, usage of strong laxatives, and application of liniments which features Greco-Roman and Islamic medicine in one body. Constantinus was able to enrich the original work by

¹³⁰ As seen in this page, the contents are identical even in order with Ibn al-Jazzar's *Zad al-Musafir*'s.

¹³¹ 6/259 (page 1r) Constantinus Africanus (1015-1087). Public Domain Mark. Wellcome Collection. <https://wellcomecollection.org/works/n6sxy7xe>

adding appropriate information specifically possessing various climates and resources for an all-purpose book. It is made evident through history that this book was popular as numerous scholars possessed several copies of it and medieval universities embraced its contents especially the Italian city of Salerno that became the center of medicine.

Unlike the *Viaticum* which had practical usage, the *Pantegni* was an encyclopedic work which covered both theoretical as well as practical approaches in medicine. The work, based on the *Kitab al-Malaki* (The Royal Book) of Ali ibn al-Abbas al-Majusi, was in two parts: *Theorica* and *Practica*. *Theorica* provided a broad overview of the theoretical aspects of medicine, including anatomy, physiology, and the etiology and pathology of diseases. The principles were based on concepts created by Galen while weaving in progress from Arabic medicine and created a broad framework for the understanding of the human system and its diseases. On the other hand, the *Practica* or the practical portion of *Pantegni* which was more concerned with the clinical aspect of the medicine addressed the processes of disease diagnosis and cure. It covered pharmacology, surgery and even the preparation of chemically-constructed medicines intensively. There are pertinent treatment recipes and directions which were part of the adapted version of *Pantegni*, thereby making it relevant for physicians. For the first time ever in Latin Europe, the harmony between creeds and practice was illustrated within the overall concept of medicine.

Pantegni was notable not only in terms of its contents but in terms of its contribution towards the standardization of medical studies in Europe during the medieval period. It became a primary textbook in the Medical School of Salerno and together with many other works, was reproduced and spread throughout Monastic and university libraries. The integration of Islamic and classical medicine in the content of the book established a new standard for any other medical encyclopedia in the western world, including Avicenna's *Canon of Medicine* that came later.

Nevertheless, the *Pantegni* was also a source of controversy. First, Constantinus' translation was incomplete, which led to some authors such as Stephen of Antioch

passing judgement on his failure to include the author of the original text. This last author later rendered his own version of Kitab al-Malaki into Latin. He branded Constantinus as someone who did shameless theft of ideas and credit from other peoples' works. This delineates the critical view of the movement of ideas between the East and Western frontiers.

Apart from the Viaticum and the Pantegni, , among other significant texts, Constantinus also wrote a document entitled De elephancia (On Leprosy), which was relatively advanced in the understanding of leprosy of the four-humor models. In this short writing, leprosy was divided into different forms and effective therapeutic measures were explained, thus showing his hands-on practice. In contrast to numerous writings of the Middle Ages, it invited no revulsion to the affliction, considering it a treatable sickness that needed systematic approaches.

The development of pharmacology in Europe was also influenced by the activities of Constantinus. His *Antidotarium magnum*, a book full of medicinal recipes proved his comprehension of complicated polypheteron. Some of these recipes, such as myrrh, ambergris and antimony, were ingredients used by the Islamic peoples, signifying the global nature of his materials and the dominance of Arabic science over European medicine.

The most significant points in his works are his approaches to cultural transmission acting between Islamic and Latin medicine. In the course of these adaptation, much of the Arabic knowledge was brought to Europe in a different perspective which made it possible for its prospects to be part of the medieval European society. It represented well the exchanges that took place in the center of a medieval Mediterranean civilization.

Even though there were criticisms regarding the ways and motives of Constantinus, his role is so significant that cannot be overstated. He managed to establish the infrastructure of practicing and teaching medicine in euro, laying grounds for many - not only his contemporaries, but also generations of scholars and practicing

medicine to come. So important in medical education and scholarship were his texts that they could be seen as appropriate even in the Renaissance.

Constantinus Africanus is still a significant figure in the medical history even today. As a result of his work, the languages and cultures from which he translated and transformed works have demonstrated the effectiveness of mutual integration in the advancement of sciences or knowledge. There are disputes regarding his authorship but this publication still is a crucial piece of medieval civilization history whose theme relates these two worlds Europe and Islam.

1.3.2. The Role of Salerno School of Medicine

On the journey of scientific information from Islamic lands to Europe, Salerno School of Medicine (Schola Medica Salernitana) played a significant role. Especially with the arrival of Constantinus in Salerno, the school shifted from its transitional phase to classical phase and became one of the prominent centers for the medical practice in the Medieval Europe. The school also adopted the Galenic tradition in medicine that was already such in vogue in the medical education. However, additional emphasis was also placed on ancient Greek and Roman medicine, Arabic texts and indigenous medicine. This gave the school a universal outlook of medicine drawing from various cultures.¹³² For instance, the school employed Latin as the language of instruction for the practice of medicine among its students. Furthermore, there is evidence to note that it for the first time ease the flow of vital medical information from the Arabic language and Greek into the Western Europe. More importantly, they functioned as guide for other medical institutions in Europe.¹³³

¹³² De Divitiis, E., Cappabianca, P., & De Divitiis, O. (2004). The “Schola Medica Salernitana”: The forerunner of the modern university medical schools. *Neurosurgery*, 55(4), p.739.

¹³³ Kristeller, P. O. (1945). The School of Salerno: Its Development and Its Contribution to the History of Learning. *Bulletin of the History of Medicine*. 17(2), 158.

Salerno had a different approach among the medical schools as it could incorporate different medical practices. It was more than a medical school, it was a repository of knowledge, integrating Greek, Roman, Jewish and, Arabic medicine. This became feasible through the conquest of Salerno since it turned into one of the key port cities enabling it to connect scholars and merchants.¹³⁴ Due to its uniqueness, it has been able to position itself as one of the foremost learning centers in Europe between 11th – 13th centuries.

The most profound influence of this evolution of the school however came from Constantinus Africanus. After his stay in North Africa and the Islamic world he introduced to the scholars and physicians a number of Arabic writings, mainly contained in the works of Avicenna and Rhazes. In this manner, he facilitated the introduction of significant Islamic models of medicine to the attention of the European scientists. As a result of these translations, the Salernitan syllabuses were revolutionized education wise and students were taught more complex theories of pharmacology, anatomy and the hygiene aspect of medicine.

The curriculum of the school in question appears to have straddled theory and practice. Students were supposed to be versed with particular texts like the Aphorisms of Hippocrates, Galen's works, and the *Regimen sanitatis salernitanum*¹³⁵ which is a counsel on health maintenance enumeration of diet, exercise and hygiene. The concept

¹³⁴ Ferre, L. (2018). The multi-cultural origins of the Salernitan medical school: A historiographical debate. *Journal of Mediterranean Studies*. 27. 1-18.

¹³⁵ It is a medieval medical manuscript that is believed to have originated from the Salerno Medical School around the 12th century. The medieval manuscript is composed of several didactic verses in Latin language which focus on actions that an individual can perform in order to promote and improve their overall health including hygiene, proper diet, exercising and moderating one's lifestyle. This can be attributed to the medical philosophy that was employed by the Salerno School which was loosely based on the traditions of Hippocrates and Galen while also factoring in concepts from Arabic medicine. As the Regimen was translated into more languages it became quite popular. For example, it was translated into English, and distributed across Europe. The aphoristic style of writing also contributed to its popularity among both doctors and non-doctors. For more, see Lafaille, R., Hiemstra, H., & Themstra, H. (1990). The Regimen of Salerno, a Contemporary Analysis of a Medieval Healthy Life Style Program. *Health Promotion International*, 5(1), 57-74.

of absolute health was revolutionary at that point and it emerged as one of the rudimentary factors of prophylactic medicine. Salerno also incorporated anatomy and surgery practical's, which later became the trademark of Salerno's method of instruction and the practice of other medical schools in the future.

Monte Cassino, a Benedictine monastery situated close to Salerno, had a complementary function in the foundation of the school. As one of the compromising sites of classical works, Monte Cassino managed to keep some important medical texts from Greece and Rome during a period when civilization in most parts of Europe seemed to be in disarray. Constantinus Africanus, who resided as a monk in the place, utilized it as a starting point for his translations and subsequent exposure to the Salernum School. This fact also creates an implication on minds that monastery and the medical school underscores the immense role that religion can play in the advancement of civilization, but surely, it should be studied extensionally.

Immigration of scholars, manuscripts along with ecclesiastical network through Salerno principles and teachings were spreading all around Europe. By the 12th century, the circulation had reached even in Northern Europe and new universities that were growing in Paris, Montpellier and Oxford.¹³⁶ The graduates of Salerno moved in all directions, settling at courts and universities where they practised and disseminated the principles of this school. This active circulation of people and ideas ensured that Salerno's impact went far beyond Mediterranean shores.

Students at Oxford and other schools were exposed to texts from Salerno owing to the growth in Latin literature and one such interesting work that gained popularity but rather remained a puzzle for the British. This knowledge was given to the English

¹³⁶ Unlike other medieval European university centers like Oxford University, the University of Paris, and the University of Montpellier, who relied solely on Latin language scholarship for their medical education, Salerno's medical school used Arabic materials. With the translation works of Constantinus such schools began to use Arabic origin works. See Minieri, J. L. (2022). *Schola Medica Salernitana: Medicine and Culture in Twelfth Century Southern Italy*. See: <https://memorients.com/articles/schola-medica-salernitana-medicine-and-culture-in-twelfth-century-southern-italy>

through monks and traders who crossed the Mediterranean coast or through students who came back from the European institutes that had been influenced by Salernum. What took place in Toledo, Spain would also remain a crucial factor in assisting. Thus there were people that were further exposed to the effects of the Salerno School, such as Gerard of Cremona, who translated Arabic texts into Latin. This movement was started by British scholars who were members of the British clergy and through their clerical ties with Church members across different nations. Most of the documents they are reported to have acquired originated from Salerno. Another example of Salerno's impact on the British literature on medicine was the inclusion of compilations like the *Articella*¹³⁷, which was very essential on the history of advancement of medicine within Britain. The Salernitan doctrines in this body of knowledge were integrated into English medical teaching and, as a result, Salerno's world perception was also reflected and obtained within British education institutions.

On the other hand, there was also participation of some English scholars like Adelard of Bath in the translation and distribution of the Arabic and Salernitan documents.¹³⁸ He traveled and visited the Mediterranean countries and was well known for learning institutions immigrated by Salerno, from there he was able to bring back important medical and scientific texts to England. Such a translation worked towards knitting the Salernitan knowledge into the British society.¹³⁹ Through trade, translation, and church networks, the Salerno Medical School gradually spread in Britain. The British and their schooling were capable of adding features which were greatly imbibed such as Salerno's concern with preventive and more humoral balanced medicine from

¹³⁷ The Salerno School of Medicine developed its own teaching curriculum based on the study of a group of classical texts made up of *Isagoge* by Johannitus, translated by Constantinus Africanus, *Aforismi* and *Pronostici* of Hippocrates, *De urinis* by Theophilus, *De pulsibus* by Philaretus and *Ars Parva* by Galen. See Pasca, M. (1994). The Salerno School of Medicine, *American journal of nephrology*, 14 4-6, 478-82 p.480.; and also Kristeller, School of Salerno, 158.

¹³⁸ Metlitzki, D. (1977). *The matter of Araby in medieval England*. New Haven, CT: Yale University Press, p.26.

¹³⁹ Alowais, A., & Idriz, M. (2021). Adelard of Bath: Original works and translations. *Al-Adab Journal*, (139), December 2021/1443, p. 42, 46.

the prominent medical traditions. The transmission of a great deal of manuscripts, the mobility of the scholars, ensured that the legacy of Salernmore and Monte Cassino was grafted to the European tradition including British.



CHAPTER II

ENCYCLOPEDIISM FROM ANTIQUITY TO MEDIEVAL BRITISH LITERATURE

2.1. Pre-Medieval Encyclopedic Works

The creation of humanity and the factors constituting the philosophical foundation of the ancient era are essential elements. Philosophers and scholars, driven by this curiosity, sought knowledge and aimed to establish its connection with thought. This thought, which gave rise to the act of bringing together all the scientific knowledge of ancient times, resulted in the emergence of works considered as encyclopedias.¹⁴⁰

Etymologically, the word “encyclopedia” is derived from the Greek words “ἐγκύκλιος” (circle) and “παιδεία” (knowledge), meaning “circle of knowledge.” The first encounter with this term is found in the work *Naturalis Historia* written by the Roman statesman, scholar, and philosopher Gaius Plinius Caecilius Secundus (First century AD). In this work, the word “encyclopedia” appears in a sentence where Pliny expresses his intention to approach the knowledge included in the Greeks’ circle of knowledge (enkykliou paideías) without arrogance. Due to Pliny’s use of the Greek alphabet to write the word, some confusion arose during the copying of the text.

In the 16th century, Renaissance writers such as Bavarian Aventinus and Paul Scalich also used the term “encyclopedia” in the title of their works (*Encyclopedia orbisque doctrinarum*). The word “encyclopaedia” was first used in English by Sir Thomas Elyot in 1531, and the term “encyclopédie” was used in French by François Rabelais in 1532. The first appearance of the word in a title occurred in the 16th century in a work by the encyclopedist Paul Scalich¹⁴¹: *Encyclopaedia; seu, Orbis*

¹⁴⁰ Aykut, A. (2001). Ansiklopedi. İslâm-Türk Ansiklopedisi. Türkiye Diyanet Vakfı İslâm Ansiklopedisi. İstanbul: T.D.V. İslâm Araştırmaları Merkezi (İSAM). V.23, pp.57-58.

¹⁴¹ Franolić, Branko (1975). *L'influence de la langue française en Croatie, d'après les mots empruntés: aspect socio-historique. Nouvelles éditions latines.* p. 36.

disciplinarum, tam sacrarum quam prophanum epistemon.... (“Encyclopaedia; or, Knowledge of the World of Disciplines, Not Only Sacred but Profane...”).

However, the use of the term as a common name for a publication type and its use as the name for works dates to the period after Diderot and his colleagues published the *Encyclopedie* in the 18th century. This work is considered the intellectual source of the French Revolution. Although the modern sense of the word “encyclopedia” emerged in the 18th century, the creation of works with an encyclopedic nature dates back to much earlier times.

When we look at encyclopedias historically, even though *Naturalis Historia* by Pliny is generally indicated as the first among the surviving encyclopedias written to this day, it is also claimed that such works had been produced in cradles of civilization such as ancient India, China, Babylon, and Egypt. For instance, we cannot overlook *Erya* (*Erh ya*), which is considered the oldest surviving encyclopedic work produced as a product of Chinese civilization and dating back to the 4th century BC. Although it has been debated whether it should be considered an encyclopedia, especially compared to modern examples and similar to its counterparts in the Middle Ages, *Erya* can be said to have similar qualities, offering information from various branches of science.¹⁴² When we consider the sharing of knowledge as the fundamental aspect, we encounter another work from the 4th century BC, *Similitudes*.¹⁴³ This work, written by Plato’s nephew Speusippus, presents subjects such as natural history, mathematics, and philosophy in a compiled form. Another work that followed Speusippus’s piece is *Lü shih ch’un ch’iu*, written in China, which is considered an encyclopedic text. This work, produced under the command of Qin Dynasty Minister Lu Buwei in 239 BC, is one of the earliest Chinese classical texts, characterized by its extensive coverage with over 100,000

¹⁴² Coblin, W. S. (1993). *Erh ya* 爾雅. In M. Loewe (Ed.), *Early Chinese texts: A bibliographical guide* (pp. 94–99). Berkeley, CA: Society for the Study of Early China; Institute of East Asian Studies, University of California Berkeley, p. 95.

¹⁴³ Karlgren, B. (1931). The early history of the Chou Li and Tso Chuan texts. *Bulletin of the Museum of Far Eastern Antiquities* (3)1–59.

characters, making it a unique work in early Chinese literature.¹⁴⁴ Returning to Europe, one notable work is *Praecepta ad Filium* (Precepts for a Son), consisting of letters written to Cato's son by Cato, who died in 149 BC. Although this work is lost today, it is claimed to be the first encyclopedia written by the Romans because it is considered a source of knowledge due to its advice on words and semantic contexts. Another Roman work, *Disciplinarum Libri IX* by Marcus Terentius Varro, written in 50 BC, is also noteworthy. Regarded as the first illustrated encyclopedia, this work contains information on grammar, logic, rhetoric, geometry, medicine, architecture, arithmetic, astronomy, and music. It is considered an important work that provides clues to medieval writers about the Greek Circle of Knowledge.¹⁴⁵

2.2. Encyclopedism in Medieval Europe

The Middle Ages, covering the period from the fall of the Western Roman Empire in 476 to the fall of the Eastern Roman Empire in 1453, is sometimes referred to as a dark age by certain historians. However, in reality, it witnessed developments that could be considered colorful. As political, economic, and social crises led to the decline of the Roman Empire, Christianity emerged as an alternative solution to the problems,¹⁴⁶ officially becoming the state religion in the 4th century.¹⁴⁷ Christian clergy members gained significant influence, establishing themselves as important figures. Empowered with increasing influence, clergy members found a place at the intellectual center of society, leaving numerous written works on various subjects throughout the Middle

¹⁴⁴ Carson, M., & Loewe, M. (1993). *Lü shih ch'un ch'iu* 吕氏春秋. In M. Loewe (Ed.), *Early Chinese texts: A bibliographical guide* (pp. 324–330). Berkeley, CA: University of California, Institute of East Asian Studies, p. 324.

¹⁴⁵ Yeo, R. (2007). Lost Encyclopedias: Before and after the Enlightenment. *Book History*, 10, 47–68.

¹⁴⁶ Piganiol, A. (1950). The causes of the fall of the Roman Empire. *The Journal of General Education*. 5(1), 62–69. Retrieved from: <http://www.jstor.org/stable/27795332>

¹⁴⁷ McGiffert, A. C. (1909). The Influence of Christianity upon the Roman Empire. *The Harvard Theological Review*, (2) 1:28-49

Ages.¹⁴⁸ Some of these works took the form of encyclopedic compilations, written with the purpose of conveying knowledge.

When we look at the works created in the Middle Ages, the influences of religious elements emerge. Unlike the function of spreading knowledge in ancient times or today, in the Middle Ages, encyclopedic works had a final purpose: to serve the Church. Various texts were written for use in schools and universities. Students had access to information, but the concept of knowledge was within certain constraints, shaped in accordance with Christian doctrine, and inclined to prevent deviation from their values. For example, Pliny, a Stoic, wrote his work starting from astronomy and finishing with fine arts. However, in AD 550, the Roman statesman Cassiodorus addressed Pliny's work in his own work, *Institutiones Divinarum et Seacularium Litterarum* (Institutes of Divine and Secular Literature), but he subjected it to a religious filter.

Isidore of Seville (560-636), a highly renowned archbishop of his time, emerges as a significant figure in religious and state affairs and as the author of the encyclopedic work *Etymologiae*. Despite his significant influence in the religious domain, Isidore emphasized the improvement of educational systems and valued knowledge in its pure form, refraining from intense religious shaping similar to Cassiodorus.¹⁴⁹ He shared knowledge as it was, attempting to derive his religious orientation from the conclusions drawn from information. His work *Etymologiae*, consisting of 20 volumes, provided extensive knowledge on the Seven Liberal Arts and various scientific fields, becoming the most consulted encyclopedia in the Middle Ages after his time. The Church's service

¹⁴⁸ Jaeger, C. S. (2002). *Scholars and courtiers: Intellectuals and society in the Medieval West*. Variorum Collected Studies. Oxford: Routledge.

¹⁴⁹ Macfarlane, K. N. (1980). Isidore of Seville on the Pagan Gods (Origines VIII.11). *Transaction of the American Philosophical Society*, (70)3, 1-40.

production gained strength with the initiation of the Carolingian Renaissance by Charlemagne (9th century), leading to the advancement of literary works.¹⁵⁰

Rabanus Maurus (780-856), another clergyman of this period and known as the “Teacher of Germany,” produced predominantly pedagogical works containing instructions for priests.¹⁵¹ His most well-known work is the 25-volume *De Institutione Clericorum* (On the Education of the Clergy). While the initial volumes primarily addressed religious life, the last 10 volumes focused on the Seven Liberal Arts.¹⁵² Rabanus Maurus’s most prominent work, an encyclopedia titled *De Universo* (On Everything) (842-847), also known as *De Rerum Naturis* (On the Nature of Things), synthesized intellectual history until the 9th century.¹⁵³ He provided guidance on anatomy and various practices through his writings and a dictionary of German-Latin anatomical terms. The work’s medical section was based on Isidore’s *Etymologiae*, and concerns arose about the religious appropriateness of Rabanus’s writings on medicine and the materials he evaluated (e.g., naked body/cadaver) for Carolingian clergy students (Rodriguez, 2019). Rabanus’s approach to education, resembling Isidore’s, can be seen. In this context, it is possible to think that Rabanus made an effort in the pure transmission of knowledge.

Another encyclopedic work written in Europe is *Liber Floridus* (Book of Flowers) by the French Benedictine clergyman and chronicler Lambert (1061-1150). As a significant implementer of the Cluniac Reforms, focusing on restoring traditional monastery life, promoting art, and giving more importance to the poor, Lambert shared information on topics such as the Bible, theology, geography, natural history, and music

¹⁵⁰ Wallach, L. (1959). Alcuin and Charlemagne: Studies in Carolingian History and Literature (H. Caplan, James. Hutton, G. M. Kirkwood, & F. Solmsen, Eds.; Vol. 32). Cornell University Press. Retrieved from: <http://www.jstor.org/stable/10.7591/j.cttq45mt>

¹⁵¹ Britannica, T. Editors of Encyclopaedia (2024, April 3). *Rabanus Maurus*. *Encyclopedia Britannica*. Retrieved from: <https://www.britannica.com/biography/Rabanus-Maurus>

¹⁵² Phelan, O. M. (2016). New insights, old texts: Clerical formation and the Carolingian renewal in Hrabanus Maurus. *Traditio*, 71, 63–89, p. 64.

¹⁵³ Maurus, R., Furlong, G. (2015). *Early edition of Rabanus Maurus’s commentaries*. In *Treasures from UCL* (1st ed., pp. 36–37). UCL Press, p. 36.

in his work Floridus. The work, consisting of about 190 authors and compiled from 300 different works, features references to significant figures' works such as Capella, Macrobius, Orosius, Isidore, Bede, and Rabanus Maurus. Additionally, new maps were created based on Ptolemy, Capella, Isidore, and Beatus's maps.

Hortus Deliciarum (Garden of Delights), another encyclopedia from the 12th century was written by Herrad of Landsberg (1130-1195). As the head abbess of a monastery with strong literary resources due to the support of Holy Roman Emperor Barbarossa, Herrad compiled information acquired from her education into this work, aiming to educate young female clerics. This 648-page work covers literature, history, theology, the Seven Liberal Arts, and is written in both Latin and German. Another work produced by clergy is encountered in the 12th-13th centuries.¹⁵⁴

One of the most significant authors of the Medieval Age was Vincent of Beauvais (1190-1264), a French Dominican friar and a prominent encyclopedist whose comprehensive work, *Speculum maius* (The Great Mirror), became one of the most influential encyclopedias of the Middle Ages.¹⁵⁵ Consisting of three main parts - *Speculum naturale* (Mirror of Nature), *Speculum doctrinale* (Mirror of Doctrine), and *Speculum historiale* (Mirror of History). The goal of Beauvais' encyclopedia was to include all knowledge (including secular and sacred) in a Christian context. His writings offered an orderly and methodical perspective of the universe that was consistent with Christian faith, reflecting the scholarly goal to combine classical philosophy with theological teachings. A crucial teaching resource in medieval schools and monasteries,

¹⁵⁴ Zelzer, Michaela. (2020). *Herrad von Hohenburg: Hortus deliciarum*.

¹⁵⁵ *The Great Mirror* sheds light on how the Christian-theological context shaped its content, structure, and organization, and explores how the encyclopedia connected to the efforts of building and making sense of the religious worldview. See Aristova, A. (2021). *Medieval encyclopedia as a form of religious worldview universalization (on the example of "Speculum Maius" by Vincent of Beauvais)*, p.52.

the *Speculum maius* highlighted the Church's influence on the creation and dissemination of knowledge.¹⁵⁶

2.3. Encyclopedism in Medieval British Literature

The advancement of encyclopedia writing in Europe sparked significant interest in the British territories, as medieval Britain became deeply influenced by the broader European tradition of encyclopedism. This movement, particularly flourishing in the 13th century, was characterized by an effort to compile comprehensive bodies of knowledge that harmonized classical learning with Christian teachings. The Church played a pivotal role in supporting these projects, recognizing the importance of organizing knowledge to educate both clergy and laypeople. Scholarly efforts in Britain aimed to reflect the intellectual and religious priorities of the time, integrating theological principles with natural philosophy and the liberal arts.¹⁵⁷

The advancement of this encyclopedic tradition in Britain laid the groundwork for scholars like Bartholomeus Anglicus, author of *De proprietatibus rerum*; Alexander Neckam, known for *De naturis rerum*; and Roger Bacon, who emphasized empirical science in *Opus majus*¹⁵⁸. These scholars played crucial roles in merging classical knowledge with Christian teachings, significantly shaping the intellectual landscape of medieval England.¹⁵⁹

¹⁵⁶ See Franklin-Brown, M. (2012). *Reading the World: Encyclopedic Writing in the Scholastic Age*, p.95,96,97.

¹⁵⁷ Ibid., p.73.

¹⁵⁸ Bacon, R., & Burke, Robert Belle (2010). *The Opus majus of Roger Bacon*, p. 526

¹⁵⁹ Lim, G. (2010). *In the Name of the (Dead) Father: Reading Fathers and Sons in Havelok the Dane, King Horn, and Bevis of Hampton*, p. 28.

2.3.1. Alexander Neckam (1157-1217)

As an English teacher, theologian, scientist, and Augustinian abbot of Cirencester Monastery, Alexander Neckam (1157-1217) is a prominent figure in the field of encyclopedic writing in British literature. He compiled his scientific research, addressing medieval approaches to knowledge and learning, by ordering the best (curiosity, hunger for learning) and the worst (literary conservatism, excessive traditionalism, negative approach to the material world) known facts¹⁶⁰ in his encyclopedic work titled *De naturis rerum* (On the Natures of Things) written around 1190 which is a large collection shedding light on the relations between classical antiquity and medieval science.¹⁶¹ In this work, which serves as a reference in the history of science in England and Europe, Neckam shares information about Islamic and Jewish science. In *De naturis rerum*, Neckam not only delves into the history of science but also gives significant importance to natural history, explaining various natural phenomena. He discusses topics such as spots on the moon, void, planets, stars, medieval inventions, animals, organisms, and more. Following the tradition of addressing moral values, Neckam aligns the achievements reached through natural history with religious service.

One of the most remarkable aspects of *De naturis rerum* is its inclusion of the magnetic compass. Neckam stands out as one of the earliest Europeans to give directorial properties of the compass in its navigation, which indicates that he comprehended terrestrial magnetism and navigation surprisingly well.¹⁶² This reference is very important because it marks the progressive development of scientific discovery in Europe during the Middle Ages by demonstrating how practical knowledge possessed by many scholars was now being recorded. Furthermore, Neckam's work inspired later compilatory literature that assisted in preservation and dissemination of scientific ideas

¹⁶⁰ Mews, J. C. in Glick, T. F., Livesey, S., & Wallis, F.. (2014). *Medieval Science, Technology, and Medicine : An Encyclopedia*, p.367.

¹⁶¹ Bromehead (1945), p.139.

¹⁶² Ibid. 139.

during the period that classical works were being reinterpreted in a Christian outlook.¹⁶³ His work emphasizes the interdependence of observation of nature and the holy writings, which is typical of the scholarship during the medieval period.

Apart from the particular scientific and encyclopedic essence that *De naturis rerum* embodies, Neckam was also a theologian and an abbot, and these two roles shaped again the organization and the central themes of the book. He believed that the marvels of nature contain deeper truths, and so he combined moral critique with scientific observation. This combination can be appreciated in the entire work, for accounts of natural phenomena are often accompanied by thoughts on the spiritual obligations of man and the need for self-discipline of those who seek to satisfy their curiosity through strictly defined Christian boundaries.¹⁶⁴

Neckam's circumscribed reading in the context of the origins of the western European science highlights the cultural interchange that took place throughout the 12th and 13th centuries. By giving Muslims and Jews as sources for the scientific practice, he set himself in a broader academic culture that was eager to learn and assimilate different ideas.¹⁶⁵ The assimilative character of foreign information shows a new direction of medieval scholarship, which began to emphasize empiricism and multiculturalism, while still tethered within bounds of Christianity.

The content of *De naturis rerum* showcases careful compartmentalization and reveals the medieval intent to organize and document every aspect of the world. Neckam describes celestial phenomena: the sky, the moon, the planets, and the stars. He then moves downward to landforms, bodies of water, and various life forms that these features support. His knowledge of technological developments like the magnetic compass indicates an understanding of practical science and a crude attempt at

¹⁶³ Lindberg, D. C., & Shank, M. H. (Eds.). (2013), p.567.

¹⁶⁴ Zahora, T. (2014). *Nature, virtue, and the boundaries of encyclopaedic knowledge: The tropological universe of Alexander Neckam (1157–1217)*, p.8.

¹⁶⁵ Copeland, R. (2016). The curricular classics in the Middle Ages. In D. Hopkins & C. Martindale (Eds.), *The Oxford history of classical reception in English literature* (Vol. 1, pp. 20-41), p.27

explaining natural powers like magnetism. In so doing, he goes drill down into the issue, which in a way is why he catalogs everything. In addition, he includes processes and causes, in addition to accepted authorities.

Neckam's moral considerations are clearly perceptible while describing the natural world, especially animals and their symbolic significance. As in the bestiaries of this epoch, some animals were used to teach moral or spiritual concepts, virtues or vices related to monastic existence. This technique of combining literal and figurative interpretation is indicative of the widespread belief that the material world, all creatures, plants and phenomena, hold keys to the divine order. Neckam presented scientific exploration as a means to comprehend God's creation, turning his encyclopedic work into both an academic reference and a religious document.¹⁶⁶

Stylistically, Neckam combines the exposition of scholarly observations while taking care to show respect to classical figures such as Pliny and Aristotle, as well as to prominent Fathers of the Church, which in turn shows his erudition. His Latin is pithy and scholarly, always mindful of quoting and referencing a particular subject as a means of supporting his arguments.¹⁶⁷ The equilibrium of scripture, patristic science and commentary reveals how a scholarly effort merges various strands of knowledge within a single Christian perspective, ensuring that emerging scientific pursuits were constantly engaged with the spirituality of the Church.

At its core, *De naturis rerum* demonstrates an important frame in the medieval combination of faith and reason. With the purpose of collecting and interpreting

¹⁶⁶ Neckam's school plays, especially his adaptations of the Latinized Aesop as well as Avianus' fables, illustrate how basic texts were utilized in pedagogy in the closing decades of the twelfth century. Neckam, while teaching at Dunstable, wrote paraphrases of the fable 'The Eagle and the Tortoise' and provided them in different lengths for classroom exercises deemed expansion and condensation. These are alterations that belong to a phenomenon in medieval pedagogy where fables were rewritten in different languages and forms for their moral teachings, thus making them popular in more schools. See, Copeland, R. (2016). The curricular classics in the Middle Ages. In D. Hopkins & C. Martindale (Eds.), *The Oxford history of classical reception in English literature* (Vol. 1, pp. 20-41), p.27

¹⁶⁷ Ibid. p.26

information from diverse subjects as cosmology and natural history, Neckam facilitated the link between classical heritage and new medieval motifs. These linkages illustrated how new discoveries could be integrated in a Christian framework. His legacy exists in the ways that later encyclopedists and other scholars adopted his methodology and preserved, and furthered, ancient wisdom while venturing into the often cultivated and unassisted domain of natural sciences. By means of this integration, Neckam provided future generations with a model of how one tackles God's creation in a learned, devout, and open-minded fashion.

2.3.2. Bartholomaeus Anglicus (1203-1272)

Another important figure in British literature in the field of encyclopedia writing was the English encyclopedist and Franciscan friar¹⁶⁸ Bartholomeus Anglicus, who lived in the 13th century (1203-1272). In his work titled *De proprietatibus rerum* (On the Properties of Things), which he wrote to benefit his students in Saxony Madgeburg and the general public¹⁶⁹, and which led to his widespread recognition, Bartholomeus shared knowledge on God, angels, spirit and intellect, body, body parts, daily life and physiology, medicine, diseases, treatments, celestial and terrestrial bodies, time and motion, matter, states of matter, fire, air, water, birds, aquatic creatures, geography and the Earth's surface, regions, places, rocks, minerals, stones, plants and trees, land animals, colors, smells, tastes, measurements, numbers, and music.¹⁷⁰ Originally written in Latin, his work was first translated into French and later, in the late 14th century, into English by John Trevisa (See Appendix 6).

¹⁶⁸ Boyar, Gerald. E. S. (1920). Bartholomaeus Anglicus and His Encyclopaedia. *The Journal of English and Germanic Philology*, 19(2), p.168.

¹⁶⁹ Seymour, M. (2004). *Bartholomaeus Anglicus (b. before 1203, d. 1272), Franciscan friar and encyclopaedist*, p. 161.

¹⁷⁰ Meyer, H. (2000). Die Enzyklopädie des Bartholomäus Anglicus. Untersuchungen zur Überlieferungs- und Rezeptionsgeschichte von 'De Proprietatibus rerum', *Münstersche Mittelalter-Schriften* Vol. 77, München.

Bartholomeus Anglicus or Bartholomew the Englishman was a scholar of the Franciscans in the 13th century. Although the year and location of his birth and the early stages of his life are vague, it is assumed that he was an English scholar born in the early calendar of the 1200s. When he became part of the Franciscan Order, Bartholomeus was as part of an Order which sought sisterhood and love, which entailed amongst other things, a respect for nature as God's work. The Franciscans were not great proponents of education, and the scholarly work of Bartholomeus amply confirms the emphasis on the learning and teaching of the Franciscans.¹⁷¹

Bartholomeus's background based on religion was a fundamental aspect of his work. The Franciscan Order was started by St Francis of Assisi and it instructed members to respect and observe the natural world as it is a part of God's wisdom.¹⁷² Similarly, one can easily view this aspect of Bartholomeus work where he mentions natural phenomena in his writings and cites it as a teaching on moral and spiritual matters. During this lifetime, a Franciscan friar took internal vows of poverty and obedience, and served in devotion and the literacy of religion.

His academic experience developed under the developing university culture of medieval Europe. Many consider Bartholomeus a student of the University of Paris, one of the major academic hubs during the 1200s. The university provided a program centered on the liberal arts, theology and philosophy, which was now increasingly the study of Aristotle and other classic thinkers. Paris exposed Bartholomeus to a cultural setting in which the relation between faith and reason was constantly prominent making him ready to join the scholarship of that age.

Here, the environment of the University of Paris, and even the whole scholastic order, had a profound impact on Bartholomeus. He took advantage of the classical past

¹⁷¹ Bartholomaeus Anglicus. (n.d.). In *Encyclopaedia Britannica*. Retrieved from <https://www.britannica.com/biography/Bartholomaeus-Anglicus>; Bartholomaeus Anglicus. (n.d.). In *Catholic Encyclopedia*. Retrieved from <https://www.catholic.com/encyclopedia/bartholomaeus-anglicus>

¹⁷² Delio, I. (2003; 10)

made known through the translation of Greek and Arabic texts into Latin by the translation movement. Aristotle, Avicenna, and Averroes were brought to Western scholars making it possible for Bartholomeus to source some of his materials. He also picked ideas from the likes of Alexander Neckam and Albertus Magnus who attempted to merge natural philosophy with Christian thought and the broad ranging change able scholarship that was developing in the Middle Ages.¹⁷³

One of Bartholomeus's best-known creations, *De proprietatibus rerum*, or "On the Properties of Things", is a universal work composed around 1240. This work contains 19 different books, the topics of which are as shown below;

- Book I: God (the incorporeal world and the Creator)
- Book II: Angels (the spiritual creation)
- Book III: The Soul (human soul and its powers)
- Book IV: Human Nature and the Four Humors
- Book V: The Parts of the Human Body
- Book VI: Human Ages, Genders, and Roles in Society
- Book VII: Diseases and Their Treatments (organized from head to foot)
- Book VIII: Time and the Celestial Bodies
- Book IX: The Cosmos and Heavenly Phenomena
- Book X: The Four Elements (fire, matter, and form)
- Book XI: Air (meteorology)
- Book XII: Birds (alphabetical list)

¹⁷³ To have an idea of the scholastic environment's influence, especially that of University of Paris on Bartholomeus and his dealing with Greek, Arabic and Latin translations read Haskins, C. H. (1927). *The Renaissance of the Twelfth Century* (pp. 75–80). Harvard University Press. For more information regarding the incorporating Aristotelian, Avicennian and Averroist philosophies into Western thought and its effects on personalities such as Bartholomeus please visit Nasr, S.H. (1968). *Science and civilization in Islam* (pp. 180–183). Harvard University Press. Also see how Bartholomeus interacts with works by Alexander Neckam and Albertus Magnus who worked to synthesize natural philosophy with Christian theology, thereby embodying far-reaching intellectual transformations of medieval Europe (Grant, E., 2001, *God and Reason in the Middle Ages* [pp125-127]).

- Book XIII: Sea Animals and Water
- Book XIV: Earth (mountains and terrestrial geography)
- Book XV: Geography (countries and peoples, alphabetical)
- Book XVI: Stones and Gems (lapidary, alphabetical list)
- Book XVII: Plants (herbal, alphabetical with 197 chapters)
- Book XVIII: Earthly Animals (alphabetical list)
- Book XIX: Practical Aspects of the Natural World (accidents of nature, such as number, music, color, smell, taste, etc.)

It is also more than an encyclopaedia of natural history, for it includes religion, medicine, history, geography and ethics. Bartholomeus sought the purpose of making advanced knowledge of any sort simple to the understanding of people by being presented in a manner that is informative and spiritually helpful.¹⁷⁴ He borrowed from classical figures such as Plinio Il Vecchio and Aristotle, as well as from modern writers in the fields of science and medicine, and fused them into Christian perceptions. Towards the end of his work, Bartholomeus makes a compilation of his auctoritates quoting them as saints or theologians (for instance, Augustine, Basil, Boethius, Isidore of Seville, Bede and Gregory the Great), and also as philosophers (for example, Plato, Aristotle, Ptolemy, Macrobius, Martianus Capella), and works translation of Albumasar, Messahallah, and Alfarganus and other Arabic philosophical and medical writings. Also that of later writers such as William of Conches, Bernardus Silvestris, and Thierry of Chartres. In one of the most recent Bartholomeus is said to have used such sources as Alexander of Halès, Michael Scot, Gilbertus Anglicus, Robert Grosseteste, Jean of La Rochelle, and possibly Ricardus Rufus. His encyclopaedia shows varying timelines of composition; for instance, he lacks Aristotle's *De sensu* in some books but employs it extensively in others. Other authorities for Bartholomew are more modern. He is said to have received the greatest support from Gilles of Corbeil, but not exclusively so. Constantinus Africanus, Dioscorides, and Hippocrates, besides Galen and Isaac Israeli,

¹⁷⁴ Ribemont, 1997: 55.

also figure among his later medical authorities. Furthermore, he also refers to ecclesial and grammatical authorities, such as Papias, Hugutio, Evrard of Béthune, and Neckam. For the more genera, Aristotelian works he has the courtesy of Burgundio of Pisa, Gerard of Cremona, and Michael Scot instead of William of Moerbeke. Most remarkably is the incorporation of the *glossa anglicana*, a commentary of Aristotle from the XIII century, in Book XVII.¹⁷⁵

De proprietatibus rerum was one of the most read and widely distributed pieces of work in the medieval era. It was translated into several languages, including French, English and Dutch, and served as a crucial tool for researchers, learners and practitioners in different occupations.¹⁷⁶ The encyclopedia was important in the spreading out of scientific and cultural information and knowledge, giving room for the learning of matters related to nature and society.

Moreover, it touched on many areas including medicine, botany, theology, geography and the later scholars such as Vincent of Beauvais and Roger Bacon used it. Bartholomeus is considered to have a very important place in the history of science and medieval intellectual history. His work is expedient because it is one of the earlier attempts to aid in the organization of knowledge in a more systematic approach, which was part of the scholastic ideal to merge the classical world view with that of Christianity. Bartholomeus facilitated the integration of science and religion by stressing the moral aspects of the natural world, which was quite typical of people's perception of the world during the Middle Ages. It shows the idea that the nature of God can be better explained by the study of God's works in nature.¹⁷⁷

¹⁷⁵ Draclants, I. (2021). *Bartholomeus Anglicus – Bartholomew the Englishman*. In press, Routledge Medieval Encyclopedia Online - RMEOL. HAL. Retrieved from: <https://shs.hal.science/halshs-03333840v1>

¹⁷⁶ Seymour, M. C. (1974). Some medieval French readers of *De proprietatibus rerum*. *Scriptorium*, 28(1), 100-103.

¹⁷⁷ See Herbermann, Charles, ed. (1913). "Bartholomaeus Anglicus". *Catholic Encyclopedia*, vol. 2. New York: Robert Appleton Company.

Furthermore, the relevance of Bartholomeus's work went beyond his own age. *De proprietatibus rerum* was frequently found in medieval collections, and its influence extended into the Renaissance. It contributed to the expansion of the stock of knowledge by providing an interface for ancients, medievals, and the later society. The combination of the two elements where man's activities and religious understanding were fused showcased the medieval operation of faith and reason at the same time, and thus, acted as a precursor of things to come.

His encyclopedic treatment determined the arrangement and presentation of information and formed the precedent for similar works that were to follow. Bartholomeus's desire for organization and classification was a significant advancement in the development of scientific writing, offering a paradigm for the purpose of the ordering and analysis of data. Even as the Scientific Revolution began to dislocate many of the medieval ideas he sought to protect, *De proprietatibus rerum* remained a reference point, reaffirming Bartholomeus's significance in the timeline of science.

2.3.3. Roger Bacon (1220-1292)

Another significant encyclopedia writer is Roger Bacon from Somerset (1220-1292). Like Bartholomaeus, Bacon was a Franciscan friar and is considered a historical precursor to the experimental approach of contemporary science. It is claimed that he was admitted to Oxford University at the age of 13. Later, he moved to Paris University, where, in addition to studying Aristotelian logic, he spent many years as an academic. Although he initially did not receive the support from the Franciscan order, which he saw as an opportunity, that contemporaries like Thomas Aquinas (1225-1274) and Albertus Magnus (1193-1280) received,¹⁷⁸ he eventually obtained Franciscan support

¹⁷⁸ Brown, F. S., Flores, J. C. (2007). *Historical Dictionary of Medieval Philosophy and Theology*. p.205

after becoming aware of Pope IV. Clement's (1190-1268) efforts and had a productive period.¹⁷⁹

Considered one of the earliest advocates of experimental science, Bacon conducted studies in the field of optics, particularly on the refraction and reflection of light and the formation of colors. He also worked in linguistics, grammar, astronomy, and mathematics. Regarding Ibn Sina as the greatest philosopher after Aristotle, Bacon's most valuable work is considered to be the encyclopedia *Opus majus* (The Great Work). In this work, he addressed various subjects such as physics, linguistics, mathematics, philosophy, theology, and metaphysics, emphasizing the importance of the experimental method and observation in science. After his death, he was remembered as the "Doctor Mirabilis," meaning the wonderful doctor.¹⁸⁰

Bacon's literary style stemmed from the belief that direct experience and careful examination were a more reliable source of knowledge than the unquestioned acceptance of authority. Unlike many medieval, who wrote dozens of commentaries on Aristotle's work without adequate critique, Bacon systematically overturned accepted beliefs. In addition to explanations of linguistic, mathematical, or physical processes, his prose systematically provided real-world examples to support his claims, appealing readers to verify his statements. Such a focus on evidence always provided value beyond that which was typically offered in the philosophical writings of his time.

While his broad interests are noticeable in all his surviving works, *Opus majus* captures his most thorough justification of his perception on the obscurity of different subjects. This was a treatise commissioned by Pope Clement IV which was intended to function not only as a compendium of that which was known, but as a tool to improve

¹⁷⁹ Şekerci, A. E. (2014). Roger Bacon as an Encyclopedist, Ansiklopedist Bir Düşünür Olarak Roger Bacon, *Milel & Nihal*. (11)2, 103-138.

¹⁸⁰ Sidebottom, E. (2013). Roger Bacon and *the beginnings of experimental science in Britain*. *Journal of the Royal Society of Medicine*, 106(6), 243–245.

scholarly work.¹⁸¹ Written in Latin, it is structured as an ambitious manifesto articulating how every discipline, from language studies to the geometry of light, serves to explain both natural and divine realities if one employs adequate thought and care.

As he critiques the barriers to true understanding on his twelve-chapter *Opus majus*, Bacon discusses two main pitfalls and their underlying biases. First, the blind trust in authoritative figures without verification. Second, a more systematic form of mental discipline that necessitates clear reasoning. An intelligent systematization of thought can prevent logical fallacies from weakening scholarly discussion. In using language to ward off intelligent thoughts, Bacon takes his work beyond the function of a survey of knowledge to that of an axe, tearing down the ill-soaked fabric of ignorance. The text serves as both a critique of modern reasoning and an advancement towards a new school of thought where knowledge is captured rather than created.

Bacon addresses and highlights the central need for precise wording in his definition of grammar, linguistics, and rhetoric. Bacon pointed out that confusion centering words is outdated, and that such muddled understanding of terms leads to needless arguments. While advocating for the adoption of languages during the translation surge from Greek to Arabic and people learned Latin, Bacon witnessed the severe lack of the establishing branch of science, the social sciences. Such linguistic rigor, as observed, is equally important to observational prowess in preventing derailments and interpreting scientific progress.

Apart from language, the *Opus majus* pays attention to mathematics, which Bacon considered as an essential building block for any comprehension of nature. He maintained that geometry, and especially Euclidean geometry, was the most powerful framework in which to understand the phenomena of light and motion.¹⁸² For Bacon, the

¹⁸¹ This was constructed to be a (considerable) overview of a person's understanding of the world, and is subdivided into seven sections: I. The causes of human ignorance II. The relation of the sciences to theology III. Grammar and the power of languages IV. Mathematics, including astronomy and astrology V. Optics (perspectiva) VI. Experimental science VII. Moral philosophy.

¹⁸² Crombie, A. C. (1953). Mathematics to Nature: Roger Bacon and His Predecessors. *Isis*, 44(2), 99–119.

accuracy of numbers was not merely an intellectual exercise, but rather a practical means which allowed scholars to quantify, contrast, and formulate predictions about reality. In his quest to give more importance to formal education that incorporates math, he predicted a principle that would become highly regarded in modern science.

Bacon's interest in optics is closely linked to these his mathematical concerns. Optics for him was the field of experimental work where nature could best be explored. In many of his works he experimented with various lenses and mirrors to test the properties of reflection and refraction. His experiments were exceptionally detailed for that period. By demonstrating methods of how these principles can be used, for example, the modification of magnifying devices, he was putting forward a new way to theorise. Indeed, other generations brought his optical studies to praise for creating a basis for later advancement in science and technology.

Bacon was aware that there are important scientific dimensions into which deeply religious issues could be included, such as philosophy and theology. He maintained that one's spiritual understanding could be maximized through the investigation of the workings of the universe. He succeeded in bringing reason into religion through blending what would otherwise be technical discourses on measurement of God's light with the properties of geometry. His scope was thus considerably broadened in offering more empirical research that ought to deepen moral metaphysics.

Bacon returned to his main point on the collaboration between scholars when learning new concepts in the *Opus majus*. He makes it very clear that new knowledge will not arise without careful consideration, control over language, and challenge to current knowledge. While much of his detailed recommendations were not embraced during his life, they were important for his Renaissance Period. Because of this, Bacon's work has been viewed and studied for many years as a primary representation for the immense amount of scientific efforts of the period.

CHAPTER III

FINDINGS AND CONCLUSION

3.1. Findings

As mentioned in the previous chapter, the findings obtained from the texts are analyzed philologically, semantically within the term of contextual analysis basis. In order to determine which information, entry or commentary in these works were influenced by the Islamic science scholars' works both these encyclopedias and surviving works of Islamic science were examined, and findings were presented below accordingly. In the findings, relevant texts from the related sections in the British encyclopedias and Islamic scientific works were identified, their translations were provided, and words/phases supporting the proof of influence were listed following each finding.

Finding 1

The first finding correlates with the texts where already existing dove's blood was used as a remedy for curing swollen eyes, which was mentioned in *De prop.*, Bk. 12, Ch. 6 and *Zād al-Musāfir*, Art. 2, Ch. 3. Anglicus indicates the application of blood extracted from the region beneath a dove's wing, which was applied hot, for the purpose of treating inner eyelid inflammation disease which is comparable to Ibn-al-Jazzar's information about bloodletting the source of blood directly taken from young pigeon under the wing and was heart blood which was then applied into the eye.

De prop.: Bk. 12, Ch. 6: Of a Culuer or Doue (On pigeon or dove)

...the bloud of a Culuer¹⁸³ is medicinable, for it is sayd, that the bloud drawn vnder the right wing, and dropped in hot, swageth and slaketh the ach of bleared eyen...

¹⁸³ Pigeon

Trans.:

...the blood of a dove is medicinal, for it is said that blood drawn from under the right wing and applied warm soothes and alleviates the pain of inflamed eyes...

Zād al-Musāfir: Art. 2, Ch. 3: On tarfah (subconjunctival hemorrhage)

او يؤخذ دم فرخ حمام وهو حار يقطر في العين وذلك ان يفصد للفرخ عرق تحت جناحه ويؤخذ من الدم الذي يسيل منه بملعقة يقطر منه في العين بحرارته التي يخرج بها من الحيوان

Trans.:

...or take pigeon's blood or the blood of a young dove while it is hot and drop it in the eye. This is done by bloodletting from a vein under the dove's wing and taking the blood that flows from it with a spoon and dropping it into the eye while it's still warm from the animal.

culuer: dove

حمام (ḥamām): pigeon/dove

under the right wing: from under the wing

تحت جناحه (taḥta jināḥihi): under its wing

drawn: drawn (bloodletting)

يفصد (yufaṣṣid): bloodletting

dropped: dripped/applied

يقطر (yuqṭar): dropped

hot: warm

وهو حار (wa huwa ḥār): while it is hot

swageth: soothes

يسكن (yusakkin): soothes

slaketh: alleviates

يخفف (yukhaffif): alleviates

ach of bleared eyen: pain of inflamed eyes

ألم العين الملتهبة (alam al-‘ayn al-multahibah): pain of inflamed eyes

spoon: tool for collecting blood

ملعقة (mala‘qah): spoon

applied warm: used while warm

بحرارته (bi-ḥarāraṭihi): with its warmth

The mention about the medical application of dove’s blood for inflamed eyes contained in *De prop.* bears a strong resemblance to what is to be found in Jazzar’s *Zād al-Musāfir*, specifically in the section dealing with subconjunctival Hemorrhage. Both authors describe the treatment in about the blood of a young pigeon taken out from below its wing, which was supposed to be warm and placed onto the eye in order to reduce the swelling. But Anglicus places this remedy in the reference of Constantinus. The parallelism in methodology and language, especially the use of circumlocution with focus on the warmth of the blood and the performance of the anatomical procedure, connects the two texts and advocates for the claims made by Jazzar’s.

Finding 2

There are similarities in the description of addressing blockage of the liver found in *De prop.*, Bk. 7, Ch. 53 and *Zād al-Musāfir*, Art. 5, Ch. 2. Both manuscripts use nearly similar words in the explanation of techniques of venesection as well as the use of

cooling medicines. The precision of being detailed in anatomical language as in the case of the basilic vein and the “Aslim” vein and the explanation of dietary measures seems to emanate from the same conceptual base based on the same linguistic structures and meanings. This finding provides preparation for further advanced discussions related to deafness among other underlying conditions as found in the texts of Anglicus and Ibn al-Jazzar. On the blockages occurring in the liver, Anglicus offer some solutions as follows.

De prop.: Bk. 7, Ch. 53: Of the Iaundise (On jaundice)

And oft such a passion and euill is cured by blood letting, and by medicines, which coole and chaunge, layd to: and namely vpon the region of the lyuer, for there the blood is most infected, as in his owne well. Also men giue them inward in dyet, & in medicine those things, which swage and cleanse blood, and chaunge euill disposition of blood. And if it commeth of stopping, men giue medicines which shed and open: but not too hot, as it is said in Viatico.

Trans.:

And often such a condition or ailment is treated by bloodletting and with medicines that cool and alter, applied specifically to the region of the liver, as this is where the blood is most contaminated, being a source of its own impurity. Additionally, they are given diet and medicinal substances that soothe, cleanse the blood, and alter the bad condition of the blood. If the ailment is due to an obstruction, medicines that disperse and open are administered, but they should not be excessively hot, as stated in *Viaticum*.

Zād al-Musāfir: Art. 5, Ch. 2: On blockages generated in the liver

فمتى حدثت في الكبد سدد وكانت تلك السدد من كيموس حار، أعني من قبل دم غليظ أو مرة صفراء ودلت على ذلك أحوال العليل والبول وأن يكون تدبيره من قبل ذلك بالأغذية والأشربة الحارة، فينبغي عند ذلك أن نأمر العليل بفصد الباسليق من الجانب الأيمن أو بفصد العرق المعروف بالأسليم ويخرج له من الدم على قدر القوة، وذلك إن ساعد السن والزمان والعادة والقوة. فإن منع من إرسال الدم مانع، سقيناه الأدوية المطفية للحر التي تقع فيها الأشياء المفتحة للسدد، مثل هذا الدواء المحكم المركب النافع لما ذكرناه، إن شاء الله.

Trans.:

When blockages occur in the liver from hot chyme, I mean due to thick blood or yellow bile, and the patient's condition and urine indicate that, and their diet has been of hot foods and drinks, it's appropriate then to instruct the patient to undergo bloodletting from the basilic vein on the right side or the vein known as Aslim, drawing blood according to their strength, if age, time, habit, and strength allow. If bloodletting is not possible, we give them medicines that extinguish heat and open blockages, like this precise, compound, beneficial medicine we mentioned, God willing.

فصد (fasd): bloodletting

الكبد (fl-Kabid): liver

سدد (sadam): blockage/obstruction

كيموس حار (kaymus har): hot chyme

دم غليظ (dam ghaliz): thick blood

مرة صفراء (murrat safra): yellow bile

الباسليق (al-basiliq): basilic vein

العرق المعروف بالأسليم (al-Irq al-ma'ruf bil-Aslim): vein known as Aslim

الأدوية (al-adwiya): medicines

الأدوية المطفية للحر (al-adwiya al-mutfiya lil-har): heat-extinguishing medicines

الأشياء المفتحة للسدد (al-ashya' al-muftaha lil-sadam): substances that open blockages

حرارة (hararah): heat

تدبير (tadbir): regimen

علامات العليل (alamat al-'alil): patient's symptoms

البول (al-bawl) : urine

الأغذية (al-aghdhiya): foods/diet

الاشربة (al-ashribah): drinks

السن (al-sinn): age

الزمان (al-zaman): time

العادة (al-'adah): habit

القوة (al-quwwah): strength

Finding 3

De prop., Bk. 7, Ch. 21, explains the loss of hearing completely as a result of humors obstructing the auditory nerves and ear passages. *Zād al-Musāfir*, Art. 2, Ch. 7 tells a similar story that complements the aforementioned statements while identifying the ear as “the gateway to the mind” with varying degrees of hearing impairment ranging from complete loss to faint/different voices heard. The findings highlight a period interest in diagnosing not only what causes blocked or malfunctioning auditory pathways but also how those conditions may impact cognitive functioning and awareness by examining how these impairments affect both sensory reception and intellect.

De prop.: Bk.7, Ch. 21: Of Deafnesse (On deafness)

Deafnesse is priuation and let of hearing, that is the gate of the inwit¹⁸⁴, as Constantine sayth. Sometime it happeneth, that the hearing is all withdrawen and lost, and then it is

¹⁸⁴ inwit: inner mind or conscience

properly called deafnesse, and commeth of humours, that stoppe the sinewes of hearing,
and the hoales of the eares: Insomuch that no manner noise may come therin...

Trans.:

Deafness is the privation and loss of hearing, which is the gate of the intellect, as Constantine says. Sometimes it happens that hearing is entirely withdrawn and lost, and then it is properly called deafness. This occurs due to humors that block the nerves of hearing and the passages of the ears, to such an extent that no sound can enter therein.

Zād al-Musāfir: Art.2, Ch. 7: On the heaviness and dissapearance of hearing

كثيرا ما يكون هذا مقارنا لذهاب الذهن واللب - وقد كان بعض الأطباء يسمي الأذن باب العقل. ودخول
الضرر على فعل حسه للنفس يكون على ثلاثة أضرب إما ضرب كلي كالصمم وإما جزئي كاستماع
الأشياء استماعا ضعيفا وإما ضرر قبيح على الاستحالة كالذي يسمع شبيها بدوي الرحا والطنين
والصوت الشبيه بالصغير. ويكون ذلك من أسباب شتى

Trans.:

This is often compared to the loss of mind and intellect - and some physicians used to refer to the ear as the gateway to the mind. The harm that enters its sensory function for the soul can occur in three forms: either as a total form, like deafness; or a partial form, like hearing things faintly; or as an unpleasant harm due to distortion, such as hearing sounds resembling the hum of a millstone, buzzing, or a sound similar to whistling. This arises from various causes.

بعض (ba'd): some, part

الأطباء (al-aṭibbā'): doctors, physicians

يسمي (yusammī): calls

الأذن (al-'uḍun): the ear

باب (bāb): door, gate

العقل (al-'aql): the mind, intellect

As seen in the matching texts, Ibn al-Jazzar considers hearing as “the gate to the mind,” as the same given in *De prop.*

Finding 4

In the following two chapters the common point is that both depict women's diseases where the topic of female ailments is thoroughly examined, with a particular emphasis on menstruation. Bartholomeus provides a general overview of menstruation, referencing the contributions of Aristotle, Rufus, and Constantinus, thereby incorporating and conveying the insights they offered in this field.

In the translation made by Trevisa, the following part is given in Latin.

De prop.: Bk. 4, Ch. 8, Of the Euill Propertie of Bloud (On the bad properties of blood)

Itē dicit Ruffus: mulieres nimis se exercentes, & sepius mouentes, non multū menstruant: sed quae quiescunt, & multū comedunt, suauius viuunt, tales multa purgatione indigent. Item quando sanguis talis, vel frigidare, vel crassie ora venarum constringente debito modo non exit, ad exeundum alias vias querit: vt venas narium, & emorroidarum, quas si clausas inuenerit, ad alia membra se diffundit, & grauem naturae infert passionem: nam tales, vt dicit in viatico Const. defectum appetitus patiuntur: nam cibaria bona abhorrent: puluerem vero carbonum, & laterum appetunt, & similia: nam sanguis retentus in maliciosum fumiū terrestrem & ponticum conuertitur: quo raptō, ad orificium stomachi, appetitus rationalis subuertitur, & irrationalis generatur. Vnde omnia talia corpora, sunt maximis morbis apparatus.

Trans.:

Rufus also says: women who exercise too much and move frequently do not menstruate much; but those who rest, eat a lot, and live comfortably, need much purging. Also, when such blood either cools or thickens due to the constriction of the veins' openings, and does not exit in the proper manner, it seeks other ways to leave: such as through the veins of the nose and hemorrhoids. If it finds these paths closed, it spreads to other body

parts, causing severe natural suffering: for such individuals, as stated in the *Viaticum* of Constantine, suffer from a loss of appetite: they abhor good food and instead crave things like coal dust, bricks, and similar substances: for the retained blood is transformed into a harmful terrestrial and Pontic vapor. This vapor, drawn to the mouth of the stomach, overturns the rational appetite and generates an irrational one. Therefore, all such bodies are predisposed to the most severe diseases.

In Jazzar's work, it is seen that it provides a general introduction on menstruation, followed by the same information presented by Rufus cited in *De prop.*; and we can see that Jazzar makes his own additions which is identically given in *De prop.* as also shown below.

Zād al-Musāfir, Art. 6, Ch. 9: On menstrual retention

وقد زعم روفس أن النساء اللاتي يعملن، ويكثرن الحركة، لا حاجة لهن في كثرة إنزال الطمث
والنساء اللاتي يلزمن الخفض، والدعة، ويكثرن الأكل، فهن محتاجات إلى كثرة إنزال الطمث.

Trans.:

Rufus claimed that women who work and are very active do not need a lot of menstrual discharge. Women who are sedentary, indulge in comfort, and eat a lot, need more menstrual discharge.

...فإذا تطاول احتباس الطمث، ولد عللا، يصل ضررها إلى المعدة فتذهب شهوة رة الطعام، ويعرض
للمرأة الغشيان الدائم، وتشتهي أغذية رديئة مثل الفحم، والتراب، والطين، وما أشبه ذلك...

Trans.:

If the retention of menstruation is prolonged, it leads to illnesses, the harm of which reaches the stomach, causing a loss of appetite. It results in women experiencing constant fainting and craving poor-quality foods such as coal, dirt, clay, and similar substances.

تطاول (taṭāwal): prolongs

ولد (walada): leads to

يصل (yaṣil): reaches, arrives

فتذهب (fa-tadhhab): then goes away, disappears

يعرض (yu'rid): presents, exposes

تشتهي (tashtaḥī): craves, desires

احتباس (iḥtibās): retention

الطمث (aṭ-ṭumth): menstruation

علا ('ilal): illnesses, ailments

ضررها (ḍarruhā): its harm

المعدة (al-ma'idah): the stomach

شهوة (shahwah): appetite

الطعام (aṭ-ṭa'ām): food

الغشيان (al-ghashyān): fainting, unconsciousness

المرأة (al-mar'ah): woman

أغذية (aḡdhīyah): foods

الفحم (al-faḥm): charcoal

التراب (aṭ-ṭarāb): dirt, soil

الطين (aṭ-ṭīn): clay

دائم (dā'im): constant

ردية (radi'ah): poor

When we look at the similarity here, we can see that a majority of the base information concerning menstruation and its ailments comes from Ibn al-Jazzar's knowledg. The Rufus references and the description of how sedentary living or humoral blockage can cause abnormal cravings closely echo what was described by Ibn al-Jazzar initially. This overlapping underscores how vigorous Islamic medical theories are in Latin sources which demonstrate how pivotal were Ibn al-Jazzar's contributions to broader understanding about women's health during this period.

Finding 5

In this finding upon the discussion of mouth ailments, various symptoms - such as swelling, blisters, ulcers, and thrush - are identified and often linked to corrupt humors migrating from other parts of the body. Particular attention is paid to changes in mouth coloration (red, black, white) and their corresponding indications of excess blood, yellow bile, or phlegm. In children, the appearance of mouth sores is commonly attributed to the sharpness or corruption of milk, while in adults, the same issue can become far more severe if a bad mixture of humors takes hold. Emphasis is placed on mitigating these corrupt humors early on - whether through purging, bloodletting, or targeted medicines - before the affliction becomes entrenched and more difficult to cure. The related parts are as follows;

De prop.: Bk. 5, Ch. 19: Of the Mouth (On mouth)

...that the mouth is griued sometime by forenesse and sicknesse of the lymmes that be nigh thereto, and is griued with pimples & blaynes, and with whelkes and botches, and with such other, and with corrupt humours that fall to the mouth from other places. And if the mouth be red and some deale browne, and hot, and aking, and burning: the matter is of bloud and Cholera. And if it be much blacke, it is the worse and the more grieueus, and the more to dread least it bréede a canker. It happeneth that totches bréede in the mouths of sucking children: the which totches come of sharpnesse of milke and of corruption thereof.

Trans.:

It's also beneficial to remove and expel the great excesses that arise from the brain to the lungs. These excesses, when expelled through the mouth, allow the vital spirit in the heart and brain of the animal to perform its functions more efficiently. It's also advantageous to rid the digestive organs of excess: for when the stomach is filled with raw humors, nature, through the act of expulsion, cleanses the stomach via the mouth, as Constantine and Galen say in their commentary on *Aphorisms*: 'In vomiting and purgations that are done promptly, if done correctly, they are beneficial and helpful; the opposite is true if they are not done properly.' Constantine, in his *Viaticum*, says that sometimes the mouth suffers from the pain and sickness of nearby limbs, and is troubled with pimples, blisters, boils, and other such issues, along with corrupt humors that spread to the mouth from other places. If the mouth is red, somewhat brown, hot, aching, and burning, the issue is related to blood and cholera. If it is very black, it is worse and more serious, and there's more reason to fear it might turn into a canker. It happens that sores develop in the mouths of breastfeeding children, which arise from the sharpness and corruption of the milk. This is what Constantine discusses in his *Viaticum*, etc.

Zād al-Musāfir: Art. 2, Ch. 24: On illnesses occurring in the mouth

الباب الرابع والعشرون في الأدوية العارضة في الفموقد يعرض في الفم خاصة دون باقيه من الأعضاء أدواء كثيرة مثل الورموالقروح والبثر والسلاق وما أشبه ذلك، فيصل إلى البدن منها مضرة عظيمة شديدة، وهذه العلل إنما تعرض إذا سالت مادة فاسدة إلى الفم، فإن رأيناه أحمر أو أسود علمنا أن ذلك متولد من فضول الدم والمرة الصفراء ولا بد لصاحب ذلك أن يجد وجعا شديدا أو حرارة وحرقة. وإن كان أبيض ووجد العليل وجعا رخوا بلا حرقة ولا حرارة فإن ذلك من فضول البلغم، وإن مال إلى السواد الشديد فعند ذلك يخاف من تولد الأكلة في الفم، وقد يوجد أيضا في الفم القلاع وهو قروح تعرض فيجلدة الفم من باطنه وفي اللسان وبخاصة الأطفال، وذلك فيهم من حدة اللبن وفقدانهم الغذاء، وهو فيهم سليم يبرئ الدواء القابض المعتدل فيأسرع مدة بإذن الله تعالى. خلط رديء مضموم، وما فإذا عرض للبالغين فرديء لأنه يتولد منينبت منه في جسم اللسان وأخذ منه مكانا كبيرا في البالغين فهو أردأ، وربما هلك منه العليل. فإذا علمنا أي الأدوية تولد في الفم بالبرهان الذي قدمنا أخذنا عند ذلك في ردع الفضلة المنحدرة إلى الوضع، وإنما يفعل ذلك في أوائل العلة، وأما في وسطها فيستعمل أدوية رداة محللة، ثم لا ينتقل إلى الأدوية التي تحلل وتسكن إلا على تدريج. وينبغي أن ينقص البدن إن كان ممتلئا منخلط رديء بالأدوية المسهلة المخرجة للكيموس الغالب أو بالفصد إن لميمنع منه مانع ولا حال دونه حائل. والأدوية التي تردع الفضول التي قلنا إنها تستعمل في أوائل العلة مثلرب التوت أو رب الحصرم

أو طبيخ السماق أو طبيخ الآس أو طبيخ الجنار أو عنب الذئب وما أشبه ذلك. وإذا انقصت الفضول ولم ينحلب إلى الموضع فينبغي أن يخلط هذه أدوية مسكنة منضجة مثل المر والزعفران أو ماء قد طبخ فيها الحلبة وسلاقة التين وما أشبه ذلك. مع

Trans.:

Many diseases may specifically occur in the mouth, as opposed to other body parts, such as swelling, ulcers, blisters, thrush, and similar conditions, which can cause great and severe harm to the body. These diseases only occur if corrupt matter flows into the mouth. If we observe the mouth to be red or black, we know that this is due to an excess of blood and yellow bile, and the person must be experiencing severe pain or burning. If it is white and the patient feels a soft pain without burning or heat, then that is due to an excess of phlegm. If it leans towards extreme blackness, then there is a fear of ulcer formation in the mouth. Thrush also may occur in the mouth, which is ulcers that appear on the inner skin of the mouth and on the tongue, especially in children. This is usually due to the sharpness of milk and their lack of proper nutrition. In children, it is generally harmless and can be cured with moderate astringent medicine in the shortest possible time, God willing.

However, if it occurs in adults, it is worse because it arises from a bad mix, becoming entrenched in the body of the tongue and occupying a large area in adults, making it worse, and the patient may even die from it. If we know which diseases are generated in the mouth by the evidence we have presented, we then focus on reducing the excess matter descending to the area. This is done at the onset of the condition. In the middle stage, resolving and repellent medicines are used, and one should not switch to medicines that resolve and soothe except gradually. If the body is full of bad humors, it should be reduced with purgative medicine that expels the dominant chyme or by bloodletting if there is no contraindication or obstacle. The medicines that repel the excesses, which we said are used at the onset of the condition, are like blackberry syrup, sour grape syrup, sumac stew, myrtle stew, pomegranate stew, wolfberry, and similar things. If the excesses are reduced and do not dissolve into the area, then it is appropriate

to mix these soothing and ripening medicines like myrrh and saffron, or water in which fenugreek and figs have been boiled, and similar things.

swelling: inflammation

ورم (waram): swelling

ulcers: sores

قروح (qurūḥ): ulcers

blisters: pimples

بثر (bithar): blisters

thrush: mouth ulcers

السلاق (al-salāq): thrush

corrupt humors: bad humors

مادة فاسدة (māddah fāsidah): corrupt matter

black: blackness

أسود (aswad): black

yellow bile: choleric humor

المرّة الصفراء (al-mirrah al-ṣafrā'): yellow bile

phlegm: phlegmatic humor

البغم (al-bulgham): phlegm

soft pain: mild discomfort

وجع رخو (waja' rakhū): soft pain

burning: heat or irritation

حرقه (ḥarqah): burning

ulcer formation: canker

الأكلة (al-akalāh): ulcer formation

sharpness of milk: acidic milk

حدة اللبن (ḥiddat al-laban): sharpness of milk

proper nutrition: balanced nourishment

فقدان الغذاء (faqdan al-ghidhā'): lack of nutrition

harmless: benign

سليم (salīm): harmless

moderate astringent medicine: balanced drying agent

الدواء القابض المعتدل (al-dawā' al-qābiḍ al-mu'tadil): moderate astringent medicine

bad mix: poor humor composition

خلط رديء (khilṭ radī'): bad mix

entrenched in the body: deeply embedded

ينبت في جسم اللسان (yanbut fī jism al-lisān): grows in the body of the tongue

purgative medicine: laxatives

الأدوية المسهلة (al-adwiyah al-musahhilah): purgative medicine

dominant chyme: primary humor

الكيموس الغالب (al-kīmus al-ghālib): dominant chyme

bloodletting: phlebotomy

الفصد (al-faṣd): bloodletting

blackberry syrup: mulberry concentrate

رب التوت (rubb al-tūt): blackberry syrup

sour grape syrup: acidic grape concentrate

رب الحصرم (rubb al-ḥiṣram): sour grape syrup

sumac stew: sumac decoction

طبيخ السماق (ṭabīkh al-summāq): sumac stew

myrrh: aromatic resin

المر (al-murr): myrrh

saffron: saffron extract

الزعفران (al-za‘farān): saffron

fenugreek and figs: herbal preparation

الحلبة والتين (al-ḥulbah wa al-tīn): fenugreek and figs

Comparison of these observations shows that the basic information about mouth diseases is derived from Ibn al-Jazzar’s teachings unlike those ascribed only to Constantinus. The focus on humoral disturbances, color and heat symptoms, as well as the prescription of purgatives and local remedies all stem from the medical tradition espoused by Ibn al-Jazzar. This connection only serves to underline the importance of

his outlook in determining how medieval authors approached oral health in relation to its effect on the rest of a person's body.

Finding 6

In this finding, the investigated texts exploit a common perspective that revolves around teeth as the focal point of general health care; together, these texts shed light on how teeth are involved in human beauty, speech formation, and food chewing which gives strength to the body; they also explore various causes of toothache and decay such as humors from both head and stomach parts, extreme weather conditions, inadequate diet for gum diseases and such.

De prop.: Bk. 5, Ch. 20.: Of the Teeth

And Constantine there to saith in viatico particula. The help of the téeth is great, and with helpe, a great hightnesse of the body, that is to vnderstand, if the téeth be not fore: for in sore téeth the working is corrupt. And the passions of the téeth be diuers, which part of diuersitie is openlye knowen to the sight, as chill, rottennesse, stinking, breaking and brusing, holes mouldring or fallyng, watring, and such other. The part not apparing, is hidde, as when the téeth ake sore, and yet they séeme to be in good case without.

The cause of such aking is humors that come downe from the head, eyther vp from the stomacke, by meane of fumositie, either els by sharp humours and beating in the gums: and then is sore ach felte with leaping and pricking, through the mallyre and sharpnesse of the humours. And if the ach come of the head, the head is heauie, and aketh in the face, that commeth of red bloud, or of Cholera, that commeth downe to the rootes of the téeth. And if the ach come of the stomacke, the aking and paine is felt in the stomacke, and ther goeth & bursteth out continuall belching. Also sometime téeth be pearced with holes & sometime by worms they be changed into yelow colour, greene, or blackal this commeth of corrupt and euill humours, that come downe of euill meates by the sinnewes to the strings of the téeth. Also sometime the téeth shake and wag, and that is for humours that be in ye rootes of the téeth. For if the humdre be sharp, néedes the teeth shall haue hoales, and stinch and matter shall bréede iu them. And if Wormes be the cause, full sore ache is bred: for they eating, pearce into the subtill sinew, and make the téeth to ake, and grieue them very sore, by fore humors within either without, that infecteth the sinewes of feelyng, and séemeth sometime to sléepe, because of great

colde, as by snow or yce, that conserayneth the sinewes of the téeth. Also sometime, the téeth fall-out, because of great moysture that looseth the striuges of the téeth. And sometime by great drynesse, as it tareth in olde men, whose téeth fall out through withdrawing of moysture of feeding. Constantine rehearseth these and many other passions of the téeth, but these shall suffice. Then vnderstande, that the téeth be rooted and sticked in the iawes, as in their preper ground & soundation, and by reson of colde hauing masterie in them, they be whiter than other bones, and for that they be hard, they be not easely hurte. The substaunce of the téeth •eeleth not, for they haue not powce of féelyng, as sayth Constantine. And therefore a broken tooth aketh not: yet it is sayd, that a tooth is griued and aketh, through the sinew of feelyng, that in the roote thereof, is often hurt and griued. Teeth be bound within with sinewes; and téeth passe the bounds of the flesh; and they feele, no sorenesse within themselues; and be closed with lrye, that they be not scene: it is vncomely when they be seene, except it be in laughing: And the ouer and the neather come ofte together, and touche each other: and though the neather moue sometime, the ouer be stedfast and moue not, and be ordinateleye ordeinos, speciallye to shape the voyce of word and of speaking, and they serue all the body.

Trans.:

Constantine states in *Viaticum* Part 2 that the function of teeth is significant, and with their aid, the body achieves a great stature, provided that the teeth are not sore; for in sore teeth, their function is corrupted. The conditions of the teeth are diverse, and some are visibly known, such as chill, rotting, stinking, breaking, bruising, holes forming or falling, watering, among others. The hidden part is when the teeth are sore, yet they seem to be in good condition externally.

The cause of such aching is humors that come down from the head or up from the stomach, either through vapors or by sharp humors and pounding in the gums. This results in severe pain with leaping and pricking sensations due to the malignity and sharpness of the humors. If the pain originates from the head, the head feels heavy and aches in the face, resulting from red blood or cholera that descends to the roots of the teeth. If the pain originates from the stomach, the aching and pain are felt in the stomach, accompanied by continuous belching. Sometimes, teeth are pierced with holes or changed into yellow, green, or black colors by corrupt and evil humors that descend

from bad foods through the nerves to the roots of the teeth. Sometimes, the teeth shake and wag due to humors in the roots. If the humor is sharp, the teeth will develop holes, and stench and matter will form in them. If worms are the cause, they cause severe pain as they eat into the delicate nerves, causing the teeth to ache and be greatly troubled by either internal or external corrupt humors that infect the nerves of feeling. This pain can sometimes seem dormant due to extreme cold, like from snow or ice, which constrains the nerves of the teeth.

Also, teeth may fall out due to excessive moisture that loosens their roots or due to extreme dryness, as seen in elderly people whose teeth fall out due to reduced moisture from feeding. Constantine recounts these and many other conditions of the teeth, but these should suffice. It is understood that teeth are rooted and anchored in the jaws, their proper ground and foundation. Due to the predominance of cold in them, they are whiter than other bones and are hard, making them less susceptible to damage. The substance of the teeth does not feel, as they lack the capacity for sensation, according to Constantine. Therefore, a broken tooth does not ache. However, a tooth is pained and aches through the nerve of sensation in its root, which is often hurt and troubled. Teeth are bound within by nerves, and teeth pass beyond the bounds of the flesh. They feel no soreness within themselves and are covered with enamel so that they are not seen. It is unseemly for them to be seen, except when laughing. The upper and lower teeth often come together, touching each other. Though the lower teeth sometimes move, the upper teeth are stable and do not move. They are orderly arranged, especially to shape the voice and speech, and serve the entire body.

Zād al-Musāfir: Art. 2, Ch. 18: On toothache

الباب الثامن عشر في وجع الأسنان من إن الأسنان عظيم نفعها لأنها خلقت لجمال الإنسان والقيام بموضع الأغذية التي يكون بها قوام الأبدان مع المعونة للإنسان على تقويم الكلام ببيان، فهذا فعلها ما لم تألم وتفسد، فإذا ألمت وفسدت فقد تنقص أفعالها وتظهر فيها علل مختلفة منها علل ظاهرة تراها بالعيان مثل تأكل الأسنان^١، وتثقبها وتحركها وتعفننها ونحو الوسخ يعلوها وما أشبه ذلك، ومنها أعراض خفية مثل أن يحس العليل في باطن أسنانه ضربانا ووجعا شديدا، ويرى ظاهرها كأنه ليست به علة، وإنما يعرض لها ذلك من كثرة الفضول وتحلبها فيها من الرأس أو المعدة، أو من حدة الفضول الفاسدة المنكرة التي تنحلب من اللثة أو قلة وصول الغذاء إليها، فإن ألمت الأسنان من كثرة تحلب الفضول

سمينا ذلك زيادة الغذاء"، وإنما تألم من هذا الصنف لكثرة تحلب الفضول إليه ليس بحدتها فإن ألمت من حدة الفضلة وجد العليل لذلك وجعا شديدا وضربانا دائما لأن حدة تلك الفضول تؤلمها في وقت تتحلب إليها. وإن كان الألم من قلة وصول الغذاء إليها حدث فيها يبسا ونقصا ورقة كالذي يعرض للمشايخ من الرقة في أسنانهم والنقص في لثاتهم، فأما البرهان الذي يعلم به من أي فضل عرض الوجع في الأسنان وهل هو من الرأس أو من المعدة فهو أن من وجد وجعا شديدا وضربانا دائما في أسنانه وكان مع ذلك ثقل في رأسه واحمرار في وجهة فإن ذلك من قبل فضل دم ومرة صفراء متحلبة من الرأس، فإن ذكر العليل أنه لا يجد مع وجع أسنانه ثقلا في رأسه لكنه يجد مع ذلك حرارة شديدة في معدته ومراة في فمه وبخارا يرتفع إلى حلقه، علمنا أن ذلك من فضول الحر في المعدة. وإن ذكر أنه يجد وجعا رخوا في أسنانه وكان مع ذلك ثقل في رأسه وامتلاء في وجهه، علمنا أن ذلك من فضول غليظة بلغمائية أو سوداوية كائنة في الرأس. فإذا وجد الألم في أسنانه. مع ثقل في معدته وجشاء حامضا، علمنا أن ذلك من فضول باردة في معدته. وقد تتألم الأسنان أيضا من حرارة شديدة أو برودة مفرطة فيحس العليل حرارة في أسنانه أو برودة تؤذيه وليس يجد من ذلك وجعا شديدا مثل ما يجد من تحلب الفضول إليها. من وقد تتألم أيضا من أكل شيء بارد مفرط البرد أو شربه، أو من أكل شيء حار شديد الحرارة يتبعه بارد أو من أكل شيء بارد يتبعه حار. فإن كان وجع الأسنان من قبل تحلب الفضول إليها فينبغي لنا أن ننظر من أي فضل عرض ذلك ومن أي موضع تحلبت من الرأس أو المعدة. فإن كان ذلك من الفضول الحديدة المتحلبة من الرأس ودل على ذلك البرهان الذي قدمنا أمرنا العليل بفصد القيصال، إن ساعد الزمان والقوة والسن، فإن منع من فصد القيصال مانع فصدنا له العرقين الذين تحت اللسان، أو يسقى مطبوخ الخيار شنبر وأيارج فيقرا المعمول بالصبر المغسول بالأفوية. فإن كانت تلك الفضول الحادة في المعدة أسقينا العليل حب الأصطماخيون أو حب المصطكى والصبر ومطبوخ الأهليلج أو نقوع التمر هندي ونأمره أن يستعمل القي بالسكنجبين والماء الفاتر.

Trans.:

The benefits of teeth are immense, as they are created for the beauty of humans and for chewing food, which sustains our bodies. They also assist in articulating speech clearly. This is their function unless they become painful and decayed, then their performance diminishes, and various ailments appear. Some ailments are visible, such as tooth erosion, cavities, loosening, decay, and similar accumulation of filth. Others are hidden symptoms, like feeling throbbing and severe pain in the interior of the teeth while their exterior appears unblemished. These ailments occur due to excessive accumulation and draining of humors into them from the head or the stomach, or due to the sharpness of corrupt, vile humors draining from the gums or the lack of nutrition reaching them. If the teeth pain due to excessive draining of humors, we call this an excess of nutrition, and they pain from this type due to the excess draining of humors to them, not because of

their sharpness. If the pain is from the sharpness of the surplus humor, the patient feels severe pain and constant throbbing because the sharpness of those humors pains them the moment they drain into them. If the pain is due to a lack of nutrition reaching them, they become dry, diminish and weaken, like what happens to the elderly with frail teeth and diminishing gums.

As for the evidence which tells us from which surplus the pain in the teeth arises and whether it's from the head or the stomach, it is that if someone feels severe and constant pain in their teeth along with heaviness in their head and redness in their face, then it is due to surplus blood and yellow bile draining from the head. If the patient mentions not feeling heaviness in their head with their tooth pain but feels intense heat in their stomach, bitterness in their mouth, and vapor rising to their throat, we know that it is from hot humors in the stomach. If they mention feeling a soft pain in their teeth along with heaviness in their head and a fullness in their face, we know that it is from thick phlegmatic or melancholic humors in the head. If they feel pain in their teeth along with heaviness in their stomach and a sour belch, we know that it is from cold humors in their stomach.

Teeth can also pain from intense heat or excessive cold, making the patient feel heat or cold in their teeth that irritates them, but not as severe as the pain from humors draining into them. They can also pain from consuming or drinking something extremely cold or from consuming something extremely hot followed by something cold or vice versa. If the toothache is from the draining of humors into them, we need to look at which humor is causing it and from where it is draining, whether from the head or the stomach. If it is from sharp humors draining from the head, as indicated by the evidence we provided earlier, we order the patient to be bled from the basilic vein if the time, strength, and age are suitable. If bleeding from the basilic vein is not possible, we bleed from the two veins under the tongue or give a decoction of wild cucumber and aloe vera syrup prepared with washed aloes. If those sharp humors are in the stomach, we give the patient seeds of the *astmachilus* or seeds of mastic and aloe, and a decoction of tamarind, and order them to vomit using oxymel and lukewarm water.

الأسنان (al-asnān): teeth

نفعها (naf'uhā): their benefits

الجمال (al-jamāl): beauty

الإنسان (al-insān): humans

الأغذية (al-aghḍiya): food

الأبدان (al-abdān): bodies

الكلام (al-kalām): speech

فسدت (fasadat): decayed

ألمت (alamat): became painful

الأفعال (al-af'āl): actions (or performance)

علل ('ilal): ailments

ظاهرة (ẓāhirah): visible

باطن (bāṭin): interior

فضول (fuḍūl): humors

الرأس (al-ra's): head

المعدة (al-ma'idah): stomach

اللثة (al-lithah): gums

الفضلة (al-faḍlah): surplus

تحلب (taḥallub): draining

وجع (waja'): pain

ضربانا (ḍarbān): throbbing

المشايع (al-mashāyikh): the elderly

أسنانهم (asnānuhum): their teeth

ثقل (thaql): heaviness

احمرار (iḥmirār): redness

وجهه (wajhuh): his face

المعدة (al-ma'idah): stomach

بخار (bukhār): vapor

حموضة (ḥumūḍah): sour

البرهان (al-burhān): evidence

الألم (al-alam): pain

القيء (al-qiy'): vomiting

الماء الفاتر (al-mā' al-fātir): warm water

Though there are other parallels and an almost identical vocabulary, it is quite evident that the treatise attributed to Constantinus Africanus is based on - if not directly reproduces - from *Zad al-Musafir*. The shared terms, humoral explanations and prescriptions indicate a diffusion of medical knowledge beyond religious divides and cultures. As shown, teeth health per se, encompassing aesthetics, speech and digestion was universally recognized as the state of the body overall well-being thus attesting to a common medieval medical principle in diverse traditions. However, this overlap of ideas

signifies that Constantinus intentionally borrowed from Ibn al-Jazzar as part of a larger narrative of Islamic-Christian medical exchanges.

Finding 7

This finding compares Bartholomeus' *De prop.*: Bk. 5, Ch. 21 with *Zād al-Musāfir*: Art. 2, Ch. 24. The chosen extracts deal mainly with children's oral diseases such as those that affect the tongue's surface. In this account by Bartholomeus attributed to Constantinus Africanus (bad milk), little bubbles may be seen on the top of tongues of infants; and in contrast, according to Ibn al-Jazzar's text, canker sores are prevalent within mouths or on tongues that could be caused by 'sharpness' of milk or undernourishment as well."

De Prop.: Bk. 5, Ch. 21.: Of the tongue

In Pantegni, Constantine assigneth other defaults of the tongue, where hée sayth, That there ryse broad blaines spread into the vtter skinne of the tongue, as it faceth in children that suck euill milke:

Trans.:

In *Pantegni*, Constantine describes other tongue disorders. He notes that broad blisters can spread on the outer skin of the tongue, as seen in children who suck bad milk.

Zād al-Musāfir: Art. 2, Ch. 24,,: On illnesses occurring in the mouth

وقد يوجد أيضا في الفم القلاع وهو قروح تعرض في جلدة الفم من باطنه وفي اللسان وبخاصة الأطفال،
وذلك فيهم من حدة اللبن وفقدانهم الغذاء

Trans.:

"Aphthous ulcers" are sores that appear on the inner mouth skin and tongue, especially in children, due to the sharpness of milk and their lack of nutrition.

لسان (lisān): tongue

بثور عريضة (buthūr ʿarīḍa): broad blisters

جلدة اللسان (jildat al-lisān): outer skin of the tongue

أطفال (aṭfāl): children

حليب فاسد (ḥalīb fāsīd): bad milk

القلاع (al-qulāʿ): aphthous ulcers or sores

جلدة الفم (jildat al-fam): inner skin of the mouth

حدة اللبن (ḥiddat al-laban): sharpness or acidity of milk

نقص التغذية (naqṣ al-tagħḍiya): lack of nutrition

These descriptions taken as a whole, strongly imply that the material in Bartholomeus' work done under Constantinus Africanus' name may have been borrowed from or heavily influenced by Ibn al-Jazzar's earlier findings. The two texts stress upon poor quality milk as an irritant for these sores among children suggesting some common medical knowledge of how oral health is affected by nutrition. Finally, these similarities highlight the wider circulation of medieval medical knowledge which reveals that Christian and Islamic tractates had similar views on pediatric disorders of the tongue and mouth.

Finding 8

In this finding, *De prop.: Bk. 5, Ch. 21: Of the Tongue and Zād al-Musāfir: Art. 2, Ch. 17: On Impediment of Tongue Movement and Loss of Speech* are compared. These selected passages address various causes that hinder tongue movement and speech, ranging from obstructions or swellings in the nerves to harmful alterations in the tongue's own temperament such as excessive heat, cold, moisture, or dryness. Both texts highlight how visible indicators (like redness, whiteness, or puffiness) can reveal

underlying issues; these acknowledge that even when the tongue seems healthy it is also possible for speech to be missing due to problems in the brain or nerves instead.

De prop.: Bk. 5, Ch. 21: Of the tongue

As Const. saith, in some the tongue is constrained more than it needeth; insomuch that it maye not moue into diuers parts, therefore it needeth to cut the strings to haue the larger mouing be all the space within the mouth. The tongue is subiect to haue many passiers and grieses, as in the substance therof, & in the sinewes, that come, theet & therefore in Viatico Cons.saith, The tongue of a beast is seth quiet mouing, & the vse of speking, the cause therof commeth of default of of mani•• ye braine by stapping of ye••wires, by ye which, ye vertue of feeling passeth: somtime of a postume, either of vlains ye rise on ye tongue: somtime by ye•per defaults in ye substance of ye tongue, as euill cōplection; by ye which ye feeling st•pered by too gret heat or colde, or monsture, or drinesse, or a postume, or •wolting, and such other. And if the tongue be grieuouslye swollon, it betokeneth encosse of heate: and if it be white, it betokeneth coldness; & if it be soft, it betokeneth moysture: and if it be drie & rough, it betokeneth drinesse. And all such things, let the vse of the tongue, or take away all the vse or part therof. If the tongue seemeth whole and without wemme, and the speach fayleth: the default commeth of the braine, or of the sinewes of feeling stopped. Sometime loosing of speach commeth by loosing of wit, as in phrensie and Litargi.* Hitherto speaketh Constantine in viatico.

Trans.:

As Constantine says, in some cases, the tongue is more constrained than necessary, so much so that it cannot move to various parts of the mouth. Therefore, it may be necessary to cut the strings to allow for greater movement throughout the mouth. The tongue is subject to many disorders and grievances, both in its substance and in the nerves that come and go. In *Viaticum*, Constantine notes that the tongue's function in quiet movement and speaking can be impaired due to deficiencies of moisture in the brain or by the blocking of the nerves through which the sensation of feeling passes. This impairment can sometimes result from an abscess or ulcers that develop on the tongue, or due to inherent defects in the tongue's substance, such as an evil complexion. This can impede sensation by excessive heat or cold, abnormal growth, dryness, an abscess, swelling, and other issues. If the tongue is severely swollen, it indicates

excessive heat; if it is white, it indicates coldness; if it is soft, it indicates moisture; and if it is dry and rough, it indicates dryness. All these conditions can hinder the use of the tongue or completely take away its function. If the tongue appears healthy but speech is impaired, the issue comes from the brain or the blocked sensory nerves. Sometimes, loss of speech is caused by a loss of wit, as in cases of frenzy and lethargy. This is what Constantine discusses in *Viaticum*.

Zād al-Musāfir: Art. 2, Ch. 17: On Impediment of tongue movement and loss of speech

وقد تذهب حركة اللسان فيبطل الكلام إما من سقوط القوة المحركة التي تأتيه من الدماغ وإما من قبل علة من سدد أو ورم يعرض في العصب الذي يجري فيه قوة الحركة من الدماغ إلى اللسان، وإما من قبل خلط في اللسان مثل أن يعرض فيه فساد مزاجه إما من الحرارة أو البرودة أو الرطوبة أو اليبوسة، أو يعرض فيها الورم أو الانتفاخ وما أشبه ذلك، فإن رأينا اللسان شديد الحمرة فذلك دليل الحر، وإن كان شديد البياض فذلك دليل البرد، وإن كان مسترخيا مع كثرة الرطوبة فيه فذلك دليل الرطوبة، وإن كان شديد الجفاف منقبضا فدليل اليبس، وإن حدث فيه ورم أو بثرة أو غير ذلك فقد نراه بالعيان فنعلم أنه بسبب بطلان الكلام، فإن لم نر في اللسان تغيرا ولا علة ظاهرة ووجدنا العليل قد انقطع كلامه وكان مع ذلك ذهاب حركة بعض أعضاء الجسد، ولم ير في اللسان علة ظاهرة علمنا أن ذلك من قبل ألم العصب الذي يجري فيه قوة الحركة من الدماغ إلى اللسان وقد يبطل الكلام أيضا من آفة دخلت على الذهن وأذهلته

Trans.:

The movement of the tongue can be lost, resulting in speechlessness, either from the loss of the moving force coming from the brain or due to an ailment from obstruction or swelling in the nerve that carries the movement force from the brain to the tongue, or due to a humor in the tongue itself. This might be due to the tongue's temperament changing to heat, cold, moisture, or dryness, or due to swelling, puffiness, etc. If we see the tongue very red, it indicates heat; if very white, it indicates cold; if slack with excessive moisture, it indicates moisture; if very dry and contracted, it indicates dryness. If swelling, blistering, or anything similar occurs, we can see it and know it's the cause of speechlessness. If we see no change or apparent ailment in the tongue, but the patient has suddenly become speechless, and it's associated with the loss of movement in other body parts, and no visible ailment is seen on the tongue, we know it's due to an ailment

in the nerve carrying the movement force from the brain to the tongue. Speechlessness can also occur from an affliction that has befallen the mind, causing it to be perplexed.

لسان (lisān): tongue

سد (sadd): obstruction

ورم (waram): swelling

عصب (‘aṣab): nerve

حركة (ḥaraka): movement

دماغ (damāgh): brain

فساد (fasād): corruption/defect

حرارة (ḥarārah): heat

برودة (burūdah): coldness

رطوبة (ruṭūbah): moisture

يبوسة (yubūṣah): dryness

بثر (buthr): blister

ذهن (dhihn): mind

آفة (āfah): affliction

بطلان (buṭlān): loss/cessation

قوة (quwwah): force/power

مزاج (mizāj): temperament

انتفاخ (intifākh): puffiness

دليل (dalīl): indication/sign

مسترخ (mustarakh): slack/relaxed

انقباض (inqibāḍ): contraction

عيان (‘ayān): observation

بطل (baṭala): to cease/to be invalid

علة (‘illah): ailment/illness

ظاهر (zāhir): visible/apparent

ذهاب (dhahāb): loss/disappearance

كلام (kalām): speech

عضو (‘uḍw): body part

مؤلم (mu’lim): painful

مذهل (mudhil): perplexed

These parallels emphasize how the two sources are actually quite similar, and this consistency suggests that the material attributed to Constantinus Africanus in Bartholomeus’ work is very similar to what Ibn al-Jazzar wrote about. These texts show a common base for diagnosis by mentioning common signs that include the redness indicating heat while whiteness indicates coldness. By giving identical symptoms connected with speech impediments as well as possible local (tongue-centered) or general (brain- or nerve-related) reasons behind them; they share a diagnostic framework. The similarity between these treatments and their symptoms illustrates the prevalence of medieval medical transfer from one culture to another lending support to the mutual dependence of Christian and Muslim scholars in understanding of tongue disorders.

Finding 9

This comparative analysis examines Bartholomeus' *De prop.*: Bk. 5, Ch. 23: *Of the Voice* and *Zād al-Musāfir*: Art. 1, Ch. 16: *On Drowsiness* as it pertains to their shared emphasis on music's healing potentiality. In his passage, Bartholomeus through Constantinus Africanus noted that pleasant melodies could be used to cure both mental disorder and body weakness of people who are physically ill or mentally disturbed by sickness. Similarly, Ibn al-Jazzar points out how a soft voice with constant rhythm like those of ud and tambour can vitalize patients hence awakening them spiritually and relieving their sufferings.

De prop.: Bk. 5, Ch. 23: *Of the voice*

Also by swéet songs of harmony and accord of Musicke, sicke men and frantike come oft to their witte againe and health of body. Wherevpon Constatinus in viatico particula. 2. cap. 1. de amore, que dicitus hereos, sie dieit.*

Trans.:

Also, through sweet songs of harmony and the accord of music, sick men and those in frenzy often regain their senses and body health. Consequently, Constantine in *Viaticum* Part 2, Chapter 1, on love, which is called "heroic," says so.

Zād al-Musāfir, Art. 1, Chapter 16: *On Drowsiness*

صوتا لطيفا محكما دائما غير مؤذ ولا عنف ويحتال على أن يستيقظ بهذا وما أشبهه، وإن أمكن أن يكون ذلك بإيقاع يحكي إيقاع العود والطنبور وما أشبه ذلك من ضروب المطربات كان ذلك أفضل وأكمل، لأن النفوس تميل إلى ذلك، وتقوى به جدا والطباع تنبسط انبساطا به تنبسط النفس وتقوى إن شاء الله تعالى

Trans.:

A gentle, firm, and continuous voice that is not harmful or harsh should be used, and efforts should be made to awaken the patient with this and similar means. If it is possible for this to be done with a rhythm that mimics the sound of the oud and the tanbour, and

other types of music, it would be better and more effective. This is because souls are inclined towards such sounds, and they are greatly strengthened by them. Temperaments are expanded in a way that the spirit is refreshed and empowered, God willing.

صوت (ṣawt): sound/voice

لطيف (laṭīf): gentle

محكم (muḥkam): firm

دائما (dā'imān): continuous

غير مؤذ (ghayr mu'dhi): non-harmful

عنف (ʿunf): harshness

إيقاع (īqāʿ): rhythm

العود (al-ʿūd): the Oud (a musical instrument)

الطنبور (al-ṭanbūr): the Tanbour (a stringed instrument)

ضروب (ḍurūb): types

المطربات (al-muṭribāt): musical sounds

النفوس (al-nufūs): souls

تميل (tamīl): inclined

تقوى (taqwá): strengthened

الطبائع (al-ṭibāʿ): temperaments

تنبسط (tanbasit): expanded

النفس (al-nafs): the spirit

موسيقى (mūsīqā): music

These closely related texts are indicative of a strong medieval consensus regarding the therapeutic aspect of music which means that the story attributed to Constantinus Africanus in the Bartholomeus' work is consistent with Ibn al-Jazzar's. Both authors then identify tunes and rhythms as factors for regaining one's health and having a calm mind pointing to cross-cultural appreciation that human beings particularly respond audibly more than any other stimuli.

Finding 10

In this comparative examination, *De prop.: Bk. 5, Ch. 40: Of the Gall and Zād al-Musāfir: Art. 2, Ch. 6: On Dimness (Visual)* are analyzed side by side, both highlighting the medicinal use of gall in treating eye ailments. In Bartholomeus' text, attributed to Constantinus, gall's subtlety and dryness are said to "cut" and "waste" excessive humors, thereby clearing the eyesight - particularly when derived from predatory birds such as the goshawk. Ibn al-Jazzar likewise prescribes gall from both land animals and birds to dissolve superfluous moisture in the eye, noting that it can effectively clarify vision.

De Prop.: Bk. 5, Ch. 40: Of the Gall

Also the Gall by his subtiltie & sharpnesse, •arueth and cutteth great humors, and wasteth them by his drynesse. And therefore to clense the eye sight, and to make it cleare, and to put of the impediment and lette of the spirit of lyfe, and namely the Gall of & •oshauke; and of other foules, which lyue by rauine, is necessary, as sayth Con in Viatico.

Trans.:

The gall, through its subtlety and sharpness, carves and cuts great humors, and wastes them through its dryness. Therefore, to cleanse the eyesight and make it clear, to remove the impediment and hindrance of the spirit of life, especially the gall of the goshawk and other birds of prey, is necessary, as stated by Constantine in *Viaticum*.

Zād al-Musāfir: Art.2, Ch. 6: On dimness (visual)

ويوضع العلق على الصدغين ويكتحل بالأدوية التي يقع فيها ماء المرارات، وذلك أن جميع المرار قد
ينفع من اجتماع في العين ويجلو البصر ويذيب فضول الرطوبة التي تجتمع من لباس العين ما كان من
مرار حيوان البر وما كان من مرار الطير متى طار منه وأكل اللحم

Trans.:

Leeches are applied to the temples, and collyrium is used with remedies containing the water of gall bladders. This is because all types of gall can be beneficial when combined in the eye. They clear the vision and dissolve the excess moisture that accumulates from the eye's covering, whether it is gall from land animals or from birds, once they have flown and consumed meat.

ينفع (yanfa'): benefit

العين (al-'ayn): the eye

ويجلو (wayajlū): and clarifies

البصر (al-baṣar): the vision

ويذيب (wayudhīb): and dissolves

فضول (fuḍūl): humors

لباس (libās): the covering

مرار (marār): gall

حيوان (ḥaywān): animal

البر (al-barr): land

الطير (al-ṭayr): the birds

وأكل (wa-akal): and ate

اللحم (al-laḥm): the meat

From both these instances we can see that Christian and Islamic medical thoughts are very similar to each other; this implies that Bartholomeus' account could possibly be based on what Ibn al-Jazzar said before. They both talk about the unique characteristics of bile such as it being dry and sharp which are key stimulation of unwanted humors elimination as well as improvement of eyesight. This further elucidates their common therapeutic strategy, broadening our knowledge about the Middle Ages' fluid exchange with respect to medicine in general, when practices and remedies for superior health interacted across cultures.

Finding 11

This analysis compares *De prop.: Bk. 5, Ch. 40: Of the Gall and Zād al-Musāfir: Art. 5, Ch. 10: On Jaundice* concerning the question of how this coloration (gall - yellow bile) influences the general health and external form of an individual's body. The passage by Bartholomeus mentions that boiling gall poisons blood and changes skin color making such symptoms as thirst, bitter mouth taste, headache above one's eyes, ringing in ears appear. It also explains how impediments in the channels of gall bladder can change bile course either up towards stomach resulting in yellowing of face along with a taste of dry bitterness or down to lower parts. Similarly, Ibn al-Jazzar describes jaundice arising from incorrect passage for bile into gall bladder, but instead it gets disseminated throughout the blood and thus colors skin along with urine and stool too. Jazzar further says that if something blocks the lower opening of this organ then its fluid would move upwards into stomach causing heat sensation in throat, thirstiness together with whitish feces similar to what is said in Bartholomeus' text.

De Prop.: Bk. 5, Ch. 40: Of the Gall

And by continuing hease, and great boyling of the humour of the Gall, comming again to the Lyuer, the bloud is infected, which being infected, bothe after the nourishments that are sent to fēede the mēbers, and apphyreth and enfedeth them: and also maketh and causeth the skinne to be yelow of colour or els grēene, or blacke. The tollens of those

passions be these: The infection of all the body, thirst, bytternesse of ye mouth, ache of the forehead, rynging in the eares, yelow brine with yelow some continuall yelow spewing. And sometyme it happeneth, that the poo•es of the case of the Gall be stopped and letted: And then Coler infecteth the Lyuer, and bréedeth the same maner of passion. Therefore in Viatico, Con saith, that when the case of the Gal is greued, that than saylleth the vertue thereof, by the which he vseth to drawe out the red Coler of the Lyuer: And so the Coler abyding with the bloud, the bloud is dyed & chaunged. Also he sayth, that when Apostume is bred in the wayes by the which Coler passeth to the Gall, the Coler turneth to the Lyuer, and passeth about with the bloud into all the body. For if the nether hole be stopped, than Coler passeth vp to the ouer waye, and to the stomacke, and than the fare is yelow, and the mouth is bitter and dry, burning and thirst in the stomacke.

The Uryne and dyrt commeth whyle, for that Coler is farre from the Lyuer and the Keyne; where the Uryne is wont to be dyed. And if the ouer hole be stopped, than Coler dyeth the nether partes: And tokens be séene that be contrary to the foresayd tokens, as Constantine sayth. The gall lyeth vpon the liuer like a bladder, hauing a skin easie to breake, named Cista Fel•s, the Filme of the Gall. This that is spoken and treated of the Gall, sufficeth touching to this matter.

Trans.:

Continuing on, the intense boiling of the humor of the Gall, upon returning to the liver, infects the blood. This infection affects both the nourishments sent to feed the body's members, appearing and feeding them, and also causes the skin to turn yellow, green, or black. The symptoms of these conditions include: infection of the entire body, thirst, bitterness of the mouth, forehead ache, ringing in the ears, yellow urine, and continuous yellow vomiting. Sometimes, the pores of the gallbladder are blocked, leading to bile infecting the liver and causing similar conditions. Therefore, in *Viaticum*, Constantinus says that when the gallbladder is distressed, its ability to draw out the red bile from the liver is impaired. Thus, the bile staying with the blood, dyes and changes it. He also mentions that when an abscess is formed in the paths through which bile passes to the Gall, the bile turns back to the liver and circulates with the blood throughout the body. If the lower opening is blocked, then bile passes up to the upper path, to the stomach,

making the complexion yellow, and causing the mouth to become bitter, dry, burning, and inducing thirst in the stomach.

The urine and excrement become pale because the bile is far from the liver and the kidneys, where the urine is usually colored. If the upper opening is blocked, then the bile dyes the lower parts. Signs appear that are contrary to the aforementioned symptoms, as Constantine states. The gallbladder lies upon the liver like a bladder, having a skin easy to break, named Cista Fellea, the “Film of the Gall”.

Zād al-Musāfir: Art. 5, Ch. 10: On jaundice

وأما العلة السابقة، فتقسم على ضربين إذا قويت الطباع على تلطف أثقال المرية وقوتها وألحقتها بسطح البدن، فإنها تولد يرقانا في الحميات الحارة وأنذرت بسلامة وخلاص من المرض. إلا أن يكون ذلك قبل اليوم السابع، فإنه يدل على أن ظهور اليرقان لم يكن من فعل الطباع لكن بحدة المرض وقهره للطبيعة وإكراهه لها على إظهار الدلائل المنذرة 355 في غير وقتها. ولذلك زعم أبقراط أن اليرقان الظاهر في الحميات الحارة 35 قبل اليوم السابع منذر بخوف لا محالة. والظاهر بعد السابع منذر بالسلامة. وقد يكون اليرقان من أسباب أخرى غير التي وصفنا. فمنه أن يفسد مزاج الكبد من قبل أحد الأمراض التي تقدم ذكرها في هذه المقالة. فتضعف قواها الطبيعية عن تنفيذ أفعالها على النظام وعن إرسال الحر المري المغيرة من الدم إلى كيس المرارة. فتبقى المرة منحصرة في الكبد وتقضي على الدم وتصبغه وتصيره مرياً. وهذا الصنف من اليرقان لا بد أن تتقدمه أسباب تنذر به مثل فساد الأفعال الطبيعية ونقصان البدن والجوع والثقل في الجانب الأيمن. ومنها أيضاً أن يعرض لجرم الحرارة الألم والضربان مثل “أن تضعف قوتها الجارية عن جذب المرار الأصفر فلا تجذبه إليها، فيبقى في الكبد فينصبغ الدم به. أو تعرض للمرارة السدد من قبل ورم يسد المسالك التي يجوز فيها المرار إلى جسم المرارة، فيرجع حينئذ إلى الكبد، فينتشر في جميع... مع الدم، فيغيره. فإذا انسد المجرى الأسفل من المرارة سعدت المرة الصفراء إلى المجرى الأعلى النافذ إلى المعدة، فصفرت الوجه وغلبت حرارتها على طعم الفم ولدت في الحلق جفافاً وفي المعدة حرارة وعطشاً وكان لون البول والبراز أبيض لعدم صبغ المرارة. فإن كانت السدة في المجرى الأعلى النافذ إلى المعدة كثر انصباب المرة إلى الأمعاء وصبغت البول والبراز جميعاً، وصار البول كأن فيه طينا أحمر وزنجفرا وعليه رغوة شديدة الصفرة، وتكون الطبيعة متعذرة. وأكثر ما يشكون اليرقان من قبل آلام المرارة بغثة ولا يفسد منه لون الجسد أكثر من أن يصفر ولا تمتنع الكبد عن فعالها. وقد يكون اليرقان مع

Trans.:

This weakens its natural powers from executing its functions orderly and from sending the altered hot bile from the blood to the gallbladder. Consequently, the bile remains

confined in the liver, overflows onto the blood, dyes it, and turns it bilious. This type of jaundice is usually preceded by signs like the corruption of natural functions, bodily weakening, pain, and heaviness in the right side.

Another cause may be the occurrence of pain and disturbance in the heat organ, such as the weakening of its power to draw yellow bile towards it, leaving it in the liver to stain the blood. Or, blockages in the gallbladder due to swelling can obstruct the pathways through which the bile passes to the gallbladder, causing it to return to the liver and spread throughout the body.”

When the bile mixes with the blood, it alters it. If the lower passage of the gallbladder becomes blocked, the yellow bile rises to the upper passage leading to the stomach. This yellows the face and the heat of the bile dominates the taste in the mouth, causing dryness in the throat and heat and thirst in the stomach. The color of the urine and feces becomes white due to the lack of bile pigmentation.

If the blockage occurs in the upper passage leading to the stomach, there is an increased flow of bile into the intestines, staining both the urine and feces. The urine appears as if it contains red clay and cinnabar with a strongly yellow froth on top. In this case, the body’s natural processes are challenged. Most people with jaundice experience sudden gallbladder pains but this does not greatly alter the body’s color beyond turning yellow, nor does the liver stop functioning.

المرارة (al-marārah): gallbladder

الكبد (al-kabid): liver

المرءة الصفراء (al-mirrah al-ṣafrā’): yellow bile

الدم (al-dam): blood

البول (al-bawl): urine

البراز (al-barāz): feces

البشرة (al-bashara): skin

العطش (al-‘aṭash): thirst

الجفاف (al-jafāf): dryness

المعدة (al-ma‘ida): stomach

الورم (al-waram): swelling

المسالك (al-masālik): pathways

الأمعاء (al-am‘ā’): intestines

المرية (al-marīyah): humor

الصبغ (al-ṣibgh): dye/stain

الحمى (al-ḥummā): fever

الألم (al-alam): pain

الصداع (al-ṣudā‘): headache

طنين الأذن (ṭanīn al-udhān): ringing in the ears

القيء (al-qay’): vomiting

اللون الأصفر (al-lawn al-aṣfar): yellow color

الحويصلة الصفراوية (al-ḥawīṣilah al-ṣafrāwiyyah): cystic duct

These striking similarities suggest a shared, or at least mutually informed, understanding of gall’s role in spreading or withholding bile from the liver and bloodstream. Bartholomeus’ material, presented under Constantinus Africanus’ name, closely mirrors Ibn al-Jazzar’s earlier discussion, particularly regarding the correlation of blocked gallbladder passages with characteristic shifts in complexion, urine, and

feces. As with their other overlapping observations, this congruence reinforces the idea of cross-cultural medical exchange in the medieval era, highlighting how Christian and Islamic physicians alike recognized gall-related imbalances as crucial to diagnosing and managing illnesses such as jaundice.

Finding 12

In this comparative analysis, *De prop.*: Bk. 7, Ch. 2 and *Zād al-Musāfir*: Art. 1, Ch. 12 both discuss an intensely painful headache that leaves sufferers unable to endure noise or light. In Bartholomeus' text this ailment, termed "Emigranea" or migraine, is linked to choleric vapor, hot wind, and gas creating a hammering sensation in the skull. Meanwhile, Ibn al-Jazzar describes "the disease of the egg," referring to a similarly severe cranial pain in the "egg" of the skull, provoked by the sharpness of yellow bile and thick winds when the head is notably weakened. Despite emerging from Christian and Islamic medical traditions, these passages converge in their explanations of how fiery humors and adverse winds combine to produce excruciating head pain, accompanied by hypersensitivity to sights and sounds.

De prop.: Bk. 7, Ch. 2: *Of head ache, and of the causes & signes thereof (On headache, and of its causes and signs)*

The head is grieved within with an ache and an euill that Phisitions call Emigranea, as saith Constant. And he saith, this ache and euill is most griuous: for who that hath that euill, feeleth in his head, as it were beating of hammers, and may not suffer noyse, nor voyce, nor light, nor shining. And this euill is of cholarike smoake with hotte winde and ventositie, & therefore he feeleth in his head putting & pricking, burning and ringing.

Trans.:

The head experiences internal discomfort due to a pain and affliction that physicians term migraine, as Constantine explains. He notes that this type of headache is particularly severe because those suffering from it feel as if their heads are being pounded with hammers, and they are unable to bear noise, voice, light, or brightness.

This condition is caused by choleric vapor combined with hot wind and gas, resulting in sensations of jabbing, pricking, burning, and ringing in the head.

Zād al-Musāfir: Art. 1; Ch. 12: On the Disease of Egg (As part of the skull)

وقد يعرض في البيضة على الجمجمة وجع شديد مؤذ حتى كأن العليل يحس منه كأن رأسه يضرب
بالمطراق ولا يقدر أن يسمع منه صوتا شديدا ولا شيئا يقرع شيئا، ولا يستطيع أن ينظر إلى ضوء،
ويكون ذلك من حدة المرة الصفراء ورياح غليظة إذا وافقت من الرأس ضعفا شديدا

Trans.:

And there may occur on the “egg”¹⁸⁵ of the skull a severe and hurtful pain so intense that the sufferer feels as if their head is being struck with a hammer, and they are unable to hear any loud sounds or anything striking against something else, nor can they bear to look at light. This condition results from the sharpness of yellow bile and thick winds when they coincide with a significant weakness in the head.

يعرض (yu’rad): appear

البيضة (al-bayḍā’): the egg (often metaphorical for a part of the skull)

الجمجمة (al-jumjumah): the skull

وجع (waja’): pain

شديد (shadīd): severe

مؤذ (mu’adh): hurtful

رأسه (ra’suh): his head

يضرب (yuḍrab): is being struck

بالمطراق (bāl-maṭrāq): with a hammer

¹⁸⁵ Gerrit Bos defines “البيضة” as “helmet”. *Ibn al-Jazzār’s Zād al-musāfir wa-qūt al-hādir*; p.129.

يسمع (yasma'u): hear

صوتا (ṣawtan): a sound

شديدا (shadīdan): loud

يقرع (yaqra'u): striking

ينظر (yanẓur): look

ضوء (daw'): light

المرّة (al-mirrah): the bile

الصفراء (al-ṣafrā'): yellow

و رياح (wa-riyāḥ): and winds

غليظة (ghalīẓah): thick

وافقت (wāfaqat): coincides with

الرأس (al-ra's): the head

ضعفا (da'fan): weakness

This association of symptoms with their causes demonstrates that there was a considerable overlap in medieval medical theory. It implies that Bartholomeus' text and Ibn al-Jazzar's work drew upon a common pool of humoralism. Their descriptions even included hammer like throbbing, aversion to bright light or loud noise and they both seem to understand the effect migraines have on sufferers. The texts both state that these imbalances are caused by excess bile or choleric humor which means that it is imperative for one to ensure proper management of internal vapors thereby maintaining an equilibrium within the brain. These similarities show that there were broader connections between cultures in the healing sciences, hence international circulation of medical knowledge between Christian and Islamic traditions.

Finding 13

In this comparison of Bartholomeus and Ibn al-Jazzar's accounts, the scalp condition is described as having honey-like discharge in their writings in *De prop.*: Bk. 7, Ch. 2 (under the name of Constantinus Africanus) and *Zād al-Musāfir*: Art. 1, Ch. 7 by Ibn al-Jazzar. "Favum" is how Bartholomeus refers to scabs that resemble honeycombs since they have tiny holes through which sticky liquid falls out exactly like honey does from its comb-like structure while "Al-Shahdah" is the name given to this sickness by Jazzar. Both authors trace such scalp conditions back to a humor or phlegm vitiated with malice which translates into pimples or sores on the skin that ooze viscid matter resembling honey.

De prop.: Bk. 7, Ch. 2: *Of head ache, and of the causes & signes thereof (On headache, and of its causes and signs)*

Also the head is griued specially without in the skinne with pimples, and whelkes, and scabs, out of the which commeth matter much lyke to honie, and therefore Constant. calleth such a scab, Fauum an honie rombe: for such whelkes haue small hoales, out of the which matter commeth, as honie out of the honie combe. And this euill commeth of vicious and gleymie humour, which commeth to the skin of ye head, and bréedeth therein pimples & whelks.

Trans.:

The head is specially afflicted on the outer layer of the skin with pimples, blisters, and scabs, from which a substance resembling honey is discharged. Therefore, Constantinus refers to such a scab as "Favum," meaning a honeycomb, because these blisters have small holes through which the substance flows, just as honey exits the honeycomb. This condition is caused by a harmful and sticky humor that reaches the scalp's skin, resulting in the formation of pimples and blisters.

Zād al-Musāfir: Art. 1; Ch. 7: *The disease named Al-Shahdah (Honeycomb / Favus)*

وقد يعرض أيضا في جلدة الرأس قروح فيها ثقب صغار ويخرج منها رطوبة غليظة لزجة شبيهة بالعسل، ولذلك يسمى هذا الداء الشهدة، وتولد من بلغم مالح.

Trans.:

It may also occur on the scalp as sores with small holes from which oozes a thick, sticky moisture similar to honey. Therefore, this disease is named Al-Shahdah, and it originates from salty phlegm.

يعرض (yu'rad): be presented/appear

جلدة (jildah): the skin

الرأس (ar-ra's): of the head

قروح (qurūḥ): sores

ثقب (thuqub): holes

صغار (ṣaghār): small

ويخرج (wa yakhruj): and comes out

رطوبة (ruṭūbah): moisture

غليظة (ghalīzah): thick

لزجة (lazjah): sticky

شبيهة (shabīhah): similar

بالعسل (bi-al-'asl): to honey

وتولد (wa tawallad): and originates

بلغم (balgham): phlegm

مالح (mālīḥ): salty

The descriptions of these texts are so similar that it is evident they share a common underlying humoral framework despite their distinct Christian and Islamic backgrounds. While Bartholomeus said “a vicious and gleymie humour” after Constantinus, on the other hand; Ibn al-Jazzar noted “salty phlegm.” All of them referred to the thick, moist material that affects the surface of the scalp and which develops in its folds. Again, this is another condition examined by these texts where similarity in terms and explanations highlights wider picture of exchanges in medical knowledge among medieval societies whereby common ideas concerning bodily humors and their manifestation in skin diseases transcended ethnic boundaries.

Finding 14

In this finding, *De prop.*: Bk. 7, Ch. 2 and *Zād al-Musāfir*: Art. 1, Ch. 8 both examine scalp conditions that most frequently affect children. Bartholomeus describes a persistent “scall,” or “Tinea”, which erodes the outer layer of the scalp much like a moth eats cloth and causes relentless itching and scaly patches - especially in children with abundant blood and soft skin. Correspondingly, Ibn al-Jazzar addresses “Al-Sa’fa” and “Al-Riya,” scalp disorders marked by small sores, severe itching, skin peeling, and burning sensations. He similarly attributes these conditions to corrupt or yellowish humors mingled with the blood, emphasizing the vulnerability of children with moist skin and high blood volume.

De prop.: Bk. 7, Ch. 2: *Of head ache, and of the causes & signes thereof (On headache, and of its causes and signs)*

Also the head is ofte diseased with a familiar passion, that children haue ofte, & by Constantin that euill is called Squama, a scall, and we call that euill Tinea a Mothe: for it fretteth and gnaweth the ouer part of the skinne of the head, as a Mothe fretteth cloath, and cleaueth thereto without departing, holding the skinne right fast. And such an euill breédeth passing great itching and fretting & clawing, of that itching falleth manye scalls. This euill commeth often to children that haue great plentie of bloud, & for softnesse of the skinne, and for plentie of meate and drinke.

Trans.:

Also, the head is often affected by a common condition that children frequently have, and Constantin refers to this ailment as Squama, a type of scaly skin condition, which we call Tinea or ringworm. It erodes and gnaws at the surface layer of the scalp's skin, similar to how a moth damages cloth, and sticks to it persistently, tightly adhering to the skin. This condition leads to severe itching, irritation, and scratching, from which numerous scaly patches may develop. This issue often occurs in children who have an abundance of blood, due to the softness of their skin and from having plenty of food and drink.

Zad al-Musafir: Art. 1; Ch. 8: On Al-Sa'fa and Al-Riya (Tinea Capitis & Seborrheic Dermatitis)

السعفة و الرية، حالتان تظهران غالباً على فروة الرأس، وتحدثان أحياناً معاً. تسببهما هذه المادة الصفراء المختلطة بالدم الفاسد. السعفة تظهر على شكل قروح صغيرة مع ألم شديد وحكة مستمرة، بينما الرية تسبب حكة شديدة وتقشر الجلد مع تكون الحرقان. تؤثر الحالتان كثيراً على الأطفال بسبب دمهم الغزير وبشرتهم الرطبة.

Trans.:

“Al-Sa'fa” and “Al-Riya,” two conditions that often appear on the scalp, sometimes occurring together. They are caused by this yellowish substance mixed with corrupt blood. “Al-Sa'fa” appears as small sores with severe pain and constant itching, while “Al-Riya” causes severe itching and skin peeling along with a burning sensation. Both conditions often affect children due to their abundant blood and moist skin.

السعفة (al-sa'fah): tinea capitis / ringworm

الرية (al-riyah): seborrheic dermatitis

تظهران (tazharā): appear

فروة (furwah): scalp

الرأس (al-ra's): the head

المادة (almāddah): the substance

الصفراء (al-ṣafrā'): yellow

المختلطة (almukhtaliṭah): mixed

بالدم (bāldam): with the blood

الفاسد (alfāsīd): corrupt

تظهر (taẓhar): appears

على شكل ('alā shakl): in the form of

قروح (qurūḥ): sores

ألم (alam): pain

شديد (shadīd): severe

مستمرة (mustamirrah): continuous

حكة (ḥakah): itching

وتقشر (wataqshir): and peeling

الجلد (al-jild): the skin

الحرقان (al-ḥarqān): burning sensation

الحالتان (al-ḥālatān): the two conditions

الأطفال (al-aṭfāl): the children

دمهم (damhum): their blood

الغزير (al-ghazīr): abundant

الرطوبة (al-raṭbah): moist

Taken together, these parallel descriptions underscore a shared medical perspective on scalp ailments, despite their respective Christian and Islamic origins. Bartholomeus' reference to "Squama" or "Tinea" and Ibn al-Jazzar's terms "Al-Sa'fa" and "Al-Riya" both highlight the role of excess humors in creating persistent scalp lesions and itching. As with their other commonalities, this convergence reveals how medieval physicians from different cultural milieus recognized comparable causes abundant blood, moist skin, and corrupt humors, and arrived at similar diagnoses for children's scalp conditions. This consistency attests to an extensive exchange of ideas, further solidifying the cross-cultural nature of medieval medical knowledge.

Finding 15

In this examination, *De prop.*: Bk. 7, Ch. 3 and *Zād al-Musāfir*: Art. 4, Ch. 9 both address headaches arising from overeating or excessive drinking. Bartholomeus suggests that if no harmful humor is present but the ailment stems from excessive intake, hot water should be consumed in large amounts followed by induced vomiting. Ibn al-Jazzar similarly indicates that when the stomach becomes overfilled and food begins to spoil, especially in a person with weaker organs (like a sensitive head), headache and confusion can follow. His recommendation aligns closely with Bartholomeus': induce vomiting, or otherwise promote natural elimination, to prevent the spoiled food from lingering in the body.

De prop.: Bk. 7, Ch. 3: *Of medicine and remedies for ache and pain of the head*

... if the head ache be without vicious humour, and commeth of some passing qualytie, then the patient needeth no purgation but rather alteration. And if the faulte be in qualities: we must vse contrarye ••alities. And if the ache commeth of too great repletion of meate or of drinke, as it fareth in •lu•tous or dronkē men: then the best remedie is to drinke hotte water in great quantitie, and then with in a while after, busie him for to spew.

Trans.

If the headache is without harmful humor and arises from a temporary condition, then the patient does not need purging but rather a change in condition. If the problem lies in qualities, we must use opposing qualities. If the headache comes from excessive repletion of food or drink, as is often the case with gluttonous or drunken individuals, then the best remedy is to drink hot water in large quantities and then, shortly after, induce vomiting.

Zād. Al-Musafir: Art. 4, Ch. 9: On indigestion

وأما الذي من قبل قوة كل واحد من أعضاء البدن وضعفه، فهو أن أضعف الأعضاء في بدن كل واحد من المتخمين (هو الذي) يحس الأفة. فإن كان الرأس ضعيفا عرض للمتخم ثقل في (رأسه وصداع أو سهر واختلاط الذهن، وكذلك يعرض في كل عضو من أعضاء) البدن الوجع إذا. ويجب على المتخمين ومن أحب من الناس حفظ الصحة أن يحذر من أعراض التخم، ويبادر إذا أصابه ذلك بالقي، من قبل أن يتغير الطعام ويفسد. فإن تعذر القي فليتلطف في إسهال طبيعته. وإن تغير الطعام وفسد بسبب التخم وقلة سم، فأنفع الأشياء له أن يشرب ماء فاترا ثم يتقيأ كل ما فسد في معدته.

Trans.:

Regarding the variation based on the strength and weakness of each of the body's organs, the weakest organs in the body of an overeater are the ones that usually feel the harm. If the head is weak, the overeater may experience heaviness in the head, headaches, insomnia, and confusion. Similarly, pain can occur in each organ of the body. Therefore, it is essential for overeaters and those who care about their health to be cautious of the symptoms of overeating. If nausea occurs, they should induce vomiting before the food changes and spoils. If vomiting is not possible, they should ease it through natural diarrhea. If the food changes and spoils due to overeating, causing harm, it is beneficial to drink warm water and then induce vomiting to expel the spoiled food from the stomach.¹⁸⁶

¹⁸⁶ Jazzar also continues as follows: "it is also advisable for wine drinkers not to exceed their tolerance capacity and their accustomed habits while being cautious about the effects of alcohol consumption, as we mentioned earlier, God willing." (وقد ينبغي أيضا لشارب النبيذ (أن) لا يتجاوز في شربه مقدار احتماله، وجرت به)

الرأس (al-ra's): the head

وجع (waja'): pain (headache)

صداع (suda'): headache

طعام (ta'am): food

أعراض (a'raad): symptoms

التخم (al-takham): overindulgence (excessive repletion)

معدة (ma'ida): stomach

القي (al-qay): vomiting

شرب (shurb): drink

ماء (maa'): water

فاترا (faatira): hot / warm (in context of water)

These parallel insights underscore a consistent humoral approach, whereby overindulgence threatens the body's internal balance and leads to uncomfortable symptoms, including headaches. Both texts emphasize removing the surplus - through vomiting or other forms of purgation - as the most direct method of relief. This uniformity in therapeutic strategies reinforces the broader theme of a shared medieval medical tradition, wherein Christian and Islamic writers converge on key remedies for ailments brought on by dietary excess.

(. عادثه. ويحذر منه (ما يخرج إلى السكر)، كما ذكرنا في الأغذية إن شاء الله تعالى In this example, Jazzar gives suggestion to drinkers as Bartholomeus also does (...as it fareth in •lu•tous or dronkē men...).

Finding 16

Comparing *De prop.*: Bk. 7, Ch. 30 and *Zād al-Musāfir*: Art. 3, Ch. 12, both texts suggest that different humoral imbalances are associated with the color of sputum or expectoration respectively. In this regard, Bartholomeus uses white and sticky sputum for phlegm; black for melancholy; yellow for bile; red-tinged - frothy ones to represent a “raw” stomach; and transparent-white as a sign of wellbeing. Likewise, pleurisy is diagnosed by Ibn al-Jazzar through examination of expectoration colour: pure blood-red shows that it is normal while predominance of yellow bile can cause it to be yellowish; shifting towards black bile will change it to black and phlegm makes it white. In every case, what matters most is an understanding of these humoral “signs” which enable one know the condition inside any human body.

De prop.: Bk. 7, Ch. 30: *Of corrupt spettle and bloudie (On corrupt and bloody sputum)*¹⁸⁷

By a mans spettle,*are discerned the sundry infirmities of mans bodye: as if the spettle be white Viscus, the sicknesse commeth of fleame: if black lyke the colour of leade and clammye, the sicknesse commeth of melancholy: if the spettle be citrine, yeolowish, or glassie, then the sicknesse commeth of cholar: if tawney or a reddish matterye coulour, the infirmitie commeth of bloud. The whitte spettle not knottie, signifieth health. The foamie or froathie spettle, a rawe stomacke. The gleerie spettle lyke cleere horne, slacke, rawe and slowe of digestion.

Trans.:

By a man’s sputum, one can discern various infirmities of the body. For instance, if the sputum is white and viscous, the illness arises from phlegm. If it is black, resembling the color of lead and sticky, the sickness comes from melancholy. If the sputum is citrine, yellowish, or glassy, the illness is due to bile. If it is tawny or reddish, the infirmity is

¹⁸⁷ Sputum is also known as phlegm; hence, the corresponding term for sputum is considered as phlegm in Jazzar’s book.

related to blood. Clear white sputum that is not thick signifies good health. Foamy or frothy sputum indicates a raw stomach. The gleaming sputum, resembling clear horn, is slack, raw, and slow to digest.

Zād al-Musāfir: Art. 3, Ch. 12: On Pleurisy and Pleuritis

وأكثر ما تتولد الشوصة عن الدم الخالص النقي، وربما كان تولدها عن الدم الحار المري أو الدم الغليظ السوداوي أو الدم الرطب البلغماني. وربما كانت من الأخلاط كلها أو جلها. وإنما يستدل على الخلط المولد لها من لون النفث. وذلك أن النفث إذا كان أحمر، دل على أن المادة من دم محض. وإن كان أصفر، دل على أن المرة الصفراء أغلب على مزاج الدم. وإذا كان أسود، دل على أن عليه الاحتراق على الدم، إما على بسيطة المرة الصفراء أو انتقالها إلى المرة السوداء. وإذا كان أبيض، دل على البلغم. وقد يعرض أيضا بين ذلك مع ما ذكرنا من أحوال العليل. وذلك أن المادة متى كانت دموية كان البدن ممتلئا والسعال رطبا والعطش قليلا. وإذا كانت المادة صفراوية كان البدن نحيفا والسعال يابسا والعطش قليلا. وإن كانت المادة سوداوية كان البدن نحيفا والنفض رقيقا ضامرا والبول رصاصيا. وإن كانت بلغمانية كان السعال رطبا غزيرا والعطش قليلا. وإن كانت المادة مركبة من الأخلاط كلها أو جلها، كان النفث مثلونا بألوان الأخلاط التي تركبت المادة منها، وكانت أحوال العليل أيضا كذلك.

Trans.:

Pleurisy most often originates from pure, clean blood, and sometimes it originates from hot, bitter blood or thick, melancholic blood or wet, phlegmatic blood. It might also be from all or most of the humors. The humor that generates it can be indicated by the color of the expectoration. If it is red, it indicates that the matter is from pure blood. If it is yellow, it indicates that yellow bile predominates the blood's temperament. If it is black, it indicates burning on the blood, either on the simple yellow bile or its transition to black bile. If it is white, it indicates phlegm. There may also occur between that with what we mentioned from the patient's conditions. When the matter is bloody, the body is full, the cough is moist, and the thirst is little. If the matter is bilious, the body is emaciated, the cough is dry, and the thirst is little. If the matter is melancholic, the body is thin, the pulse is fine and fading, and the urine is leaden. If it is phlegmatic, the cough is moist and abundant, and the thirst is little. If the matter is composed of all or most of the humors, the expectoration is colored with the colors of the humors that composed the matter, and the patient's conditions are also like that.

خالص (khālis): pure

نقي (naqī): clean

حار (hār): hot

غليظ (ghalīz): thick

سوداوي (sawdāwī): melancholic

بلغماني (bulghamānī): phlegmatic

الأخلاق (al-akhlāṭ): the humors

لون (lawn): color

نفث (nafth): expectoration

أحمر (aḥmar): red

محض (maḥḍ): pure

أصفر (ṣafr): yellow

صفراء (ṣafra): yellow bile

أسود (aswad): black

أبيض (abyad): white

بلغم (bulgham): phlegm

دموية (damawiyah): bloody

ممتلئ (mumtali'): full

رطب (raṭb): moist

صفراوية (ṣafrāwīyah): bilious

يابس (yābis): dry

رصاصي (raṣāṣī): leaden

الألوان (al-alwān): the colors

This commonality implies that the works in question depend on humoral theory. Sputum color as a diagnostic measure is referred to in both by Bartholomeus under Constantine's name and Ibn al-Jazzar. Red, yellow, black and white shades are connected with specific body fluids by each author; hence enabling them to identify the sources of different diseases. The similarities between their conclusions indicate a broader medieval cross-cultural exchange of information which demonstrates that humoral analysis was used by Christian and Islamic physicians to have insight into and cure several illnesses.

Finding 17

This particular section of the text depicting *De prop.*: Bk. 7, Ch. 49 and *Zād al-Musāfir*: Art. 4, Ch. 17, each concentrate on colic and point out that the intestine is probably located in the lower right part of the abdomen to the left side. Bartholomeus suggests that these may be as a result of seven things which includes stool becoming hard from excessive heat or blocked by thick and dry meals, gas trapped and abscesses and worms. Likewise, Ibn al-Jazzar identifies some sources for colic such as hot weather ,diet high in tannins, mucus accumulation, wind and parasitic infestation which all interrupt the normal process of bowel movement leading to severe pain in the stomach region.

De prop.: Bk. 7, Ch.: 49: *Detertura torment (On purging torment)*

Constantine sayth, That this passion is bread in a gutte, which is called Colon, that is to say, hollowe: that gut is the bum, and is in the right side of the neather wombe, be clipped as a girdle euen to the left side.

Trans.:

Constantine says that this condition originates in a gut called the colon, which means “hollow.”¹⁸⁸ This gut is located near the rectum and is on the right side of the lower abdomen, extending like a belt across to the left side.

Zād al-Musāfir: Art. 4, Ch. 17: On colic (Qoulanj)

لِابَابِ السَّابِعِ عَشَرَ فِي الْقَوْلَنْجِ أَمَّا الْقَوْلَنْجُ الْعَارِضُ لكَثِيرٍ مِنَ النَّاسِ، فَعِلَّةُ تَحْدُثُ فِي الْبَقَاءِ الْخَامِسِ الْمُسَمَّى قَوْلُونِ أَيْ الْأَجُوفِ . وَمَوْضِعُهُ مِنَ الْجَوْفِ مِمَّا يَلِي النَّاحِيَةَ الْيُمْنَى مِنْ أَسْفَلِ الْبِطْنِ، ثُمَّ يَسْتَدِيرُ كَالْمَنْطِقَةِ مُعْتَرِضًا إِلَى الْجَانِبِ الْأَيْسَرِ. وَإِنَّمَا سُمِّيَ هَذَا الدَّاءُ قَوْلَنْجًا بِاسْمِ الْعَضْوِ الَّذِي يَكُونُ فِيهِ. وَهُوَ مِنَ الْأَمْعَاءِ الْغَلَاظِ.

Trans.:

Colic, which affects many people, is a condition that occurs in the fifth organ called “qoulon,” which is the colon. Its location starts on the lower right side of the abdomen and spirals up towards the left side. This disease is named “qoulanj” after the organ where it originates, which is the colon. It is one of the parts of the intestines.

Regarding the causes of colic, another reference is given by Anglicus as follows:

And this passion hath seauen manner causes, as Constantine sayth. The first is firye heate and cholarike, meddeled with feauers, and drieng and dardning the moisture of durte, and letteth outpassing and deliuerance of durt¹⁸⁹. The seconde cause is thicknesse and greatnesse of dry and stopping meates, that let delyu•raunce and out passing of durt. The third is gleaming flume, letting and stopping the wayes of the neather deliuerance. The fourth is thicke and greate ventositie and Winde, meddeled with gleamie humours, stretching and haling the gutte. The fifth is a Postume bread in the gutte, letting frée out passing of durte. The sixt is multitude of short and broad wormes, and of long and rounde Wormes, that bée dead, and cleaue together in this gut, & may not haue passage to voide out therof. The seauenth is vnféeelingnesse of the got, that feeleth not the griefe of durte, neyther putteth it out.

¹⁸⁸ It is used in terms of “colon.”

¹⁸⁹ The Word, “durt / durte” translated as “dirt” is used in terms of “feces” in *Zād al-Musafir*.

Trans.:

Constantine says that this condition has seven causes. The first is fiery heat and choleric temperament, mixed with fevers, which dries and hardens the moisture of dirt, blocking the passage and release of dirt. The second cause is the thickness and bulk of dry and obstructive foods, which also hinder the release and passage of dirt. The third cause is thick phlegm, which blocks and obstructs the lower passageways. The fourth cause is dense and excessive wind mixed with thick humors, stretching and pulling at the gut. The fifth cause is an abscess formed in the gut, preventing the free passage of dirt. The sixth cause is an accumulation of dead, short, broad worms, and long, round worms, which cling together in the gut and cannot pass out. The seventh cause is the insensitivity of the gut, which does not feel the discomfort of dirt and therefore does not expel it.

Zād al-Musāfir: Art. 4, Ch. 17: On colic (Qoulanj)

أولها: أن تكثر الحرارة النارية الصفراوية على الزيل فتتشف رطوبته حتى يجف ويستحجر فيرتبك ويمتنع من الانحدار. والثاني: أن يكون الغذاء في نفسه قابضا جافا عاقلا للطبيعة. والثالث: أن يكون البلغم اللزج قد كثر في معاء القولون ولحج فيه، فسد طريقه ومنع الزيل من الانحدار. والرابع: أن يكثر تولد الرياح الغليظة في هذا المعاء، فإن كان هذا المعاء ضعيفا مستعدا لحدوث هذه العلة به، تولد القولنج إذا تولدت الرياح من أحد الأسباب التي ذكرنا لامتناع الزيل عن الانحدار أو باعتراض الرياح له في طريقه. والخامس: أن يحدث ورم في هذا المعاء فيمنع الزيل من النفوذ والتزول. والسادس: أن تكثر الحيات والديدان في البطن فتعترض وتلتف بالزيل، فتحدث القولنج. والسابع: أن يضعف حس الأمعاء فيفقد التأذي بالزيل، فيكون ذلك سببا لبقاء الزيل في المعاء واحتباسه فيه.

Trans.:

The first cause is that excessive yellow fiery heat acts on the feces, drying up its moisture until it hardens and becomes impacted, obstructing its passage downward. The second cause is that the food itself is astringent, dry, and contrary to natural function. The third cause is that thick phlegm has increased in the colon and obstructed it, thus blocking the passage and preventing the feces from descending. The fourth cause is the excessive generation of thick gases in this intestine. If this intestine is weak and predisposed to this condition, colic will occur if gases are generated from any of the

mentioned causes, preventing the feces from descending or obstructing the gas in its path. The fifth cause is the occurrence of a tumor in this intestine that prevents the feces from passing through and moving. The sixth cause is the increase of worms and parasites in the abdomen, which obstruct and entangle the feces, resulting in colic. The seventh cause is the weakening of the sensitivity of the intestines, leading to a lack of response to the feces, which causes it to remain in the intestine and become trapped.

Regarding the symptoms of this ailment which are identical as given in *Zād al-Musāfir* in the latter part of the same chapter, Anglicus continues as follows;

This passion, of what cause so euer it come, grieueth and tormenteth the body grievously, & hath generall and proper accidents: For generally therewith commeth spuing, abhomination and wambling, fretting, and gnawing, passing ach and sore in that side of the wombe, and hardnesse of the wombe. And if it commeth of hot cause, it séemeth that the wombe is sticked & pricked with néedles...

And if it come of winde and ventositie, the ach stretcheth and spreadeth, and chaungeth place with grinding and swelling. If it commeth of a Postume¹⁹⁰, there is heate with ach, and Feauers with thirst and... If it commeth of Wormes, there is torment and ach and abhomination. And sometime he casteth out wormes at the mouth.

Trans.:

This condition, whatever its cause may be, severely afflicts and torments the body, with both general and specific symptoms. Generally, it causes vomiting, nausea, rumbling, gnawing pain, severe aching and soreness on one side of the abdomen, and hardness of the abdomen. If it arises from a hot cause, it feels as though the abdomen is being pricked with needles...

If caused by wind and gas, the pain stretches, spreads, and shifts location, accompanied by grinding and bloating. If it is due to an abscess, there is heat with the pain, along with

¹⁹⁰ The term “postume” is used in terms of “swelling/abscess” in the Arabic text.

fevers, thirst, and... If worms are the cause, there is torment, pain, and nausea, and sometimes worms are expelled from the mouth.

Zād al-Musāfir: Art. 4, Ch. 17: On colic (Qoulanj)

ولهذه العلة (أعراض عامة تعمها من أي صنف عرضت، ولها) أعراض خاصة تابعة لهذه الأسباب السبعة الحسية المتولد عنها هذا الداء. فأما الأعراض العامة: فالقي المتتابع والغثيان والوجع الشديد الشبيه بالإلتواء، حتى يأخذ مكانا كبيرا من البطن. وربما اشتد بهم الوجع في الخاصرتين والجنبين واحتباس البطن إلى أن تجوز العلة، ثلاثة أيام....

ومتى تولد القولنج من المرة الصفراء، فالدليل على ذلك: دوام العطش في المرة الصفراء ووحدة الوجع وشدة حتى يجد العليل كأن بطنه ينخس بالإبر...

ومتى كان تولد القولنج من الورم فالدليل ظاهر بالعيان يدرك باللمس لأنه متى عرض ورم في هذا المعاء، ظهر إلى خارج عند مرق البطن. فمتى كان الورم تحت اليد حارا وكان لونه أحمر ووجد العليل حمى وعطشا واللسان مع وجع شديد، فذلك دليل أن الورم حار ملتهب.

ومتى كان تولد القولنج من قبل الدود والحيات، وجد العليل مغصا وتقطيعا ولذعا، وربما (تقيأ) الدود والحيات من فيه.

Trans.:

For this ailment (colic), which may manifest with general symptoms common to any type of ailment, and also has specific symptoms related to these seven sensory causes that give rise to this disease. As for the general symptoms, there is continuous vomiting, nausea, and severe pain resembling colic, which can occupy a large portion of the abdomen. Sometimes, the pain intensifies in the flanks, and the sides with abdominal distension persist for up to three days...

When colic is induced by thick winds, the evidence includes the pain moving from one place to another in the abdomen, gurgling sounds, and bloating...

When colic arises from swelling, the evidence is visible and can be felt through touch. If there's a protrusion in the lower abdomen, it's a clear indication of a swelling that has come out. If the swelling feels hot to the touch, has a red color, and the patient experiences fever, thirst, and severe pain, it indicates an inflamed and hot swelling.

When colic results from intestinal worms and roundworms¹⁹¹, the patient experiences cramps, cutting pain, and stinging sensations. Sometimes, the patient may vomit intestinal worms and roundworms.

القولنج (qoulanj): colic

قولون (qoulon): colon

الأجوف (al-ajawf): hollow

الأمعاء (al-am'aa): intestines

الغلاظ (al-ghilaz): thick

البقاء الخامس (al-baqa' al-khamis): fifth organ

الناحية اليمنى (al-nahiyah al-yumna): right side

أسفل البطن (asfal al-batn): lower abdomen

المنطقة (al-mintaqah): belt/region

الحرارة النارية (al-hararah al-nariyah) : fiery heat

الصفراوية (al-safrawiyah): choleric temperament

الزبل (al-zibil): dirt/feces

الغذاء القابض (al-ghitha' al-qabidh): astringent food

جاف (jaf): dry

البلغم اللزج (al-balgham al-lazij): thick phlegm

¹⁹¹ Intestinal worms (الدود: dūd) and roundworms (الحيات: ḥayyāt). Ullman, W. (2002). Wörterbuchzudengriechisch-arabischen Übersetzungen, p.141, as cited in Bos, G. & Käs, F. (2023). *Ibn al Jazzar Zād al musafir bks 1 2*. p.42.

رياح غليظة (riyah ghaliza): thick gases

ورم (waram): tumor

الحيات (al-hayyat): worms/parasites

ديدان (didan): worms

الأمعاء الضعيفة (al-am'aa al-da'ifah): weak intestines

الغثيان (al-ghathayan): nausea

القيء المتتابع (al-qay' al-mutataabi'): continuous vomiting

التقيؤ (al-taqayu'): vomiting

التواء (iltiwa'): colic-like pain

تقطع (taqti'): cutting pain

الجانبين (al-janibayn): flanks

انتفاخ البطن (intifakh al-batn): abdominal bloating

العطش (al-atash): thirst

الإبر (al-ibar): needles

حمى (humma): fever

Both accounts, despite varied presentations, show an important consensus about the causes of colic which are all related to colon blockages and imbalances caused by hard feces, phlegm as well as parasites that lead to hindrance of free movement of waste materials. Both texts stress on the need for getting rid of such roadblocks and highlight parallel approaches - with identical or highly similar expressions - that may be used in

reducing pain and improving digestive functions. These similar observations display common medical standpoint on how colic should be best handled with emphasis on re-establishing proper gut flow and treating underlying humoral disorders.

Finding 18

According to Bartholomeus' *De Prop.*, Bk. 18, Ch. 27 (citing Constantine) and Ibn al-Jazzar's *Zād al-Musāfir*: Art. 7, Ch.13; the natural state of a dog is attributed to its cold and dry temperament which is ruled by black bile. In every description, this humour can disintegrate to the degree that it provokes madness or rabies that are commonly seen in the fall harvest/autumn or spring. The two descriptions exhibit an identical set of signs for a rabid dog: wandering aimlessly as if it was drunk; rebuffing known places and people; frothing at the mouth while drooling in addition to both texts mentioning similar physical symptoms - rolled back eyes, flat ears and tucked tail - as well as reflecting a confused dog that has attacked anything even its own shadow.

De prop.: Bk. 18, Ch. 27: De alijs proprietatibus canum (On the Other Properties of Dogs)

...an hound is kindly cold and dry, and blacke. Cholera hath mastrie in him. And if Cholera be much rotted and corrupt, it maketh the hound madde. And this falleth most in haruest and in springing time. And other hounds flye and voyde the madde hound; as pestilence and venim: and he is alway exiled; as it were an outlawe, and goeth alone wagging and rowling as a dronken beast, and runneth yaning, & his tongue hangeth out, and his mouth driueleth and foameth, and his eyen vs euertourned and reared, & his eares lie backward, and his faile is wrickled by the legges and thighes: and though his eyen bée open, yet hée stumbleth and spurneth against all thing, and barketh at his owne shadow.

Trans.:

...a dog's natural temperament is cold and dry, with black bile (melancholy) dominating its constitution. When this black bile becomes excessively decayed and corrupted, it causes the dog to become mad. This condition occurs most frequently during the harvest

and springtime. Other dogs avoid and flee from the mad dog, as one would from a pestilence or venom. The mad dog is always shunned, like an outlaw, wandering alone, staggering and rolling like a drunken animal, running and gaping, with its tongue hanging out, mouth drooling and foaming. Its eyes are rolled back, ears flattened, and tail curled between its legs and thighs. Even with its eyes open, it stumbles and collides with everything and barks at its own shadow.

Zād al-Musāfir: Art. 7, Ch. 13: On dogs / rabies

الكلب في طبيعه بارد يابس، الغالب عليه المرة السوداء، فلا فراط هذا الكيموس السوداء فيهم ولغلبته عليهم يتعفن ويعم فسادهم جميع أجسادهم، فيخرجهم ذلك إلى الكلب. وأكثر ما يعرض لها ذلك في الخريف والربيع. فأما الدلائل التي يعرف بها الكلب، فهو أن يرى الكلب قد أنكر صاحبه وهام على وجهه، فلا يأوي إلى الموضع الذي كان يأوي إليه، وتراه هائما كالسكران، مفتوح الفم مرخي اللسان، ويسيل من فمه بلغم كثير، وتتقلب عيناه وتحمر، وتسترخى أذناه، ويدخل ذنبه بين فخذه، ويرى مفتوح العينين لا يفرق بين ما يصادف من الحجارة والناس، ويهارش كل شيء يستقبله حتى يهارش ظله ويخاطفه من الحيوان.

Trans.:

A dog in its nature is cold and dry, dominated by black bile, and due to the excess of this melancholic humor in them and its dominance over them, it decays and its corruption spreads throughout their bodies, leading them to rabies. This most often occurs in autumn and spring. As for the signs by which a rabid dog is recognized, it is that the dog no longer recognizes its owner and wanders aimlessly, not returning to the place it used to frequent. You see it wandering like a drunk, with an open mouth and a drooping tongue, and thick saliva flowing from its mouth. Its eyes roll and turn red, its ears become relaxed, its tail tucks between its thighs, and it is seen with open eyes, unable to distinguish between stones and people. It attacks everything it encounters, even its own shadow, and lunges at walls.

الكلب (al-kalb): dog

بارد يابس (barid yabis): cold and dry

المرّة السوداء (al-murra as-sawda): black bile (melancholy)

فساد (fasad): corruption/decay

الكلب (al-kalb): madness/rabies

الخريف (al-kharif): autumn

الربيع (ar-rabi'): spring

هام (ham): wandered aimlessly

كالسكران (kal-sukran): like a drunk

مرخي اللسان (murkhi al-lisan): drooping tongue

يسيل (yasil): flows

بلغم (balgham): thick saliva

تتقلب عيناه (tataqallab 'aynahu): eyes roll

تحمر (tahmaru): turn red

تسترخي أذناه (tastarkhi uthnuhu): ears become relaxed/flattened

يدخل ذنبه بين فخذه (yadkhul dhanabahu bayna fakhidhayh): tail tucks between thighs

مفتوح العينين (maftuh al-'aynayn): open eyes

يهارش (yuharish): attacks

The description of rabies in dogs has a similar understanding about the humoral origin of the disease, clinical indications and seasonal prevalence. Both writers also point out that spoiled black bile is mainly responsible for mad dog syndrome. The symptom profiles - abnormal gait, excessive salivation, loss of recognition and attacking anything in its path - also highlight how this illness is similarly depicted in both texts. In

conclusion, these common findings support one diagnostic approach to rabies, which emphasizes the interaction between imbalance of fluids and visible signs of physicality and behavior.

Finding 19

In this finding, both Bartholomeus, in *De prop.*: Bk. 18, Ch. 88 (citing Constantinus Africanus), and Ibn al-Jazzar, in *Zād al-Musāfir*: Art. 1, Ch. 8, attribute lice and nits to tainted humors lodging beneath the skin. In Bartholomeus' passage, different remedies are prescribed depending on whether the infestation arises from hot or cold humors: mercury with willow or lead ash for the former, and Staphisagria or Auripigmentum for the latter - always blended with oil and vinegar (or salt water). Ibn al-Jazzar similarly tailors treatment to the individual's humor, advocating mercury ointments or combining hellebore, verdigris, and arsenic for cold-based cases, and underscoring the importance of rinsing with salt or seawater to eradicate lice.

De prop.: Bk. 18, Ch. 88: *De pediculo (On lice)*

...lice and nits gender in the head or in the skinne, and come of purgations, which kinde casteth out, and maketh them fast betwéene the flesh and skinne vpon that place. ...quicke Siluer with ashes of willowes, slayeth them, & namely if they be gendred of hot humour, & so doth Lead burnt with oyle and vineger, & if they be gendred of cold humour, then helpeth Staphisagra & Auripigmentum, with oyle and vineger, & so doth sea water, and water of salt Welles.

Trans.:

...lice and nits often form in the head or skin and originate from bodily purgations, which expel and trap them between the flesh and skin at those places. ...quicksilver mixed with willow ashes kills them, especially if they are generated from hot humor. Burnt lead mixed with oil and vinegar has a similar effect. If they are generated from cold humor, Staphisagria and Auripigmentum mixed with oil and vinegar are effective, as is seawater and water from salt wells.

Zad al-Musāfir: Art. 1, Ch. 8: On lice that originate in the head

وقد يكثر القمل والصبيان في الرأس وسائر الجسد، ويكون ذلك قبل خلط عفن ترفعه الطبيعة من الجلد واللحم. فإن كان تولد القمل في رأس ذي مزاج حار فينبغي أن يطفى الرأس بالزئبق بعد أن يمات برماد البلوط وبالخل والزيت، أو يخلط الزئبق والمرداسنج بالخل والزيت، وسائر الجسد. فإن كان تولد القمل في رأس ذي مزاج بارد فينبغي أن يؤخذ من حب الرأس وبورق وزرنيخ من كل واحد جزء، يسحق ذلك ويخلط بدهن وخل ويدهن به الرأس. أو يؤخذ خربق أبيض وحب الرأس ونطرون من كل واحد جزء، يدق ويسحق بدهن ويتمرخ به في الحمام ويدمن غسل الرأس بالماء المالح وبماء البحر فإنه يهلك القمل، فإن تعذر ماء البحر فخذ ملحاً يصب عليه ماء وشيء من خل ويمرخ به البدن.

Trans.:

Lice and nits may abound in the head and the rest of the body, and this may occur before the decaying matter, which is naturally lifted from the skin and flesh by the body. If lice appear on the head of someone with a hot temperament, it is advisable to apply mercury to the head after it has been killed with oak ash, vinegar, and oil. Alternatively, mercury and mardasang may be mixed with vinegar and oil and applied to the head and the rest of the body. If lice appear on the head of someone with a cold temperament, one should take equal parts of head lice, verdigris, and arsenic, grind them, and mix them with oil and vinegar, then apply this mixture to the head. Alternatively, one may take white hellebore, head lice, and natron in equal parts, grind and crush them with oil, then apply it in the bath. It is beneficial to wash the head regularly with salty water or seawater, as it will eliminate the lice. If seawater is unavailable, take salt, pour water over it, and add some vinegar, then rub this mixture over the body.

قمل (qamal): lice

صبيان (sayban): nits

الرأس (al-ra's): head

الجسد (al-jasad): body

خلط عفن (khalat 'afin): decaying matter

مزاج حار (mizaj har): hot humor

الزئبق (az-zu'baq): mercury/quicksilver

رماد البلوط (ramad al-balut): oak ash

خل (khal): vinegar

زيت (zayt): oil

المرداسنج (al-mardasang): mardasang

مزاج بارد (mizaj barid): cold humor

حب الرأس (habb al-ra's): head lice

بورق (buraq): verdigris

زرنikh (zarnikh): arsenic / auripigmentum (orpiment)

خربق أبيض (kharbaq abyad): white hellebore

نطرون (natron): natron

ماء مالح (ma' malih): salty water

ماء البحر (ma' al-bahr): seawater

ملح (milh): salt

Ultimately, the above texts are in agreement that lice result from rotten material and are dependent on the patient's prevailing bodily state of humors where it leans towards "hot" or "cold". They have similar solutions in applying strong amalgams (e.g. mercury, hellebore, or arsenic) with oil, vinegar or mineral salts to kill lice and nits. Both Bartholomeus and Ibn al-Jazzar relate specific cures to humor diagnoses, which is

a common characteristic found among all these writers: focus on the cause (hot/cold), cleanse with salt/saltwater so as to ensure a thorough cure against lice infestation.

Finding 20

In this finding, both Bartholomeus' *De prop.*: Bk. 6, Ch. 25 and Al-Majusi's *Kitab al-Maliki*: Vol. 1, Disc. 5, Ch. 35 highlight the role of moderate brain moisture and rising vapors in initiating sleep. Bartholomeus likens "kindly sleep" to a moist, clear smoke ascending to the brain, thickening the spirits and dulling the nerves. *Kitab al-Maliki* similarly attributes natural sleep to "pure, good, and clear moist vapors" traveling from the body to the brain, which foster drowsiness after a meal. Both texts thus emphasize that a balanced, temperate moisture within the brain is key to restful slumber.

De prop.: Bk. 6, Ch. 25: *Of sleepe (On sleep)*

...some sléepe is kindly, & some vnkindly: but thereof we shal speak nothing at this time. Kindly sléepe commeth of temperate moysture of the braine, as of smoake that is moyst and cléere, that commeth from all the bodye vp to the brayne, and that smoake thicketh the spirites, and •lleth the sinewes, and so bindeth the wits.

Trans.:

Some sleep is kind, and some unkind; but we shall speak of nothing regarding that at this time. Kind sleep comes from the temperate moisture of the brain, like smoke that is moist and clear, which rises from all the body up to the brain. This smoke thickens the spirits, weakens the nerves, and thus binds the wits.

Kitab al-Maliki: Vol. 1: Disc. 5, Ch. 35: *On the description of the action of sleep and wakefulness in the body*

فالنوم الطبيعى يكون من رطوبة الدماغ المعتدلة و تراقى بخارات رطوبة جيدة صافية من البدن إلى الدماغ، و لذلك صار إذا تناولنا الغذاء و تراقى بخاراته الرطوبة إلى الدماغ أحدث لنا كسلًا و نعاسًا، و طلبنا النوم فى ذلك الوقت.

Trans.:

Natural sleep results from a moderate moisture in the brain, and the rising of pure, good, and clear moist vapors from the body to the brain. Therefore, when we consume food and its moist vapors rise to the brain, it causes laziness and drowsiness, prompting the desire to sleep at that time.

نوم (nawm): sleep

طبيعي (ṭabī‘ī): natural

غير طبيعي (ghayr ṭabī‘ī): unnatural

رطوبة (ruṭūba): moisture

دماغ (dimāgh): brain

بخار (bukhār): vapor/smoke

أرواح (arwāḥ): spirits

أعصاب (a‘ṣāb): nerves

عقل (‘uqūl): intellect/mind

بخارات (bukharāt): vapors

صافية (ṣāfiya): clear/pure

كسل (kasal): laziness

نعاس (nu‘ās): drowsiness

الغذاء (al-ghidhā’): food

Both descriptions of “kindly sleep” in Bartholomeus passage and “natural sleep” in *Kitab al-Maliki*, while presented under different cultural and contextual backgrounds, share the idea that moderate water content in a brain due to the smooth and mild vapor

rising from one's body is essential for rest. Every account expounds on how these vapors give denseness to their souls as well as reduce nerve activity; hence indicating that it is important to have an appropriate flow of moisture for a healthy sleep. This perspective not only mirrors the humoral theories that were prevalent during medieval times but also demonstrates lasting agreement on the physiological basis of a phenomenon so crucial for human life.

Finding 21

The pulse examined in *De Prop.* Bk. 3, Ch.23 is categorized by the author into ten types based on factors such as size, velocity, power, temperature and regularity. Comparing these findings with similar descriptions in *Kitab al-Maliki* suggests that medieval scholars from both Latin Europe and the Islamic world followed a very similar framework for analyzing arterial rhythms. A parallel account supplements these observations by pointing out that both works agree that frequency, amplitude, heat, fullness and rhythmic patterns express deeper physiological realities – primarily innate heat, the vital spirit of the body and elasticity of arterial walls. However, dryness or wetness within them as well as expansion versus contraction were seen as important indicators of health or disease during this time period because their interplay was believed to widely reflect sound or unhealthy conditions in the internal organs.

De prop.: Bk 3; Ch. 23: Of the pulses (On the pulses)

Touching this, it is to wit, as Constantions saith, that there bée many manner of diuersities of pulses, the which be referred or redused to ten. The first is knowne by length & bredth of quantitie: and this is in thrée manner wayes. One is a greate pulse, when he spreadeth in length and breadth, and déepnesse of the vaine. And this pulse great and strong commeth of the strength of the spirit: by the which the pulse is spread abroad, and néedeth to bée kéeled of the softnesse of the limmes, that is, seruing to the spreading abroad. Also some pulse is litle, slow & straight, when it returneth to the middle, that is inward toward the heart: And that is for default of vertue, and for scarcitie of heate. And some is temperate, when it draweth not to the middle, neither to the vtter sides: This temperature commeth of more bloud & lesse water.

Also the pulse is knowne by the time of mouing, and so he is called swift, slow, and meane: hée is called swift because he moueth oft in short time, and that commeth of strong heate & vertue. And slowe, for that he moueth and smiteth field in long time, & that cōmeth of defalt of vertue & slacknes of heat: the meane betwéen this is praised. In the third manner, the pulse is knowne by the strength of ye vertue. And touching that he is strong, féeble, and meane. It is strong when it seemeth that by strength it putteth away from it, the finger that toucheth it. And that commeth of the strength of vertue and of the softnesse of the limme that easily moueth. He is féeble when he smiteth féebly the finger: and commeth of féeblenesse of strength, and of hardnesse of the limme that is repugnant. The meane is temperate betwéene those two. In the fourth manner he is known by the disposition of the lim. And then he is called hard and soft, & meane. It is hard when it séemeth that he withstandeth with a manner sharpnesse & hardnesse. And that commeth of the drinesse of the vesselles thereof. It is soft when the fingers feele it with a great slownesse of mouing; so that it seemeth yt they pearce it. And that commeth of wet and moisture. The meane betwéene these two is temperate. In the fift manner he is knowne by fulnesse & meane voidnesse. It is full when it séemeth to abound in moysture. And that commeth of greate repletion of bloud and of spirit. He is voide when he séemeth to be swollen, but yet when it is touched, the fingers sinke in, as it were in a voide thing. The meane betwéene these two is temperate. In the sixt manner, the pulse is knowne by the qualitie of the vaines, and so he is departed into hot, colde, and meane. He is hot, when the fingers feele the substance of vaines hot. And that commeth of the hot matter that is therein, that is of the winde and hot bloud. The cold pulse is vnderstood in a contrary manner. The meane betwéene these two is temperate. In the seuenth manner, he is known by working and resting; and so he is departed in thicke, thin, and meane. He is thick, that in his opening smiteth oft the fingers ends, and sodeinly goeth awaie. And this commeth of strength of heate and default of vertue. The strength of heat séeketh remedie of colde and of kéeling: the default of vertue, when it may not once nor twice, nor thrice, then he trauayleth in appetite of succour. The thinne pulse commeth of the contrarie cause, that is to wit, of slownes of heate, & of strength of vertue. The meane betwéen these two is temperate. These seauen manner pulses be notable and easier to know then the other. Of the other thrée pulses, the first is departed, and that one parte is called Pondus Laudabile, and the other Non Laudabile. The second is departed, that one part properly Concors, or according, and that other is equall. And the third is departed by lesse discontenting. And so that one parte is said to bée ordinate, and that other not ordinate. And for the most skilfull Phisitions may scarcely knowe these thrée pulses, therefore we leaue them and passe forth.

Trans.:

On this matter, as Constantinus explains, there are many kinds of pulses, which are categorized into ten groups. The first is identified by length and width of quantity, and it can be of three types. One is a large pulse, which spreads in length, width, and depth of the vein. This large and strong pulse results from the vitality of the spirit, which causes the pulse to spread outward, requiring the softness of the limbs to accommodate the expansion. Another type is a small, slow, and narrow pulse, which moves inward toward the heart. This occurs due to a lack of strength and insufficient heat. There is also a temperate pulse, which neither moves inward nor spreads outward excessively. This balance arises from an abundance of blood and less water.

The pulse is also known by the time of its movement. It can be fast, slow, or moderate. A fast pulse moves frequently in a short time due to strong heat and vitality. A slow pulse moves more sluggishly and is felt less often, which stems from a lack of strength and low heat. A moderate pulse, which falls between these extremes, is considered ideal.

The strength of the pulse is another factor. It can be strong, weak, or moderate. A strong pulse feels as though it pushes the finger away when touched, indicating robust vitality and the softness of the limb that allows easy movement. A weak pulse feels faint and barely presses against the finger, resulting from feeble strength and the hardness of the limb, which resists motion. The moderate pulse balances these two extremes.

The pulse can also be categorized by the texture of the limb it is felt in. It can be hard, soft, or moderate. A hard pulse resists touch and feels sharp and firm due to the dryness of the vessels. A soft pulse is gentle to the touch and slow in movement, indicating moisture. The moderate pulse is a balance between these

The fullness or emptiness of the pulse is another characteristic. A full pulse feels abundant and moist, indicating an excess of blood and spirit. An empty pulse feels swollen but collapses when pressed, suggesting a lack of substance. A moderate pulse balances these two.

The temperature of the veins also plays a role in identifying the pulse. It can feel hot, cold, or moderate. A hot pulse feels warm to the touch due to heated blood and air in the veins. A cold pulse feels the opposite, indicating a lack of heat. A moderate pulse is balanced in temperature.

The rhythm of the pulse can also differ. It can be thick, thin, or moderate. A thick pulse strikes the fingers frequently and quickly, caused by excessive heat and weak vitality. A thin pulse is slower and less pronounced, resulting from low heat and strong vitality. The moderate pulse is balanced.

These seven types of pulses are the most notable and easier to identify. Beyond these, there are three additional types: one that is divided into acceptable (laudable) and unacceptable (non-laudable), another that is classified as harmonious (concordant) or equal, and the third, which is categorized as orderly (ordinate) or disorderly (non-ordinate).

Kitab al-Maliki: Disc. 7; Ch.3: On the types of pulse, characteristics, and categories

Regarding the types of pulse, Al-Majusi gives 10 different types¹⁹² as well as follows;

إن أحوال النبض تختلف اختلافاً كثيراً بحسب اختلاف القوة المحركة وبحسب اختلاف الحرارة الغريزية وبحسب اختلاف أحوال الشريان وما يحتوي عليه من الدم والروح إن كانت هذه على الطبع أو خارجة عن الطبع. وقد حضرت الأوائل أجناس اختلاف هذه الأحوال في عشرة أجناس: أحدها الجنس المأخوذ من مقدار الانبساط، والثاني المأخوذ من زمان الحركة، والثالث المأخوذ من مقدار القوة، والرابع من قوام محرم الشريان، والخامس عما يحتوي عليه يوم الشريان، والسادس من كيفية حرم الشريان، والسابع من وقت السكون، والثامن من زمان الحركات والفترات، والتاسع من خاصية الحكمية، والعاشر من عدد نبضات العرق.

¹⁹² Although Al-Majusi's knowledge seems to root back to Galen, who also mentions 10 types of pulse. the order of the types given in *De Proprietatibus Rerum* and *Kitab al-Maliki* are identical unlike Galen's. Galen's type orders are; 1- time of motion; 2- extent of diastole; 3- tonus or vital strength; 4- consistency of the body of the artery; 5- contents of the arterial lumen; 6- quality of heat in the artery; 7- time of rest; 8- rhythm; 9- equality or inequality; 10- regular or irregular. See Johnston, I., & Papavramidou, N. (2024). Galen on the pulses: Medico-historical analysis, textual tradition, translation. In A. Touwaide (Ed.), *Medicine in the Medieval Mediterranean* (Vol. 10), p.27.

Trans.:

The conditions of the pulse vary greatly depending on the variations in the moving force, the innate heat, and the state of the artery and its contents of blood and spirit, whether these are in their natural state or outside it. The ancients have identified the types of these condition variations in ten types: the first type is taken from the amount of pulsation (extent of dilation), the second from the time of movement, the third from the degree of force, the fourth from the consistency of the artery wall, the fifth from what the artery contains on the day, the sixth from the quality of the artery wall, the seventh from the time of rest (diastole), the eighth from the duration of movements and intervals, the ninth from the characteristic of regularity, and the tenth from the number of artery pulses.

Regarding the first type here what Al-Majusi mentions are as follows.

The first type:

أما الجنس المأخوذ من مقدار الانبساط فينقسم إلى النبض العظيم والصغير والمعتدل وإلى النبض المقصير والطويل والمعتدل وإلى النبض العريض والدقيق والمعتدل وإلى الشاخص والغائر والمعتدل

Trans.:

As for the type derived from the extent of dilation, it is divided into the large pulse, the small pulse, and the moderate pulse; into the short pulse, the long pulse, and the moderate pulse; into the wide pulse, the narrow pulse, and the moderate pulse; into the protruding pulse, the recessed pulse, and the moderate pulse.

The second type:

أما الجنس المأخوذ من زمان الحركة فيقسم إلى النبض السريع والبطيء والمعتدل والنبض السريع هو الذي يقطع مسافة بعيدة في زمان قصير والنبض البطيء هو الذي يقطع مسافة قريبة في زمان طويل والنبض المعتدل، والذي يكون في هاتين الحالتين متوسطا وكل واحد من أصناف هذا الجنس يكون عن سببين أحدهما القوة والآخر المزاج فالنبض السريع يكون عن قوة صحة وعن حرارة قوية تدعو إلى استجلاب الهواء البارد والبطيء يكون عن ضعف القوة المحركة ومن نقصان الحرارة وأما النبض المعتدل يكون من اعتدال هذه الأسباب.

Trans.:

As for the type derived from the time of movement, it is divided into the rapid pulse, the slow pulse, and the moderate pulse. The rapid pulse is one that covers a long distance in a short time, the slow pulse covers a short distance in a long time, and the moderate pulse is intermediate between these two states. Each type of this category results from two factors: one is vitality and the other is temperament. The rapid pulse results from strong vitality and intense heat that prompts the drawing in of cool air, the slow pulse results from weak motive power and a reduction in heat, and the moderate pulse arises from a balance of these causes.

The third type:

وأما الجنس المأخوذ من مقدار القوة فينقسم إلى النبض القوي والضعيف والمعتدل والنبض القوي هو الذي يقرع الأنامل بقوة حتى يكاد يدفعها والنبض الضعيف هو الذي يقرع الأنامل قرعا فيقال بغير قوة والنبض المعتدل هو الذي يكون فيما بين هاتين الحالتين وكل واحد من أصناف هذا الجنس يكون عن بين فالنبض القوي يكون من صحة القوى وشدهم أو من لين جدران الشرايين ومواتاتها والضعيف يكون عن ضعف القوة وقلة، واتساع الشريان والمعتدل يكون عن اعتدال هذين السببين

Trans.:

As for the type derived from the degree of force, it is divided into the strong pulse, the weak pulse, and the moderate pulse. The strong pulse is one that beats the fingers strongly, almost pushing them away. The weak pulse is one that taps the fingers lightly, said to be without strength. The moderate pulse is one that lies between these two conditions. Each type in this category arises from different causes: the strong pulse arises from the robustness and intensity of the forces or from the softness and suitability of the arterial walls, the weak pulse arises from the weakness of the driving force and the thinness of the artery, and the moderate pulse arises from a balance between these causes.

The fourth type:

وأما الجنس المأخوذ من قوام حرم الشريان فينقسم إلى النبض الممتلئ والنبض الفارغ وإلى المعتدل بين هذين. فأما النبض الممتلئ فهو الذي يتبين تحت الأنامل كأنه مملوء رطوبة، وأما النبض الفارغ فهو الذي يتبين تحت الأنامل كأن تجويف منه، وأما النبض المعتدل فهو الذي لا يتميز بشكل واضح بين هذين

Trans.:

As for the type taken from the consistency of the arterial wall, it divides into the full pulse, the empty pulse, and the moderate between these two. The full pulse is apparent under the fingers as if filled with moisture, the empty pulse appears under the fingers as if it were a cavity, and the moderate pulse does not distinctly differentiate between these two.

The fifth type:

وأما الجنس المأخوذ من ما يحتوي عليه جرم الشريان فينقسم إلى النبض الممتلئ والفارغ وإلى المعتدل بين هذين، فأما النبض الممتلئ فهو الذي يتبين تحت الأنامل كأنه مملوء رطوبة، والنبض الفارغ هو الذي يتبين تحت الأنامل كأنه تجويف فارغ، وإذا كبسته الأنامل أحست بأنها تغوص في شيء فارغ. والنبض الممتلئ يكون من امتلاء الشريان من الدم والروح وكثرتهما، والفارغ يكون من قلة الدم والروح، والمعتدل يكون من اعتدال هذين.

Trans.:

As for the type derived from what the arterial wall contains, it is divided into the full pulse, the empty pulse, and the moderate pulse between these two. The full pulse is one that is felt under the fingers as if it is filled with moisture. The empty pulse is felt under the fingers as if it is an empty cavity, and when the fingers press down, they feel as though they are sinking into something hollow. The full pulse results from the artery being filled with an abundance of blood and spirit, while the empty pulse is due to a lack of blood and spirit. The moderate pulse arises from a balance between these two conditions.¹⁹³

¹⁹³ The fourth and the fifth types sound similar; however they are different in their focus. While the fourth type focuses on the physical structure or consistency of the artery wall, the fifth type focuses on what fills the artery wall.

The sixth type:

وأما الجنس المأخوذ من كيفية جرم العرق أعني الشريان فينقسم إلى النبط الحار وإلى النبط البارد والنبط المعتدل. فالنبط الحار هو الذي تحس فيه الأنامل بسخونة حرم الشريان، وكذلك النبط البارد يحس منه ببرودة، والنبط المعتدل هو الذي لا تحس فيه الأنامل من الشريان لا بحرارة ولا ببرودة ظاهرة. وحرارة جرم الشريان تكون من حرارة المادة المصبوبة في تجويفه أعني الدم والروح، وبرودته تكون من برودة المادة المصبوبة فيهما، واعتداله يكون من اعتدالهما.

Trans.:

As for the type derived from the condition of the arterial wall, it is divided into the hot pulse, the cold pulse, and the moderate pulse. The hot pulse is one where the fingertips sense warmth in the arterial wall, while the cold pulse is felt as coolness. The moderate pulse is one where the fingertips do not perceive any apparent heat or coldness from the artery. The warmth of the arterial wall comes from the heat of the material poured into its cavity, namely the blood and spirit, while its coolness results from the coldness of the material poured into them. Its moderation arises from the balance between these qualities.

The seventh type:

وأما الجنس المأخوذ من وقت السكون فينقسم إلى المتواتر والمتفاوت والمعتدل، وذلك أن جالينوس ذكر أن للنبط عند الانقباض والانقباض سكونين: أحدهما السكون الذي يكون في وقت الانقباض عند فرع الشريان على الأنامل ويقال له السكون الخارج، وهذا السكون يدرك جسًا، والثاني السكون الذي يكون في وقت الانقباض عند رجوع الشريان إلى المركز، وهذا لا يدرك جسًا. والنبط الذي يكون زمان سكونه قصيرًا هو المتواتر، والنبط الذي يكون زمان سكونه طويلًا هو المتفاوت، والذي يكون زمان سكونه متوسطًا يقال له المعتدل بين المتواتر والمتفاوت. والمتواتر يكون عن قوة الحرارة وإفراطها حتى يحتاج إلى ترويح كثير، وعن نقصان القوة حتى تحتاج الطبيعة معه إلى استعمال التواتر بقدر ما يحتاج إليه من دخول الهواء. والمتفاوت يكون من ضعف الحرارة وقلتها وشدة القوة، والمعتدل فيما بينهما يكون من اعتدال المزاج والقوة.

Trans.:

As for the type derived from the duration of rest, it is divided into the frequent (mutawatar), the irregular (mutafawit), and the moderate.¹⁹⁴ Galen mentioned that during pulsation, there are two periods of rest: one is the rest that occurs during expansion when the artery spreads over the fingertips, referred to as external rest, which can be perceived by touch; the second is the rest that occurs during contraction when the artery returns to the center, which cannot be perceived by touch. The pulse with a short duration of rest is called frequent, the pulse with a long duration of rest is called irregular, and the pulse with an intermediate duration of rest is called moderate, lying between the frequent and the irregular. The frequent pulse results from strong heat and its excess, which requires frequent ventilation, or from a deficiency in strength that causes nature to resort to frequency to allow sufficient air intake. The irregular pulse results from weak or insufficient heat combined with intense strength. The moderate pulse, lying between these two, arises from the balance of temperament and strength.

The eighth type:

وأما الجنس المأخوذ من وقت الحركات والفترات فينقسم إلى النبض الحسن الوزن والسئ الوزن. والوزن هو المقايضة والمناسبة، وهذه المقايضة تكون بمقايضة زمان حركة إلى زمان حركة بمنزلة ما تكون حركة الانقباض الثاني في زمان مساو لزمان حركة الانبساط الأول أو مخالف له. واساءة المقايضة تكون بمقايضة زمان سكون إلى زمان سكون بمنزلة ما يكون زمان السكون الداخل مساوياً لزمان السكون الخارج أو بخلافه. وأما قياس زمان سكون إلى زمان حركة فينقسم إلى ما يكون زمان الانبساط مساوياً لزمان السكون الداخل أو بخلافه.

Trans.:

As for the type derived from the duration of movements and intervals, it is divided into the well-measured pulse and the poorly-measured pulse. Measurement here refers to comparison and proportion, where the comparison is between the duration of one movement and another, such as when the duration of the second contraction is equal to or different from the duration of the first expansion. Poor measurement occurs when

¹⁹⁴ In *De proprietatibus rerum*, Bartholomeus identifies these terms as thick, thin and moderate. Conceptually they are identical.

comparing the duration of one rest to another, such as when the internal rest is equal to or different from the external rest. Another form of comparison involves comparing the duration of rest to the duration of movement, where the duration of expansion may be equal to or different from the duration of internal rest.

The ninth type:

وأما الجنس المأخوذ من خاصية الحكمية فينقسم إلى النبض المنظم وغير المنظم. فأما النبض المنظم فهو الذي تكون نبضاته على دور منتظم بحيث إذا انتهى إلى حركة ما عاد إلى الحركة الأولى على ترتيبها بعينه. وأما النبض غير المنظم فهو الذي تكون نبضاته مختلفة ولا تتبع ترتيباً ثابتاً بل تكون على غير نظام.

Trans.:

As for the type derived from the characteristic of regularity, it is divided into the organized pulse and the disorganized pulse. The organized pulse is one where its beats follow a regular cycle, such that after completing a movement, it returns to the first movement in the exact same order. The disorganized pulse, on the other hand, is one where its beats differ and do not follow a fixed sequence but rather occur in an irregular pattern.

The tenth type:

وأما الجنس المأخوذ من عدد نبضات العرق فينقسم إلى النبض المتواتر والنبض المتفاوت والنبض المعتدل، ويُلاحظ ذلك بتعداد النبضات في مدة معينة ومعرفة انتظامها أو اختلافها.

Trans.:

As for the type derived from the number of arterial beats, it is divided into the frequent pulse, the irregular pulse, and the moderate pulse. This is observed by counting the beats within a specific period and determining whether they are regular or irregular.

نبض (nabd): pulse

كبير (kabir): large

صغير (saghir): small

معتدل (mu‘tadil): moderate

سريع (sarie‘): fast

بطيء (batie‘): slow

قوي (qawi): strong

ضعيف (dhaif): weak

لين (layn): soft

صلب (salb): hard

ممتلئ (mumtali‘): full

فارغ (farigh): empty

حار (har): hot

بارد (barid): cold

متواتر (mutawatar): frequent

متفاوت (mutafawit): irregular

منظم (munazzam): regular

غير منظم (ghayr munazzam): irregular

قصير (qasir): short

طويل (taweel): long

عريض (aridh): wide

دقيق (daqiq): narrow

بارز (barez): protruding

غائر (gha'ir): recessed

حسن الوزن (hasan al-wazn): well-measured

سوء الوزن (su' al-wazn): poorly-measured

مدة الحركة (muddat al-harakah): duration of movement

مدة السكون (muddat al-sukun): duration of rest

جدران الشرايين (judran al-shurayan): arterial walls

انقباض (inqibad): contraction

انبساط (inbisat): expansion

رطوبة (rutubah): moisture

جفاف (jafaf): dryness

تهوية (tahwiyah): ventilation

قوة محرّكة (quwah muharrikah): motive force

حرارة غريزية (hararah ghariziyah): innate heat

اتساع (ittisa'): dilation

تقلص (taqallus): constriction

إيقاع (iqa'): rhythm

فترات (fatarat): intervals

خلل (khalal): imbalance

ضغط (daght): pressure

استرخاء (istirkha'): relaxation

شدة (shiddah): intensity

Ultimately, the tenfold schemata in *De prop.* and *Kitab al-Maliki* indicate a complex common origin rooted in Galenic and Hippocratic principles that underlines how intricate pulse-taking could be in medieval medicine. Both of them illustrate that a “hard” pulse is often due to excessive dryness while “soft” one indicates greater moisture. In contrast, the differences between quick and slow, weak and strong, full and empty pulses suggest that there is an assumption behind each alteration about the state of underlying heat/heatlessness (innate), vital spirit or lack thereof (relatively) in man’s driving forces. Even subtleties like “frequent” (mutawatar) and “irregular” (mutafawit) pulses - tied to short or long periods of rest - align the Latin and Arabic conceptions of how expansion, contraction, and intermediate pauses reflect essential bodily rhythms. By intermingling these elements with their diagnostic practices, authors from both traditions demonstrate a profound attention to details in physiology whereby every pulse characteristic becomes essential for determining health or illness therefore emphasizing medical thought continuity throughout medieval cultural worlds.

Finding 22

In this finding, Alexander Neckam’s *De naturis rerum* represents a similar outcome parallel to *Zād al-Musāfir*’s. Both texts depict the symptoms of hydrophobia following the bite of a rabid dog and offer therapeutic solutions to overcome the afflicted person’s fear to water. The texts focus on psychological strategies that may be needed to get most patients who have a severe fear of water, actually to drink water as part of the treatment process to avoid the causative challenges. The physiological and psychological aspects of rabies are also discussed.

De naturis rerum; Bk. 2, Ch. 157: On the dogs

Ut enim docetar in Pantegni, cum timor aqute venerit, morsus a cane rabido non potest evadere. Aliis placet morbum lymphaticum esse, cum quis nullum sustinere potest humoris tactum... Si offam sentiunt beneficio tactus abjiciunt eam. Potare nequeunt, nisi virtute herbarum stuporiferarum quodammodo tactus in ipsis sopitus reddatur.

Trans.:

As it is taught in the Pantegni, when the fear of water arises, the bite of a rabid dog cannot be escaped. Some believe it to be a hydrophobic condition, in which a person cannot endure the touch of any moisture... If they sense a morsel of food through the act of touch, they reject it. They cannot drink unless, through the power of soporific herbs, the sensation of touch within them is somehow dulled.

Zad al-Musafir: Art. 7, Ch. 13: On rabies

فإن عرض للمعضوض الخوف من الماء واجتناب شربه، فينبغي أن يحتال بأن يسقى الماء من غير أن يعلم، مثل أن يصير الماء في إناء قد عمل له أنبوب طويل ويدخل طرف الأنبوب إلى أصل اللسان فيسكب منه الماء في حلقه وهو لا يعلم، أو تؤخذ قثاية فيقوم ما في داخلها ويخرج ما فيه ويصير فيه ماء ويحتال به حتى يصير إلى جوفه.

Trans.:

If the bitten person develops a fear of water and avoids drinking it, one should try to administer water without them knowing, perhaps through a long tube placed at the base of the tongue or by using a hollowed-out cucumber filled with water.

المعضوض (al-mu‘aḍūḍ): bitten person (bite of a rabid dog)

الخوف من الماء (al-khawf min al-mā’): develops a fear of water (fear of water arises)

اجتناب شربه (ijtanab shurbahu): avoids drinking it (cannot drink)

أنبوب طويل (unbūb ṭawīl): long tube placed at the base of the tongue (sensation of touch)

قثاية (qithā’ah): hollowed-out cucumber (soporific herbs)

يحتال بأن يسقى الماء من غير أن يعلم (yuḥtāl bi'an yusqā al-mā' min ghayr an ya'lam): administer water without them knowing (through the power of soporific herbs... dulled)

Hereby, it is important to highlight a detail. Neckam in his text mentions the source of the information as *Pantegni*; however, as mentioned before *Pantegni* is the work of translation of al-Majusi's *Kitab al-Maliki*. When examined, the given information seems not to exist in *Pantegni* but in *Viaticum* and as given above, it exists in *Zād al-Musāfir*. This is surely a question mark to implement further investigation, but it springs a question in mind whether Neckam might have made a wrong reference in his book, in which there is only one namely given source of Constantinus which is *Pantegni*.

Regarding the reach of this finding, the philological and semantic parallels between Neckam's and Ibn al-Jazzar's accounts are particularly evident in their discussions of hydrophobia. Both texts describe unconventional methods to administer water without the patient's knowledge; Neckam references soporific herbs to dull the senses, while Ibn al-Jazzar suggests the use of a long tube or a hollowed-out cucumber. These highly similar descriptions of symptoms and treatment techniques reflect a shared medical tradition and suggest that Neckam's text may have drawn directly or indirectly from Ibn al-Jazzar's work.

Finding 23

Related to the same matter, another identical match is seen in *Kitab al-Maliki* and *De naturis rerum* on the rabid dog bite treatment.

De naturis rerum; Bk. 2, Ch. 157: On the dogs

Morsui superponatur en-plastrum factum de nuce bene pistata, et super locum vulneris maneat per unam diem et unam noctem. Deinde sublatum detur ad manducandum gallo vel gal-linæ esurienti, si post esum biberit, non est morsus rabidi canis; si autem e contra, moritur. Oportet autem ut nocte illa et die expectetur, quia non statim morietur gallus vel gallina.

Trans.:

Place on the bite a plaster made from well-pounded walnut, and let it remain on the wound for one full day and one full night. Then remove it and give it to a hungry rooster or hen to eat. If, after eating it, the bird drinks water, then the bite is not from a rabid dog; if, however, the opposite occurs, it will die. It is necessary to wait through that night and day, because the rooster or hen does not die immediately.

Kitab al-Maliki: Disc.7; Ch.31: On the dog bite

تأخذ الجوز المدقوق ناعماً وتضمّد به الجرح يوماً وليلة، ثم تأخذه فتلقّيه لديدك أو دجاجة، فإن أكلته ولم تمت فإن العليل قد يبرأ وأمنت عليه الخوف من الماء، فحينئذ كن على ثقة من إدمالك الجرح، وإن مات الديدك أو الدجاجة فينبغي أن تعاود الأضمدة، وأعط العليل الترياق وغيره من الأدوية المسهلة للسوداء، أو توقّيه الأغذية المولدة لها.

Trans.:

Crush walnuts finely and apply them as a poultice to the wound for a day and a night. Then, remove the poultice and offer it to a rooster or chicken. If the bird eats it and does not die, the patient is on the path to recovery, and hydrophobia can be ruled out. At that point, it is safe to allow the wound to heal. However, if the bird dies, the poultices must be reapplied, and the patient should be given theriac and other purgatives for black bile while avoiding foods that produce it.

morsus (morsus): bite

عضة ('addah): bite

superponatur (superpono): to be placed/applied

تُضمّد (tudammadu): it is applied/poulticed

emplastrum (emplastrum): plaster, poultice

ضماد (dimaad): poultice

nux pistata (nux pistata): pounded walnut

الجوز المدقوق (al-jawz al-madquq): crushed walnut

vulnus (vulnus): wound

جرح (jurh): wound

maneant (maneo): let it remain

يبقى (yabqa): it remains

una dies et una nox (una dies et una nox): one day and one night

يوماً وليلة (yawman wa laylah): one day and one night

sublatus (sublatus): removed

يُرفع (yurfa'): removed

detur ad manduendum (detur ad manduendum): to be given to eat

تُلقيه (tulqihi): offer it

gallus/gallina (gallus/gallina): rooster/hen

ديك أو دجاجة (dayk aw dajajah): rooster or hen

biberit (bibo): it drinks

يشرب (yashrab): it drinks

moritur (moriator): it dies

يموت (yamut): it dies

theriaca (theriaca): theriac, antidote

الترياق (al-tiryāq): theriac

purgationes melancholiae (purgationes melancholiae): purgatives for black bile

الأدوية المسهلة للسوداء (al-adwiyah al-mushilah li-s-sawda'): purgatives for black bile

cibos generantes melancholiam (cibos generantes melancholiam): foods producing black bile

الأغذية المولدة للسوداء (al-aghdhiyah al-muwallidah li-s-sawda'): foods generating black bile

De naturis rerum and Kitab al-Maliki demonstrate that both authors practice a practical almost scientific method for testing rabies through poultice passed to birds. This could be seen in whether the bird drank water (Neckam) or dies after it eats the poultice (al-Majusi). This approach, therefore, denotes an age of observation, experiment and direct contact between healer and nature - both animal and plant - for purposes of enquiry. In effect, these texts are indicative of Latin-Arabic medical confluence all seeking to defend human health from jeopardy that was posed by body infirmity as well as community well-being.

Finding 24

In the section about the “eye” in *Opus majus*, a significant encyclopedia from 13th century Britain, Roger Bacon notes that he refers to the works of Avicenna and Alhazen, as well as Constantinus Africanus, creating a synthesis of their ideas. In *Pantegni*, Constantinus predominantly translates and conveys the information from al-Majusi's work but it is also seen that Hunayn ibn Ishaq's *Kitab al-Ashr Maqalat fil-Ayn* (Book of the Ten Treatises of the Eye) which is mainly derived from Galen's *De placitis Hippocratis at Platonis* (Γαληνου Περι Των Ιπποκρατους Και Πλατωνος Δογματων) and *De usu partium* (Περι Χρηστικων Μοριων) also included in the same work. When examining the *Opus majus*, it is necessary to investigate which Islamic scientist's knowledge Constantinus referred to in the relevant section. The data obtained from this investigation is as follows.

Opus majus: Bk. 2; Dist. 2; Ch.3: Concerning the humors of the eye and the weblike structure.

...ut dicit Constantinus, volens quod pars uveae inferior continet humorem vitreum, et in ultimo sui deferens sanguinem to venis suis et arteriis bene digestum, quo fiat et nutriatur vitreus humor, quatenus vitreus possit nutrire humorem crystallinum.

Trans.:

...as Constantinus states, maintaining that the lower part of the uvea contains the vitreous humor, and at the end of it carries blood in its veins and arteries well digested, with which the vitreous humor is formed and nourished, in order that the vitreous may be able to nourish the crystalline humor.

Kitab al-Ashr Maqalat fil-Ayn:

وتغذى الرطوبة الجليدية لنلا يجففها الهواء، وأن تتدى وتغذى الطبقة العنبية لنلا تجف وتصاب فتضر بالجليدية اذا لاقتها. وأما الروح النير فان به يكون البصر اذا اتصل بالنور الخارج. وبين الرطوبة الجليدية إلى الرطوبة الشبيهة ببياض البيض على النصف من الجليدية قشر رقيق جدا شبيه بقشر البصلة وينسج العنكبوت ليوقئها من العنبية ومن الآفات العارضة من خارج

وأما الطبقة التي تحوى هذه الرطوبة الزجاجية فانها مركبة من شينين: من عصابة مجوفة يجرى فيها الروح الذي به يكون البصر، ومن عروق وأوردة. وقد ينبغى أن نوقف القول فى هذا الموضع ونبتدى بالكلام من أوله.

Trans.:

The vitreous humor is nourished so it does not dry out due to air exposure, and it is moistened and nourishes the grape-like layer so that it does not dry out and suffer damage, which could harm the vitreous if they came into contact. As for the luminous spirit, it is with it that vision occurs when it connects with external light. Between the vitreous humor and the egg-white-like moisture at the half of the vitreous is a very thin layer, similar to onion peel and spider web texture, to protect it from the grape-like layer and from external afflictions.

As for the layer that contains this vitreous humor, it is composed of two things: a hollow nerve through which the spirit runs that by it vision occurs, and from veins and arteries. And it might be proper to pause the discourse at this point and begin speaking from the beginning.

Kitab al-Maliki: Vol. 1; Disc. 3; Ch. 13: On the description of the eyes and the benefits of their muscles.

و أما العروق و الشرايين التى فيها: فيؤدى بها الدم إلى الرطوبة الزجاجية، و من البين أن الذى يصل منها إلى الرطوبة الزجاجية على طريق الرشح، و ذلك أن الرطوبة الزجاجية ليس يصاب فيها عروق متصلة بها، و كذلك أيضاً الرطوبة الجليدية تغتذي من الرطوبة الزجاجية عن طريق الرشح اذا كان ليس يوجد فى واحد منها مكان يجري فيه الغذاء من احدهما إلى الاخرى.

Trans.:

...the veins and arteries in it, they carry blood to the vitreous humor, and it is evident that what reaches the vitreous humor is by filtration, as there are no veins directly connected to it, and similarly, the vitreous humor is nourished by the glassy humor through filtration when there is no space for nutrients to flow directly between them.

uvea: grape-like layer

العنبية (al-'unbiyah): grape-like layer

humor vitreus: vitreous humor

الرطوبة الزجاجية (al-rutubah al-zujajiyah): vitreous humor

humor crystallinus: crystalline humor

الرطوبة الجليدية (al-rutubah al-jalidiyah): glassy humor

sanguis: blood

الدم (al-damm): blood

venae et arteriae: veins and arteries

العروق والشرايين (al-'uruq wa al-sharayeen): veins and arteries

digestus: well-digested

على طريق الرشح (‘ala tareeq al-rashh): by filtration

spiritus nitor: luminous spirit

الروح النير (al-ruh al-nayyir): luminous spirit

lamina tenuissima: very thin layer

قشر رقيق جدا (qishr raqeeq jiddan): very thin layer

textus araneae: spider-web-like texture

بنسج العنكبوت (binashj al-‘ankabut): spider-web-like texture

expositio aeris: air exposure

الجفاف بسبب الهواء (al-jafaf bisabab al-hawa’): drying due to air

nutriens: nourishing

تغذي (tughadhdhi): nourishes

afflictiones externae: external afflictions

الآفات العارضة من خارج (al-afat al-‘aridah min kharij): external afflictions

filtratio: filtration

طريق الرشح (tareeq al-rashh): filtration

cochlea cava: hollow nerve

عصبة مجوفة (‘usbah mujawwafah): hollow nerve

visio: vision

بصر (basar): vision

nutrire: to nourish

يغتذي (yaghtadhi): is nourished

lumen externum: external light

النور الخارج (al-noor al-kharij): external light

quies: rest or pause

نوقف القول (nawqif al-qawl): to pause the discourse

In the case of Roger Bacon's *Opus majus* there is a clear use of Constantinus Africanus's works as a source in particular when dealing with some of the physiological details of the eye. But while Constantinus's *Pantegni* served as a starting point to the description, which Bacon provided, in this instance Constantinus is seen to recede even more as elements from Al-Majusi and Hunayn ibn Ishaq which contain far more information are included in the description. Bacon also explains the nourishment of the vitreous humor which he seems to have adopted from Constantinus. He mentions how in the lower part of the uvea lies the vitreous humor which in turn is greatly more important as it receives nutrition through veins and arteries. This type of explanation is not completely enhanced by Constantinus but is also of different premises in terms of details provided by Al-Majusi and Hunayn ibn Ishaq. As an example, Al-Majusi argues that the vitreous humor being able to dry out needs to be nourished and protected and explains the mechanics of the humors layered system and maintenance of moisture that aids the vitreous humor in operation. Of note as well is that in like manner Hunayn ibn Ishaq provides elaborate detail on how the vitreous humor has no vascular supply and is nourished indirectly through a filtration process, and also this point is mentioned in detail by Bacon in regard to the remark that the vitreous humor is constructed and well fed through the means of well digested blood, this implies that Bacon might have incorporated Ibn Ishaq's idea of how nutrition is supplied to tissues, inductively, through blood vessels into his accounts. Although Constantinus is significantly credited by Bacon when it comes to the general structure of the eye and its anatomy, the more intricate details relating to how the eye matures and how it protects itself and how it thrives appear to have a lot in common with the works of Al-Majusi and Hunain ibn Ishaq as well as other scholars in that era.

3.2. Conclusion

To recap all elements of this thesis, it is important to emphasize that the investigation of medieval Islamic science in 13th century Britain has shown how ideas and academic practices circulated across different parts of the medieval globe. The research conducted here has attempted to chart a complex web of interactions, translations, commentaries, critiques and cultural mergers, all of which sought to explain how and why texts originating in the Islamic core came to be incorporated, in one way or another, into British encyclopedias during the Middle Ages. While analyzing the intricacies of these interactions, we can see that works of scholars such as Ibn al-Jazzar, Al-Majusi, Hunayn ibn Ishaq and others became part of the intellectual milieu of the 13th century British literature scholars like Bartholomeus Anglicus, Roger Bacon and Alexander Neckam. These British authors when engaged in preparing more or less universal encyclopedia's cut across all the modern available knowledge which is evident in the robust gains amassed over the years from the Mashriq and Maghrib regions, lying in stark contrast to the more region-specific Eurocentric perspectives of medieval intellectual history.

Within this frame, before claiming deeper findings, I would like to touch briefly that this thesis reveals three important findings that respond to the core research questions. Regarding the first question about whether the information in the 13th-century British encyclopedias - namely *De naturis rerum*, *De proprietatibus rerum*, and *Opus majus* - where Constantinus Africanus is cited as a reference for some entries, originate from Islamic scholars or not; the findings prove that there is a significant portion of knowledge attributed to Constantinus Africanus in 13th-century British encyclopedias, in fact, stemming from Islamic sources. And regarding the following research question which investigates specific Islamic scholars and their works behind the entries attributed to Constantinus; analysis results address that the mentioned materials root back to Ibn al-Jazzar's *Zād al-Musāfir*, Al-Majusi's *Kitab al-Maliki* and Hunayn Ibn Ishaq's *Kitab al-Ashr Maqalat fil-Ayn*. And as for the third research question which examines that through which channels and intermediaries the knowledge transfer might

have occurred, and the roles of translation centers like Bayt al-Hikmah and key figures such as Constantinus Africanus in this process; it can be claimed that the knowledge was transferred from or via Bayt al-Hikmah of Baghdad or Kairouan to other significant academies of Europe such as Salerno Medicine School and Monte Cassino with the efforts of itinerant scholars like Constantinus Africanus serving as both the translator and the symbolic funnel, and other individuals such as Adelard of Bath, Gerard of Cremona, and unnamed Jewish or Christian translators moved between the Islamic and Christian worlds, carrying texts into monastic libraries in Paris or British lands.

Examining the findings more closely, we can see that the historical threads weaving from Baghdad's or Kairouan's Bayt al-Hikmah to Salerno, and from Salerno to British monastic schools, all converged in distinct textual artifacts that showcased a remarkable interplay of inherited and newly discovered knowledge. Where once the classical heritage of Greek and Roman authors - transmitted through Arabic translation - had been the singular focus of many medieval scholars in Europe, the deeper reading of Arabic and Persian sources now demonstrates just how frequently authors in the West relied on direct transmissions of advanced medical and philosophical knowledge that had been refined in the Islamic world. The research has consistently turned up evidence - whether in discussions of colic, headache, rabies, or the precise classification of pulses - those entire passages in Western encyclopedic compilations echo, sometimes verbatim, the instructions or theoretical pronouncements that one finds in the Arabic sources. In all these respects, the thesis has reinforced the proposition that the medieval Islamic world was not only a custodian of Greek science but also a powerhouse of original scientific innovation, which in turn profoundly shaped the European intellectual Renaissance.

Importantly, across many of the textual comparisons included in this thesis, we see scribal or authorial references to Constantinus Africanus, and in the margin or text body we find lines from Hippocrates, Galen requoted in an Arabic-Latin refashioning. The question arises: from whose perspective did these bits of knowledge appear, and why is the Arabic dimension so frequently disguised behind Christian or Latin monikers? That the commentary on such vital medical matters is usually attributed to

Constantine, Gerard, or other Latin translators reveals how, in the Middle Ages, intellectual property was often conflated with the name of a translator rather than the original author, particularly if the original was from a distant culture. The impetus among Christian scholars to Christianize or to cast knowledge in the language and style accessible to a local monastic or university context inevitably overshadowed or simplified the acknowledgment of the original Arabic or Persian scholar. Nevertheless, as the textual parallels established by the thesis reveal, the underlying sources often remain clearly traceable to earlier Arabic treatises. This phenomenon testifies to a deeper current of cross-cultural synergy that, in effect, gave shape to a Europe that was gradually stepping out of its narrower horizons, absorbing the advanced sciences that flourished in Baghdad, Kairouan, Cairo, and Cordoba.

In parallel, it has become evident that the impetus for translations and the impetus for the creation of encyclopedias had something in common: they both arose from the urge to consolidate, unify, and systematically arrange the wealth of knowledge available. Translation centers, from the Abbasid Bayt al-Hikmah to local enclaves in Palermo, Toledo, and even smaller centers in the Norman Kingdom, were established with the patronage of rulers who recognized that scientific insight endowed them with cultural prestige and practical advantage. Such rulers in the Islamic realm cultivated talent in mathematics, astronomy, medicine, and philosophy, thereby fostering an ongoing chain of textual transmissions and expansions. By the time these texts were carried north to Salerno, they were already shaped by centuries of commentary from Nestorian, Jacobite, Jewish, and other minority scholarly traditions in the Islamic world. Then, from Salerno, they traversed the network of Benedictine monasteries, particularly Monte Cassino, eventually making their way into England, where they were consulted by scholars with the impulse to compile all known things from the vantage of Christian theology and natural history. This broader historical arc underscores the idea that scientific knowledge in the medieval period was inherently cosmopolitan, shaped by a swirl of faiths and languages, which thereby counters any simplified notion that the Middle Ages were intellectually homogenous or scientifically stagnant in Europe.

On the other hand, as given in the findings, the textual examples concerning headache (migraine), the formation of lice, the classification of pulses, or the therapy for rabies demonstrate that 13th century British encyclopedists regularly situated disease and remedy within the four-humor paradigm that had evolved over centuries in the Greek tradition and was further elaborated in the Islamic world. Yet, they introduced modifications guided by monastic or scholastic frameworks, sometimes tacking on Christian moral lessons or theological rationales to what was originally a purely naturalistic and empirical discussion. The significance of these modifications, as explored in the thesis, is that they reflect a dual interest - on the one hand, fidelity to a universalistic, inherited model of bodily humors, and on the other, the imperative to integrate new knowledge under the umbrella of Christian orthodoxy. Hence, the tension between adopting an empirically grounded methodology from Islamic science and reconciling it with a worldview shaped by biblical exegesis is an undercurrent that runs through the references in the British encyclopedias, especially those compiled by men deeply immersed in ecclesiastical institutions.

The deeper philological analysis carried out in this study has illuminated how many references to Constantinus in medieval British works are actually direct lifts from the Arabic texts, even though the local author might not explicitly acknowledge that the underlying knowledge came from the Arabic tradition. For instance, the repeated observation that “Constantinus says...” about bloodletting from a certain vein to cure this or that disease almost certainly arises from Ibn al-Jazzar’s *Zād al-Musāfir* or Al-Majusi’s *Kitab al-Maliki*. The unique details about bodily humors, the advanced classification of pulses, or the specialized remedies for colic or obstructed intestines cannot be found in earlier Latin traditions with that same specificity. The presence of these intricate details in 13th century British encyclopedias testifies to a direct or indirect reliance on Islamic sources. Possibly, we can surmise that scribes who had visited Salerno or had direct contact with translations from Montpellier or Toledo brought these texts to monastic scriptoria in Britain, where they were excerpted and integrated into the broad compendium of knowledge under the single ascription “Constantinus.” Indeed, the illusions and conflations that arise in the subsequent centuries reflect an insufficiently

recognized fact: that medieval Christian thinkers were both indebted to and yet overshadowed the non-Christian contributions that underpinned their newly expanded sense of the natural world.

In that sense, the impetus behind the massive encyclopedias of the 13th century - like Bartholomeus Anglicus's *De proprietatibus rerum* - was to provide a universal map of all known knowledge, covering theology, moral philosophy, natural sciences, medicine, geography, and more. That impetus was itself in part inherited from Islamic traditions of encyclopedism, such as the enormous compendia created by Ibn Sina, Al-Kindi, Al-Farabi, Al-Masudi, and others, who strove to unify all branches of knowledge under a single rational and philosophical system. Although Christian authors in Britain occasionally displayed reservations about overt philosophical speculation that might infringe upon Christian dogma, the encyclopedic impetus - to gather, classify, and unify - nonetheless resonates with the attempts in the Islamic Golden Age to preserve and expand upon Greek, Persian, and Indian knowledge. The present thesis has argued that *De proprietatibus rerum* and similar works, including the ones by Alexander Neckam and Roger Bacon, are, in effect, Western analogues of that encyclopedic spirit, re-minted in a context shaped by Christian theology. We see, for example, how Neckam references *Pantegni* for a remedy that actually originated in Ibn al-Jazzar's text, or how Bacon's discussion of the eye draws upon Alhazen (Ibn al-Haytham) while openly attributing certain fundamentals to the "book of Constantine." All these gestures paint a picture of fluid boundaries of textual ownership and of the dynamic movement of ideas that shaped medieval intellectual landscapes.

We must also consider the question of why some references are direct and others are indirect or partially disguised. Part of the explanation lies in the politics of knowledge transfer: adopting knowledge from outside Christendom was still somewhat controversial, particularly if it bore the imprint of an overtly Islamic or "heretical" framework. Consequently, citing "Constantinus," who had been accepted into the Benedictine order at Monte Cassino, was a safer strategy than referencing a Muslim physician from Kairouan or Baghdad. This dynamic parallels how Avicenna (Ibn Sina)

or Averroes (Ibn Rushd) were sometimes cited with partial Latinized forms of their names, their philosophies often sifted through scholastic commentary that aligned them with Christian teaching. Yet, as this thesis underscores, the textual closeness to original Arabic manuscripts is still plainly evident in many of the passages we have systematically analyzed. Therefore, a second major conclusion here is that medieval British encyclopedia compilers were frequently aware that certain advanced ideas stemmed from the Islamic realm but were not necessarily compelled or free to highlight the original authors' cultural or religious origins.

Moreover, some of the references and textual parallels go beyond mere medical or philosophical treatises. They encompass mathematics, geometry, astronomy, and mechanical inventions as well. Although the present thesis has focused mostly on the medical dimension - comparing details like the cure for dog bites, the method of diagnosing jaundice, the classification of pulses, the remedy for inflamed eyes, and so forth - there exists a parallel literature tracing how Euclid's *Elements*, Ptolemy's *Almagest*, and Al-Khwarizmi's works on algebra influenced the British scholarly realm. These are not encapsulated in the same portion of the encyclopedic corpus that addresses bodily ailments but appear in different sections that discuss the cosmos, geometry, or numbers. Nonetheless, they exhibit the same essential pattern: a reliance on translations that first took place in the Islamic world (Greek to Arabic) and then a second wave of translations that took place from Arabic to Latin in Western Europe. This cyclical pattern of translation and commentary is perhaps the single most defining factor of medieval knowledge production. What is unique about the medical texts is the undeniable specificity of details - like the mention of certain ingredients, the method for preparing herbal decoctions, or the step-by-step procedure of venesection - making the chain of textual ancestry that much more concrete.

At the same time, the comprehensive textual analyses show that medieval European authors were not merely passive recipients. They rearranged and reorganized content, often merging knowledge gained from Arabic science with older or local healing traditions circulating in monastic communities. British authors might incorporate

Celtic or Anglo-Saxon herbal lore, or references to biblical healing narratives, alongside the advanced four-humor pathophysiology derived from the Arabic tradition. The result is a layered textual environment that is syncretic, innovative, and reflective of the broad horizons of medieval scholarship in the centuries leading to the proto-Renaissance. The perspective from which Western authors wrote was influenced by theological beliefs that suggested a purposeful design behind the human body and the cosmos. Reading an Arabic text that did not share these theological premises required them to adapt or reinterpret the scientific content in ways that fit within Christian cosmology. This accounts for the occasional disclaimers about the existence of a “rational soul” or the idea that sin is the ultimate cause of disease, disclaimers not present in the original Arabic texts. As seen in the final compiled passages, it is the combination of cultural adaptation and textual appropriation that allowed Islamic science to find a new home in monastic libraries, cathedral schools, and eventually the emerging universities of Britain.

A further dimension that cannot go unmentioned is the question of historiography - how modern scholarship has traced or obscured the links between medieval British encyclopedists and Islamic science. The 19th and early 20th century histories of science often neglected the role of Islamic civilization, though a handful of pioneering scholars, such as George Sarton, insisted upon its importance. Over time, we have seen a slow but steady record correction, with new philological discoveries and digital access to manuscripts enabling more profound comparative textual work. Similarly, the impetus for this thesis is, in part, to demonstrate the knowledge found in the pages of *De proprietatibus rerum*, *De naturis rerum*, and *Opus majus* bears an unmistakably Islamic scientific imprint. Indeed, even the advanced medical understanding of childhood ailments, geriatric conditions, ocular pathologies, or intestinal obstructions, which these 13th British authors included, emerges from centuries of cumulative work by Islamic scientists like Ibn al-Jazzar, Al-Razi, Al-Majusi, Ibn Sina, and many others. Without these transmissions, much of that specific, detail-driven medical knowledge would not have been accessible or integrated into the Christian West as early or as thoroughly as it ultimately was.

Due to the limitations of a single thesis, not every aspect of the Islamic scientific legacy could be examined in equal detail-fields such as optics, mechanics, mathematics, astronomy, and natural philosophy are also rich with cross-cultural exchanges that would further support the conclusions presented here. However, by concentrating on a selected set of textual comparisons related to medical knowledge, we have demonstrated in a systematic way how these processes of textual infiltration and adaptation occurred. One of the surprising findings is the degree of philological closeness in many passages to the Arabic original-indicating that the translator or compiler, whether it was Constantinus Africanus, Gerard of Cremona, or an unnamed intermediary, often did not drastically paraphrase or condense the original text but instead preserved the Arabic phrasing, resulting in a near-literal translation into Latin, which medieval British authors then excerpted. This pattern suggests that the knowledge was valued in its own right for its practical effectiveness. Where theoretical expansions or Christian moral overlays appear, they typically occur after the core of the Arabic text has been maintained. This contradicts any idea that medieval Christian scholars may have willfully distorted the knowledge simply out of theological animosity. Instead, the knowledge was integrated and at times framed within a Christian moral perspective but seldom fundamentally altered, presumably because it was acknowledged to serve valuable purposes in fields such as healing, agriculture, alchemy, and other practical applications concerns.

As far as the textual and historical evidence is concerned, such a perspective - namely that the 13th century British encyclopedias which sought to present a universal compendium of knowledge owe a commendable debt to the developments of Islamic science - is substantiated quite well. However, the last vector of the reasoning should still be approached in a different manner, while developing single parts to consider one civilization as contributing to the needs of another, in a more general sense to prove that there were multi-national multilingual, multi-faith scholars and contributions from centuries of translations and re-interpretation to medieval science. This outlook demands that we discard any naïve linear version of the “Greek → Arabic → Latin” pattern, because the actual process is far richer, more dynamic, and more repetitive, involving successive – rather than cumulative – growth of knowledge, new interpretations, and

returns to basics. Building on Greek, Persian, Indian, as well as Arabian traditions, wasn't alien to Islamic scientists as they joined the pool of amazing new genetic material that was later used by the Christian West. The British encyclopedists then as a consequence placed that knowledge in a medieval Christian mosaic alongside their own beliefs, interwoven with theological and moral critiques as evidence of sourced textual support.

Ultimately, these findings prompt a broader reflection on how medieval knowledge, far from being purely parochial, was the fruit of the cumulative intellectual labors of a wide range of cultures. A single text like *De proprietatibus rerum* is thus, in part, a relic of Bayt al-Hikmah, with layers of synergy emanating from centuries of Nestorian, Jewish, and Muslim translators. Likewise, Roger Bacon's attempt to unify theology, optics, and natural philosophy in *Opus majus* cannot be separated from the discoveries of Alhazen or the medical elucidations of Avicenna. We might imagine that Alexander Neckam's references to the Muslim scientific tradition, albeit disguised by the name Constantinus or *Pantegni*, reflect a tacit acknowledgment of the respect he held for the advanced knowledge that had reached him from beyond Europe's borders. And it is precisely the presence of these layers and illusions that gives the medieval period its vibrant tapestry, defying older stereotypes about a so-called "dark age." Instead, the medieval world, as revealed by this thesis, is a place of bustling textual commerce, a laboratory of knowledge in which entire civilizations parted, met, and exchanged ideas. Thus, it can be stated that the British encyclopedias of the 13th century are viewed as operating in the periphery or intersection of a world system that was also heavily dependent on Islamic scholars in this case.

There are evident textual parallels found within western authors in medieval periods, specifically between British works and Arabic texts, there indeed existed a profound correlation between western and Islamic academia. The thesis has demonstrated with the use of rich commentary on diseases, the humoral system and anatomy that it is common to find British scholars making such references to *Pantegni* or Constantinus, for these aides are associated with Ibn al-Jazzar. We are faced with the

needs of concurrently imagining and meditating on Medieval Europe sciences, notably looking through the Compendia works which predate modern scientific history and are strictly reliant on the Islamic civilization. Failure to incorporate this cultural exchange deeply skews our view of intellectual history. The interdisciplinary contours initiated by the British thinkers portrayed an advanced episteme that predated the Renaissance, bounding the latter to be viewed from a more complex lens. It therefore follows that the significance of re-examining medieval British encyclopedias, with an eye to the underlying influences of Islamic science, extends beyond a purely academic historical interest. It also impacts how we conceptualize the genealogies of scientific knowledge in the modern era. These genealogies, seen in full context, show that scientific progress is not bound by geographical or religious frontiers but is instead the result of unbroken chains of scholarship that cross linguistic and cultural lines. Each translator, compiler, or commentator who participated in that chain contributed to forging a new body of knowledge that was subsequently disseminated. Indeed, the polyglot environment of the 12th and 13th centuries - incorporating Arabic, Syriac, Hebrew, Greek, and Latin - formed a dynamic environment in which theoretical insights, practical cures, and philosophical discourses all found new life.

Another strong dimension is that the environment and ethos of the Middle Ages instilled a sense of multipotentiality, or a space where knowledge was freely shared; there indeed was a common ground which people amalgamed and built knowledge upon. However, basic competencies require a hierarchy of authorities, such as the Greeks, Romans, Arabs, or Christians. Orientation along orthodoxy disputes, accuracy of translation or guidance from the above-mentioned authorities slow down the assimilation of modern knowledge. Various compilers would mention Constantinus to avoid controversies or legitimize the material from a Christian perspective. During that time, Roger Bacon, who was a more radical thinker, attempted to explore Islam while blending his philosophy with Western academics, which had encompassed a myriad of contrary ideas against religion itself. So, in this sense, the other way around proves that gathering Arabic knowledge motivated Europeans to grapple with complex scientific ideas that were decidedly intricate to the existing framework.

The culmination of all this evidence is a unique and delineated pool of knowledge with bits and pieces from across the world providing a solid basis for development in the subsequent Middle Ages and eventually facilitating the beginning of the Renaissance sociopolitical periods in medicine, astronomy, and even mathematic. Nor should the significance of personal travel be neglected. Individuals like Constantinus Africanus or Adelard of Bath, as well as unnamed Jewish merchants and translators who shuttled manuscripts across the Mediterranean, were the very agents of bridging knowledge. This thesis has also shown that even though not all authors in 13th century Britain traveled personally to the Islamic lands, they possessed manuscripts that were the by-products of such cultural journeys. The intangible infrastructure of translation, the existence of stable trade routes, and the presence of multi-ethnic communities in places like Salerno or Sicily all fueled the enormous transformations that came to define medieval European scholarship. Indeed, without the impetus of these travelers and the states that sponsored translation, the cross-cultural synergy we observe would have been greatly diminished. Again, this underscores the fundamental idea that the shape of knowledge in any period is a function of social, political, and economic webs that connect people and texts.

Considering the limitation of this thesis regarding the medical content discussed in selected encyclopedias from Britain, there is leeway for some further research. For example, a similar investigation on the use of Arabic astronomy by British writers in the thirteenth century would lend equal considerations and avenues for understanding the history of astronomy in Britain. One may inquire into how they modified the planetary configurations of Al-Battani or Al-Zarqali, or into how the Arabic translation of Ptolemy's *Almagest* found its way to them. Another direction to follow would be the analysis of the fragments of Roger Bacon's works that we have already seen here and, more precisely, the references to and the publication of the works of Ibn al-Haytham on optics. Likewise, a rigorous study of the employment of Avicenna's *Canon* in Burgundian monastic infirmaries could improve the understanding of how that canon contained a local strategy for medical texts in circulation. All these proposed investigations stand to reinforce or expand the fundamental conclusion reached in this

same work: that there was a substantive and formative interaction between Islamic science and medieval British scholarship.

We should also consider that this thesis has an implicit historiographical dimension, reminding modern audiences that the threads of scientific knowledge linking the Islamic world to the medieval West were long overshadowed in traditional narratives that placed Greek and Roman achievements in direct lineage with the European Renaissance while eliding the Islamic contribution. Through the close reading of 13th century British encyclopedias, we see the actual presence and shaping force of Arabic texts on the theology, philosophy, and medicine taught in the Christian West. We see, in microcosm, that the concept of separate, hermetically sealed “Islamic” and “European” civilizations does not accurately represent the reality of intense cross-pollination that was taking place. The knowledge exemplified in Ibn al-Jazzar’s treatments for colic or in Hunayn ibn Ishaq’s elaborate definitions of ocular anatomy made their way into British libraries, were reworked to fit Christian educational aims, and eventually influenced how British and European scholars of the late Middle Ages understood and treated disease, developed anatomical theory, and conceptualized nature’s workings. Even if some of the references were mislabeled or partial, the essential content had migrated. The role of medieval Britain, so far from the Eastern Mediterranean, underscores that the intellectual diaspora of Islamic science reached well beyond the historically recognized centers of southern Europe.

Within the same line, this thesis shows that, for British encyclopedists of the 13th century such as Bartholomeus Anglicus, Alexander Neckam and Roger Bacon, as well as many others, they were active participants and patrons of a tradition of knowledge spanning continents. They produced a textual collage that incorporates material from various sources, but the nucleus of this collage was solid Islamic science from the medieval era. They took ideas that were developed during Abbasid, Aghlabid or Fatimid rule, and through translation, commentary and partial rewriting, fused them into their Latin texts. This idea is further expanded with the parallel passages from Eastern and Western texts, that have been showcased morphologically, semantically and

conceptually. The older conception of medieval Europe as a geographically and culturally self-contained unit that was cut off from classical heritage is being replaced with a more dynamic model in which medieval English authors were and are indeed the heirs or interpreters of a long Greek, Persian, Syrian and Arabic writing brewed over centuries, and was only ever written in Latin for the sake of serving monastic institutions and developing universities in Britain. This situation springs in minds about the base of this opinion. This is based on the Benedict columns that demonstrate these encyclopedias in question, which are commonly reframed inside the very embedded “European medieval Latin tradition” line should instead be seen as global nodes located outside medieval Christendom. It may be put forward that many of the illusions or confusions about “Constantinus Africanus says . . .” are emblematic of what I have called the tensions with which these authors had to grapple, on the one hand owing a great deal to the Arabs but on the other being Christian educated ones which conditioned them to comprehend their knowledge in a foreign language milieu of a monastery or a school. That these authors managed to integrate these two realms is evidence of their wide intellectual appetite as well as of the strong drive that all-encompassing knowledge confers to the human psyche: the need to gather, arrange and fit as much useful information as possible, for whatever purpose – to praise God, instruct the believers, or improve the world.

We can perhaps conclude without waver that the Islamic contribution to the medieval British learning was one of the most important factors in the shaping of the course and the details of the leading encyclopedic endeavors of the time. Earlier scholarship may have either minimized that contribution or omitted to fully acknowledge it, but the textual comparisons in this thesis confirm its profundity and finesse. The importance of that recognition goes beyond mere historical interest and is contributing to the current debates on intercultural dialogue, common heritage of mankind, and the need to have free avenues of intellectual exchange. While stressing that so many of the key features of the medieval British science had their roots in the Islamic civilization, one essentially urges contemporary scientists to realize how crossing the borders and honoring multiple intellectual cultures is a constant in the

history of world science. The Middle Ages in this respect were not an exception but the period represents the principle case of how cross fertilization of ideas, thoughts can be the stimulus for dynamism and development. The Medieval Islamic scientific and Christian civilizations' interaction as seen through the wonderful encyclopedias of Britain still serves as a history lesson on how as science flourishes in understanding and striving with the people to understand the world.

On the other hand, this study has been able to concretize a principle that is often claimed but vaguely stated with respect to the cross-cultural flow of knowledge by paying attention to details of the textual parallels of everything such as gallbladder pathology, relapsing fever, rabies treatment, migraine, tooth ache, colic, and anatomy of the eyes and more. This set of deals does not leave doubt about transmission even though it may be mediated through many layers of translators. This is in part the motivation behind gathering evidence to show that the knowledge acquisition practices was not just a rhetorical broad statement but rather a very regular part of the activities scribes, librarians, teachers and travelers engaged in as colossal thoughts would leave a huge textual footprint. Even cursory reading enables us to understand how a part of Britain was able to gain a place in the imaginations as well as the compilations in the West thus forming an ever-expanding area of inquiry which shaped over several centuries the intellect of medieval Europe. This medieval intellectual horizon in traditional form of historiography could be described as being mostly blanketed by ignorance and as only consisting of a battered classical legacy whereas in reality to a great extent it was actually filled up with vigorous Islamic intellectual activities.

Consequently, the findings reveal the achievements of the medieval cast as a singular mode of science which included a cohesive work of translation, theoretical extrapolations, anatomical sketches, and even authorship – are something that says a lot about the environment, which was critical for the advancement that Europe witnessed in the coming centuries. In other words, the conclusion emphasizes again the significant role of Islamic science in the medical and encyclopedic literature of Britain of the 13th century. Convergence of textual analysis, philological studies, and historical placing of

the facts have shown that the lines of knowledge are rarely straight or even one way. Instead, they constitute a maze of reciprocal borrowings, inventive growths, and foundations of novel frames of ideas. It follows that medieval British encyclopedias were intended primarily for a Christian audience, but this does not preclude the fact that the compilers greatly benefited from the more advanced sciences that flourished within the realm of Islam. This acknowledgment compels us to reconsider the dominant narratives surrounding medieval science.

Still, this time, doing so to construct a more complex narrative about the development of Western learning, which did not take place in isolation but rather in interaction with oriental cultures. Therefore, it serves as an overarching last hope of this study: that modern scholars and enthusiasts of British medieval studies will embrace more of the directions that have been set in motion here concerning the unexplored manuscripts, the almost forgotten translators, and the intercultural exchanges that contributed to the intellectual landscape of medieval England. By acknowledging the crucial contribution of Muslim scholars in triggering and connecting this immense web of knowledge, one starts to envisage the Middle Ages in a different light – a time of dynamic exchanges rather than one of stark differences or linear progression from Greece and Rome. The interpenetration of the two worlds, the cultural universes of Islam and Christendom, with special emphasis on the encyclopedical genre, confirms that science in the medieval period was truly global, both in geography and faith. In this interaction emerged the foundational concepts of modern medicine, mathematics, astronomy, and philosophy, which, in the two medieval centuries, assimilated almost every other respective tradition or language's spirit, which strove in the quest for a more profound knowledge of the natural world.

There are various logical directions for moving forward with the research based on the information presented in this thesis. First, a thorough examination or detailed look into medieval literature that may have referenced Constantinus Africanus or similar translators might help determine the influence or inspiration that their works were able to provide to later writers. The discussions in the documents will also show how

significant Islamic texts were in the progress of these translations while regarding the concepts of science that existed in the respective texts before Islam. Another example is the idea that many well-respected Islamic thinkers, Al-Razi, Al-Majusi, and Ibn Sina, were in some way indebted to Greece, Persia, or even India, further suggesting that researchers should take a more meaningful linguistic approach alongside a historiographical one to see precisely where Islamic ideas and way of thinking evolved. Such an approach could enhance our understanding of how scientists have built their scientific ideas on pre-existing ones throughout history. Lastly, considering manuscripts, scribes' notes, annotations, or even the catalog of European libraries could potentially be favorable for future studies in demonstrating how the spread, adjustment, and placement of context of such knowledge and information are processed.

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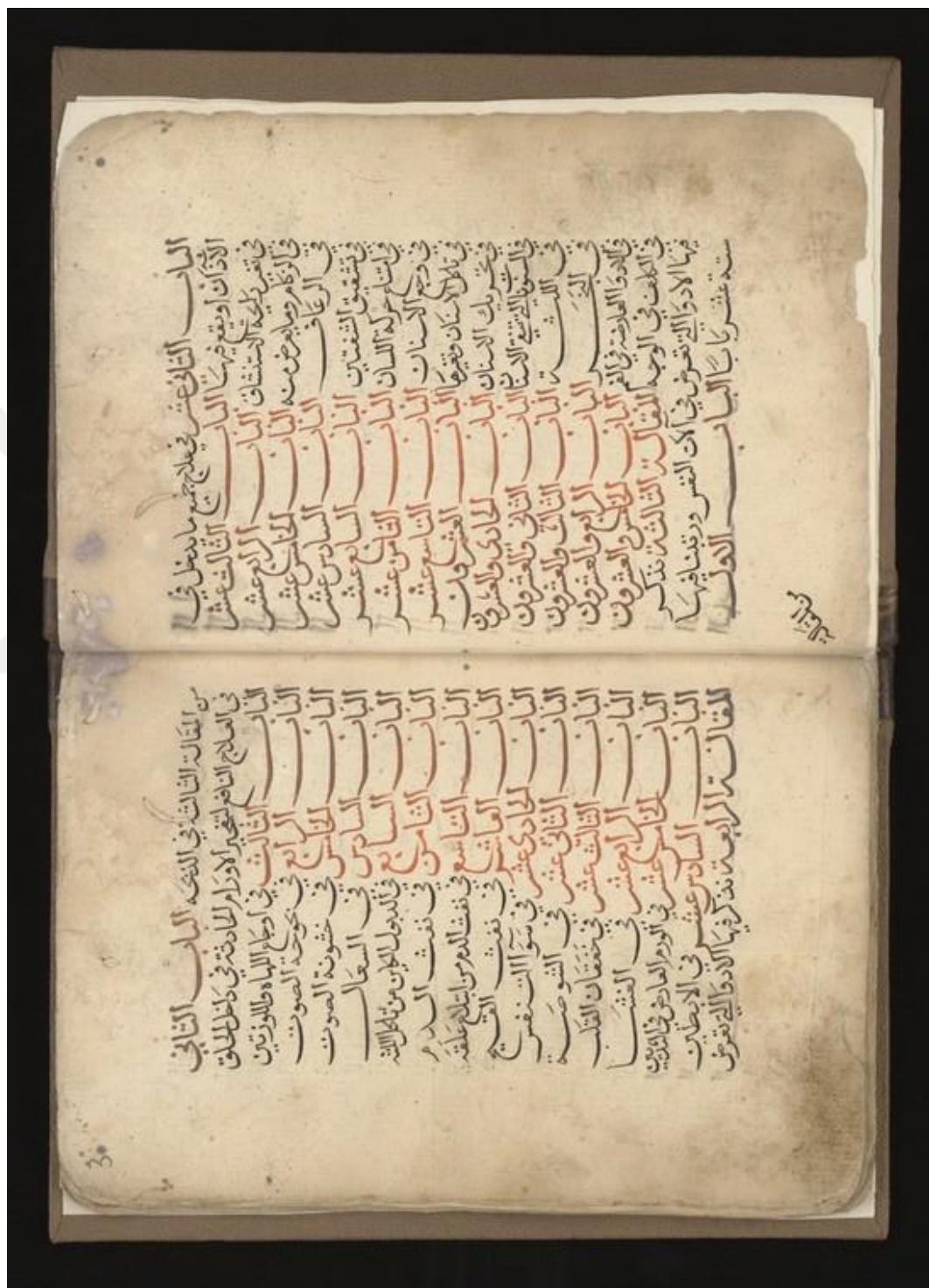
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APPENDICES

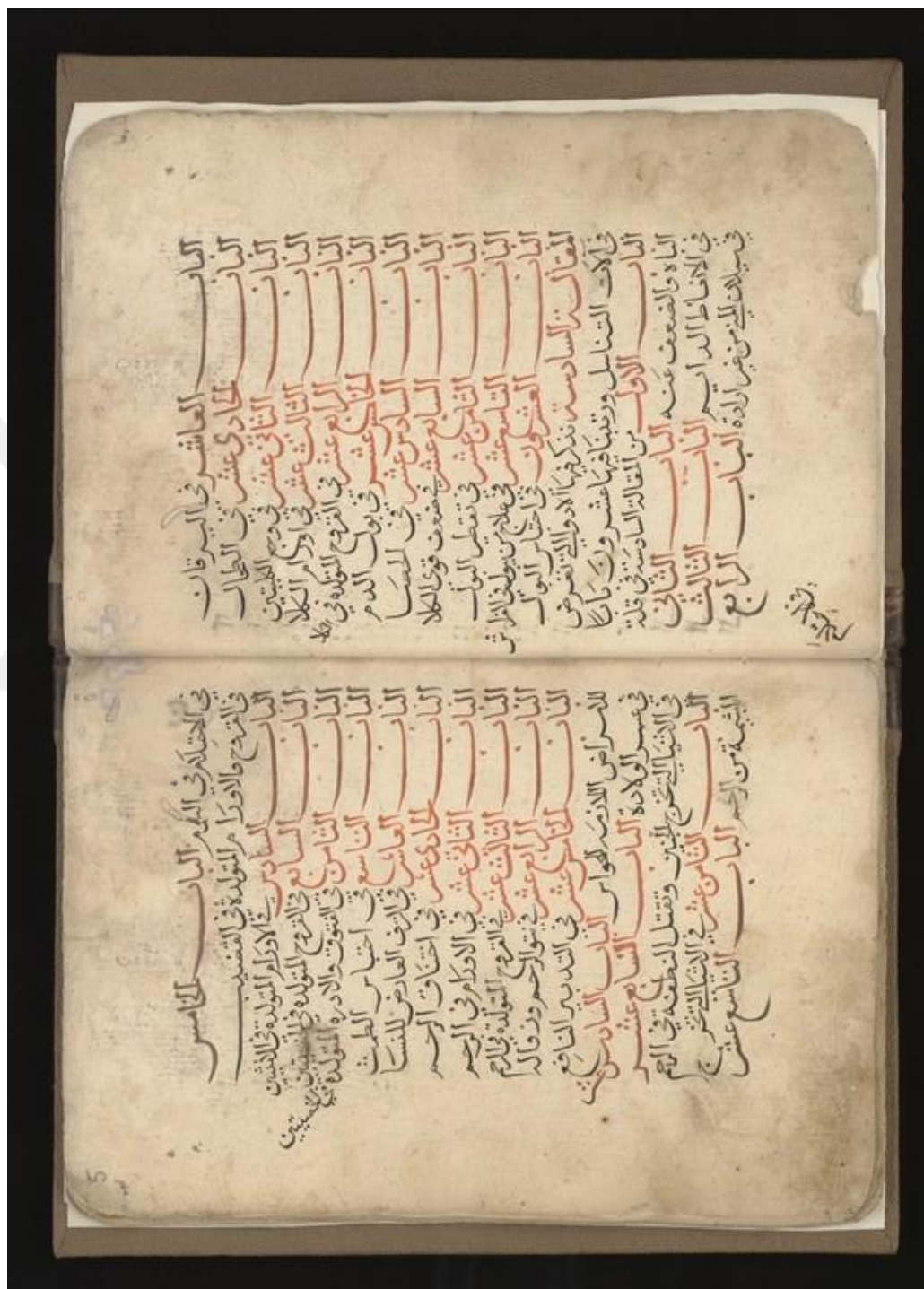
APPENDIX 1



MS Arabic 406. Attribution 4.0 International (CC BY 4.0). Source: Wellcome Collection.









APPENDIX 6

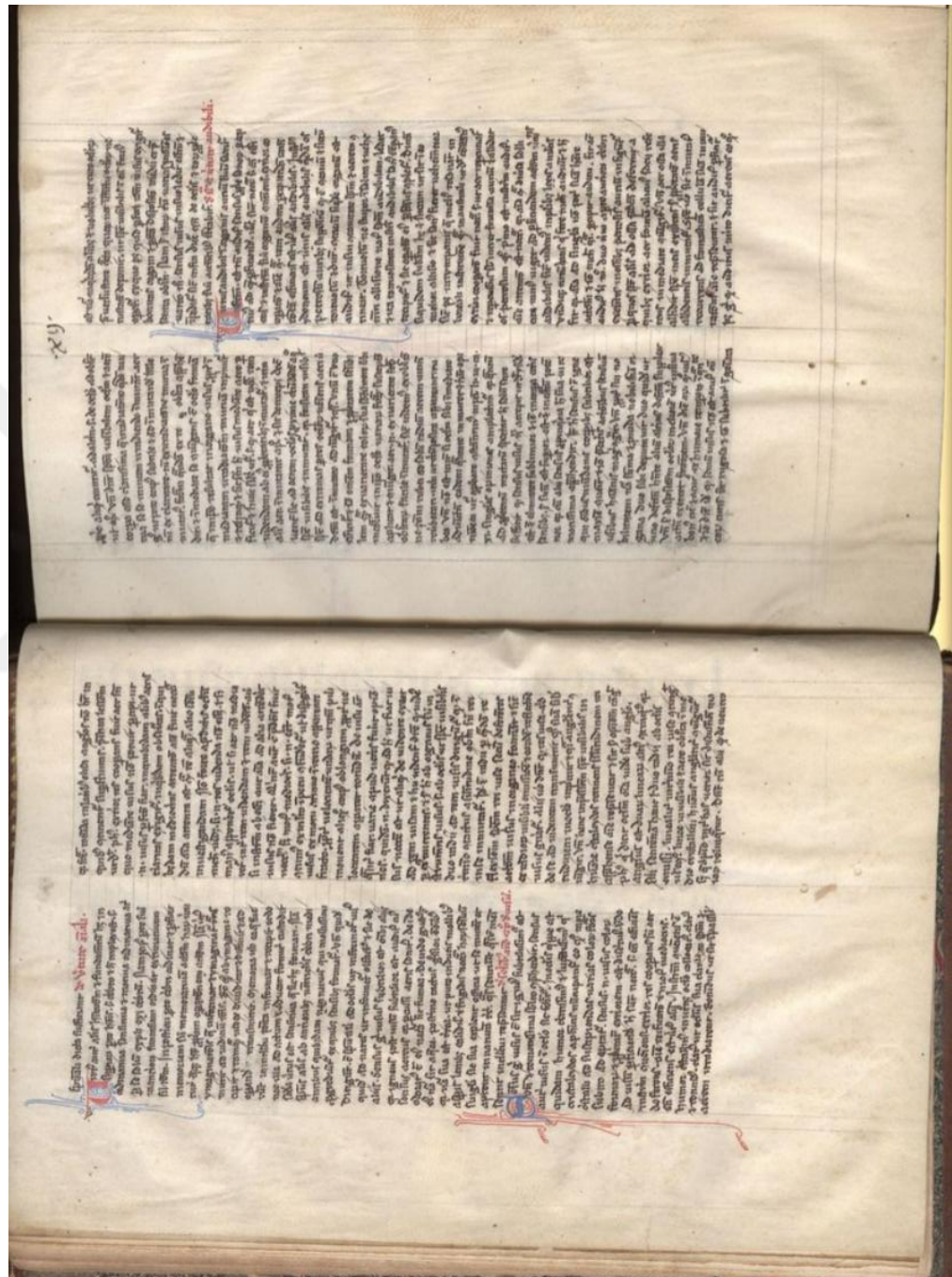
A page from *De proprietatibus rerum* as translated into Middle English by John Trevisa in 1402 and edited by Stephen Batman in 1584.

A GENERALL TABLE, CONTAINING THE number of the Chapters in euery feuerall booke, and how to finde the especiall matters contained in the same.		
Liber primus.	bed of the Philosophers.	
OF the Trinitie. fol. 1.	5 Howe the soule tooke name.	¶ Liber quintus containeth chapters. 66.
Of one and his vnitie. fol. 2.	6 Of the powers of the soule.	1 of the properties of the members in generall.
¶ Liber Secundus, containeth 20. chapters.	7 The same to be Vegetabilis in working, Sensibilis through life, Rationalis by perceiving.	2 of the propertyes of the head.
The first of Angells.	8 of the soule Vegetabile.	3 of the braine.
2 What Angel is, after Damascenus.	9 of the soule sensible.	4 of Caluarin, the fleuell.
3 Why an Angell in bodily shape is painted.	10 of the inner sense.	5 of the eyes.
4 How Angells be described.	11 of the vertue of sensitiue imagination.	6 of the disposition of the eyes.
5 How Angells be compared to materiall things.	12 of the vertue motiue.	7 of the blacke of the eye.
6 of the order of Angells Hierarchies.	13 of the reasonable soule.	8 of the eie liddes.
7 of three Hierarchies.	14 of the vertues of the soule.	9 of the browes.
8 of the order of Seraphim.	15 of the vitall vertue.	10 of the forehead.
9 of the order of Cherubin.	16 of the Animall vertue.	11 of the Temples.
10 of the order of Thrones.	17 of the visibie vertue.	12 of the Eares.
11 of the middle Hierarchy.	18 of hearing.	13 of the nose.
12 of the order of dominions.	19 of Smelling.	14 of the cheekes.
13 of the order of Principatus.	20 of the tast.	15 of the beard.
14 of the order of Potestates, or potentates.	21 of touching.	16 of the iawes.
15 of the third Hierarchy.	22 of those things that are required to the perfection of nature.	17 of the hips.
16 of the order of vertues.	23 The pulses.	18 of the chinne.
17 of the order of Archangells.	24 of the diuersitie of pulses.	19 of the mouth.
18 of the order of Angells.	¶ Liber quartus containeth chapters. 11.	20 of the teeth.
19 of euill Angells.	1 Of the foure qualities Elementaries.	21 The properties of Spectle.
20 of peruerse Angells.	2 of coldnesse.	22 of the voice.
¶ Liber tertius, containing Chapters. 24.	3 of drouth.	23 of the throte.
Of the properties of the soule.	4 of moisture.	24 of the necke.
1 of the discription of man.	5 of meate and drinke.	25 of the thoulders.
2 of the inner man.	6 of humours, of the generation, effect, and working of them.	26 of the armes.
3 of the soule.	7 of bloud.	27 28 of the hands.
4 How the soule is described.	8 of the euill propertye of bloud.	29 of the fingers.
	9 of Fleame.	30 of the nailes.
	10 of Cholar.	31 of the side.
	11 of Melancholy.	32 of the backe.
		33 of the brest.
		34 of the Paps.
		35 of the lungs.
		36 of the heart.
		37 of the breath.
		38 of the stomacke.
		39 of the liuer.
		40 of the gall.
		41 of the spleene.
		42 of the bowells.
		43 of the kidneies.

Batman, S. (1582). Retrieved from: <https://archive.org/details/b30320859/page/n25/mode/2up>

APPENDIX 7

2 pages from *De proprietatibus rerum* written in Latin.



MS at University of Victoria (B.C.). Library Shelf Mark: Ms.Lat.1; Location: Shelf 02/C/01
(Acc. 1984-061) Retrieved from: https://vault.library.uvic.ca/concern/generic_works/d7471ee7-871b-4757-8d1f-37c4d9691103

APPENDIX 8

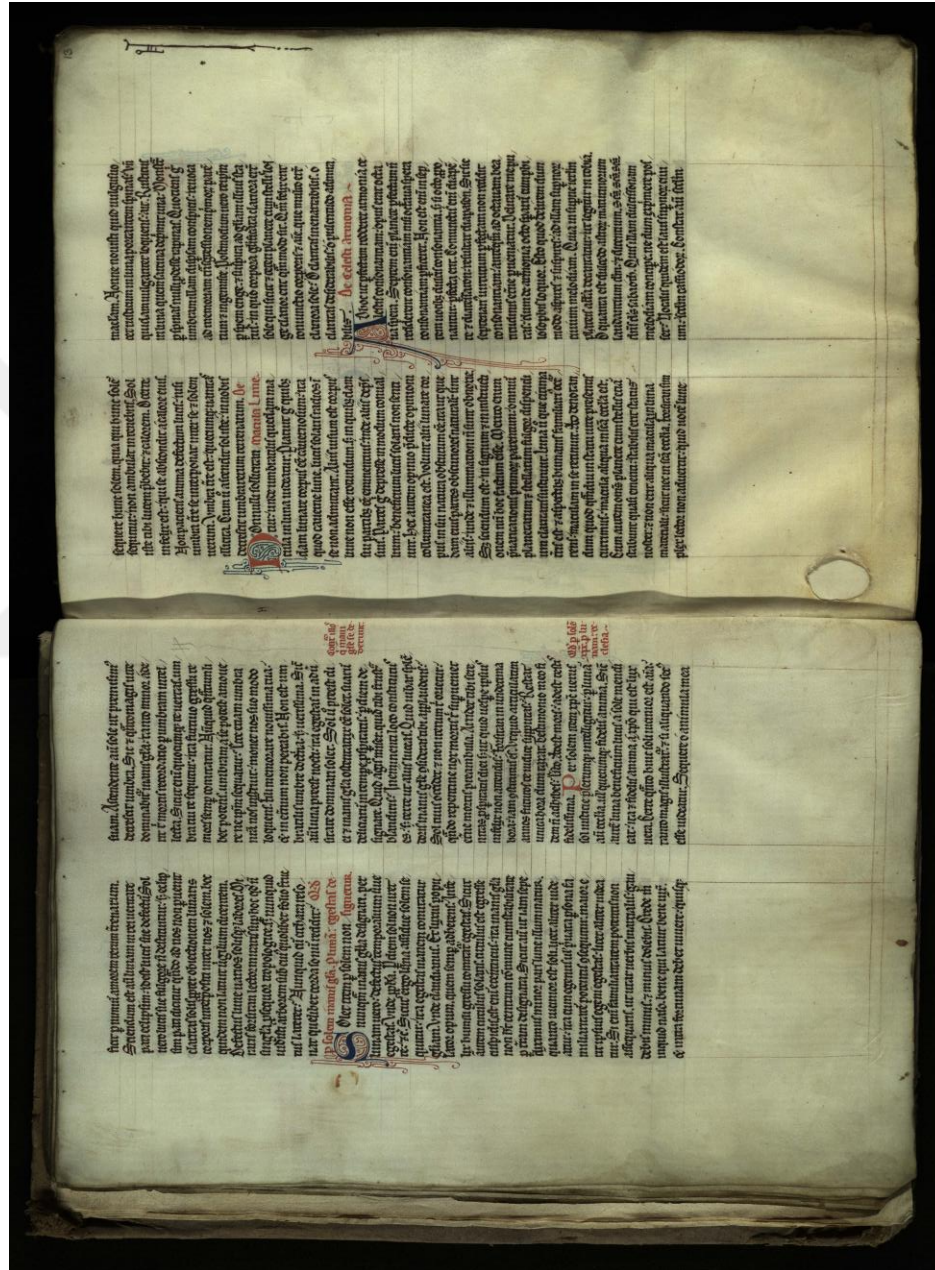
Hunayn ibn Ishaq 9th century CE description of the eye diagram in a copy of his book, Kitab al-Ashr Maqalat fil-Ayn ("Ten Treatises on the Eye"), in a 12th century CE edition



Book of the Ten Treatises of the Eye. (2024, September 13). In Wikipedia. Retrieved from: https://en.wikipedia.org/wiki/Book_of_the_Ten_Treatises_of_the_Eye

APPENDIX 9

Two-page spread from manuscript copy of *De naturis rerum*, by Alexander Neckam, 13th century, that includes the poem “Rusticus in luna.”



De naturis rerum — Rusticus in luna spread *De naturis rerum*, by Alexander Neckam, 13th century, from the collection of Trinity College, Cambridge

Retrieved from: <https://trin-sites-pub.trin.cam.ac.uk/manuscripts/uv/view.php?n=O.4.1#?cv=17>

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-----------------------	---------------	--------------------	------

Educational Background

Graduation		Year
High School	Denizli TEV Anatolian High School	1999-2003
Bachelor's	English Language Teaching, Anadolu University	2003-2011
Master's	English Language Teaching, Akdeniz University	2015-2019
PhD	Mediterranean Medieval Studies, Akdeniz University	2019-2025

Academic Experience

Position	Institution	Year
Lecturer	Eskişehir Technical University, Eskişehir	2020-Present
Visiting Lecturer	Sepuluh Nopember Institute of Technology (ITS), Surabaya, Indonesia	2023
International Relations & Localization Department Member	Turkish Higher Education Quality Council, Ankara	2021-2022
Lecturer	Antalya Bilim University, Antalya	2014-2020

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Turkish	Native
English	Advanced
German	Intermediate
Latin	Latin I, II (PhD program course)
Greek	Limited research proficiency

ACADEMIC WORKS

Articles in Refereed International Journals

Ozbay, R. & Tuztas, Z. (2016). Practising English in Second Life and via Task Based Syllabus: An Evaluation. *International Journal of Language Academy*, 4(2) 282-297. DOI Number: <http://dx.doi.org/10.18033/ijla.396>

Özbay, R., & Arıkan, A. (2024). Norwichli Julian’ın cehennemi: Revelations of Divine Love üzerine bir inceleme. *MESOS Disiplinlerarası Ortaçağ Çalışmaları Dergisi*, 6, 58–66.

Proceedings

Ozbay, R. (2016). Giving feedback on written works through casting. *The 5th International Conference on Language, Literature and Culture*, 27, 12-14 May, 2016, Burdur, Turkey. (EBSCO) <https://files.eric.ed.gov/fulltext/ED569939.pdf>

Book Reviews

R. Özbay, Spectral Sea: Mediterranean Palimpsests in European Culture. Yazar: S. G. Nichols & J. Kupper & A. Kablitz (Eds.), Libri VI (2020) 215-217.

R. Özbay, Ortaçağ'da Avrupa. Yazar: C. Wickham, Çeviren: N. Epçeli, Libri VI (2020) 159-161

Conferences

- 2016** “*Giving feedback on written works through casting.*” The 5th International Conference on Language, Literature and Culture. Mehmet Akif Ersoy University, Burdur.
- 2016** “*Practising English in Second Life and via task based syllabus: An evaluation.*” The 2nd Cukurova International ELT Teachers Conference. Çukurova University, Adana.

Other Presentations

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