NAZARİYAT REVIEW ARTICLE

Orhan Güneş. *Eski ile Yeniye Bakmak: Bir Âlimin Gözünden Modern Astronomi. Hayâtîzâde'nin Efkâru'l-Ceberût Adlı Eseri [Looking from the Old to the New: Modern Astronomy Through the Eyes of a Scholar. Ḥayātīzāde's Work Entitled Afkār al-jabarūt]*. Istanbul: Ketebe, 2021. 538 pages. ISBN: 9786257587921.

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A notable shift has occurred in recent times in the field of the history of science, one in which the traditional discourses and methodological principles are being reevaluated through the exploration of new inquiries. This trend is evident in studies focusing on the nature of scientific and technological change. Historians of science are now seeking to understand the historical processes that shape scientific practices from various perspectives, including the examination of interactions between different cultures. These historians are interested in exploring the conceptual, methodological, and institutional aspects that contribute to the development of modern science. However, the boundaries of cultural interactions are complex and dynamic rather than fixed. Consequently, researchers are increasingly emphasizing two specific elements in their discussions.[1] Firstly, they recognize the importance of addressing the theoretical knowledge structures that are shared across cultures at various levels. Secondly, they acknowledge that there is no singular set of reasons that adequately

1 Many examples can be provided on this subject. For just a few, see Sonja Brentjes, Alexander Fidora, and Matthias M. Tischler, "Towards a New Approach to Medieval Cross-Cultural Exchanges," *Journal of Transcultural Medieval Studies* 1/1 (2014): 9-50; Sonja Brentjes, "Narratives of Knowledge in Islamic Societies: What do They Tell Us about Scholars and Their Contexts?," *Almagest* 4/1 (2013): 75–95; Sonja Brentjes, "Research Foci in the History of Science in Past Islamicate Societies," *Historie* 2 (2022): 270–87.

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DOI dx.doi.org/10.12658/Nazariyat.9.1.D0105en
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explains the contextual factors influencing modern science. The impacts of this approach are also seen in various aspects of Ottoman studies. One area where this is evident is in studies that explore how Ottoman society embraced modern science and technology from Europe. Until approximately the past decade, the exploration of the Ottoman Empire's engagement with modern science and technology had primarily focused on its association with *modernization*. This connection has generally led to the association with attempts to adopt legal and social institutions based on European science and technology, in response to what are considered periods of *decline* in the Ottoman Empire. As an extension of this, the issue of the transmission of scientific developments from Europe into the Ottoman Empire had predominantly been evaluated through modern educational institutions, and this approach resulted in research practices becoming narrowly focused on a particular avenue over time. Thus, researchers who wanted to evaluate from a contextual point of view the internal dynamics of the Ottoman society, which consisted of a wide variety of ethnic and religious groups, sought new possibilities for certain questions regarding scientific knowledge production and/or reception processes.[2] One of these possibilities is embodied in Orhan Güneş's book titled *Looking from the Old to the New: Modern Astronomy Through the Eyes of a Scholar. Hayâtîzâde's Work "Efkâru'l-Ceberût"*.

In his book, Güneş argues that the assumption about the developments in the field of modern astronomy in the West having been imported to the Ottoman Empire through modern educational institutions should be re-evaluated. As evidence for this claim, he presents *Afkār al-jabarūt fī Tarjamat Asrār al-Malakūt*, a translation by Ḥayātīzāde Seyyid Şeref Halīl (d. 1267-68/1851) of the work titled *Asrār al-malakūt*, which had been written in Arabic in 1839-40 by Abbaskulu Ağa Bākīhanlı (d. 1262-63/1846) and presented to Sultan Abdülmecid I (d. 1277/1861) in 1846. The reason why Güneş chose this work is that Ḥayātīzāde had received a madrasa education and been a teacher at the Hacı Nimetullah Madrasa in Üsküdar while writing the work. Güneş designed his book as follows in order to present his argumentation to the reader. It begins with an introduction that provides details

2 For an example study that opens up the discussion on the thesis suggesting that the Ottoman Empire had entered a period of stagnation and decline due to a decrease in interest in cultural and technological advancements, see Miri Shefer-Mossensohn, *Science among the Ottomans: The Cultural Creation and Exchange of Knowledge* (Austin: University of Texas Press, 2015). For a sample study examining what the discussion on science meant for the Ottoman elites in the 19th century, refer to M. Alper Yalçınkaya, *Learned Patriots: Debating Science, State, and Society in the Nineteenth-Century Ottoman Empire* (Chicago: The University of Chicago Press, 2015).

about the reasons for selecting the specific work discussed in the book, as well as the examination methods used. The first chapter focuses on developments in post-telescope astronomy, and the second chapter explores the incorporation of modern astronomy into the Ottoman Empire. The third chapter provides short biographies of Abbaskulu Ağa Bākīhanlı and Ḥayātīzāde. The fourth chapter consists of an analysis of *Afkār al-jabarūt fī Tarjamat Asrār al-Malakūt* from a technical and scientific historical perspective, and the fifth chapter includes a transcription of the work itself. A glossary of terms is found at the end of the book.

In the book's introduction, Güneş starts by providing an overview of the historical connection between astronomy and the broader field of science during both the classical and modern eras. He categorizes this relationship under three distinct classifications: observational astronomy (also known as positional astronomy), theoretical astronomy (involving celestial mechanics), and cosmology. The information given on this subject is short and concise. In this way, readers have the opportunity to have key information about the classical- and modern-period astronomical studies that are generally accepted in the historiography of science. Güneş then continues with the information he gives about the place of modern astronomy in the Ottoman Empire. To begin, Güneş opened his discussion by stating that Ottoman's initial direct encounter with modern astronomy had occurred through Tezkireci Köse İbrahim Efendi's work titled *Sajanjal al-aflāk fī ghāyat al-idrāk* in 1662. Güneş states that the transfer of knowledge had been predominantly limited to translation and practical astronomy and had begun to gain a theoretical character in the mid-18th century, especially with the establishment of engineering schools. The connection between this work and modern astronomy lies in the fact that it encompasses descriptions of three different models of the universe, one of which includes the ideas proposed by Nicolaus Copernicus (d. 1543).[3] This information has been conveyed by many authors since the first time it was put forward in the history of science studies. However, this view is thought-provoking in several respects. The first of these is the direct statement of the Ottomans' "first encounter" with modern astronomy. What Güneş probably means here is that the work in question was the first known work on modern astronomy in the Ottoman

3 Ekmeleddin İhsanoğlu, "Introduction of Western Science to the Ottoman World: A Case Study of Modern Astronomy (1660-1860)," in *Transfer of Modern Science and Technology to the Muslim World: Proceedings of the International Symposium on Modern Science and the Muslim World,* ed. Ekmeleddin İhsanoğlu et al. (Istanbul: Research Centre for Islamic History, Art, and Culture, 1992), 67–120.

Empire. This point is also understood by the more detailed explanation the author gives in the second chapter.[4] Otherwise, considering the inadequacy of studies on the subject in the field of Ottoman science, the claim of the first direct encounter with modern astronomy would have turned into a phenomenon that needs to be supported by stronger evidence. Another issue is the expression that the transfer of knowledge had mainly been limited to translation and practical astronomy and had begun to gain a theoretical character in the mid-18th century, especially with the establishment of engineering schools. In fact, Güneş leaves the door open to other possibilities, and he is right because numerous unresolved matters are found that need to be clarified before making more definitive remarks about Ottoman scholars' stance during the period discussed in this paragraph regarding advancements in the field of astronomy. For instance, some of these include how information about advancements in astronomy from Europe circulated; what specific works, instruments, and other resources Ottoman scholars obtained through these channels; how were they perceived by their counterparts; are the inventories of personal or institutional libraries within the Ottoman Empire able to assist in identifying these sources;[5] how the period up to the presentation and/or printing process of work should be examined and evaluated; and to what degree notebooks of Ottoman scholars that have reached the present have been examined and analyzed in this context.[6] On the other hand, Ottoman scholars frequently used translations as a method for transferring information. However, scientific thought passes through many stages as it travels through the continuum of time and space.

4 Furthermore, we can also find the author's intended expression in another one of his works. For detailed information, see Orhan Güneş, "Kuyucaklı ve Konevî'nin Eserleri Bağlamında 19. Yüzyıl Osmanlı'sında Modern Astronomi", *I. International Prof. Dr. of Fuat Sezgin History of Islamic Science Symposium Proceedings*, ed. F. Başar, M. Kaçar, C. Kaya, A.Z. Fuat (Istanbul: Istanbul University Press, 2020), 194.

5 For an example study on early book inventories, see Judith Pfeiffer, "Emerging from the Copernican Eclipse: The Mathematical and Astronomical Sciences in Mü'eyyedzade 'Abdurrahman Efendi's Private Library (fl. Ca. 1480-1516)," in *I. International Prof. Dr. Fuat Sezgin Symposium on the History of Islamic Science Proceedings*, eds. F. Başar, M. Kaçar, C. Kaya, A.Z. Fuat (Istanbul: Istanbul University Press, 2020), 170–71.

6 For studies on library inventories, notebooks, and translation works can bring to the literature on the history of science in the Ottoman Empire, see Gaye Danışan Polat, "An Anonymous Ottoman Compendium on Nautical Instruments and Navigation: *Kitâbu'l-Mürûri'l-ubûr fî ilmi'l-berri ve'l-buhûr*," *Mediterranea-Ricerche Storiche* 34 (2015), 375-400; Gaye Danışan Polat, "Osmanlı Denizcileri ve Serko Haritası (Quartier de Réduction)," *Osmanlı Bilimi Araştırmaları* 18/1 (2016): 1–25; Gaye Danışan, "Cylinder Dials in the History of Ottoman Astronomy," *Bulletin of The British Sundial Society* 32/3 (2020): 10–15.

First is the process of discovering and then discussing people, ideas, and methods. Subsequently, these ideas can be accepted, rejected, transformed, or reinterpreted based on various factors or justifications. This, along with other factors, is one of the considerations that should be taken into account during the process of historicization. The extent of the translation endeavour should be assessed by considering these stages. However, considering that Ḥayātīzāde's work is related to the mid-19th-century Ottoman Empire, Güneş is understood to want to present the debate about the lack of literature regarding the introduction of modern astronomy to the Ottoman Empire in the context of the book's main research topic and the relevant period. In doing so, the author consciously avoided the risk of diverting attention from the main subject by providing only a brief reminder paragraph in the book's introduction instead of addressing the uncertainties of the earlier period. The author opted to reserve the more comprehensive narrative of this period for the second part of the book. Nonetheless, if one considers that the approach Güneş employed for his argumentation could be applied to an earlier period as well, the claim made could potentially lose its validity due to the methodological inconsistency that would arise.

Orhan Güneş focuses in his book about how delayed the Ottoman capital had been in receiving information about contemporary developments. In the introduction, Güneş expresses his intention to explore and address this question. To accomplish this, he suggests that the information presented in the work should be compared with Western sources from the same period. Following this approach, the first part of the book examines the continuous developments within the realm of modern astronomy in Europe starting from the 17th century when the telescope had been introduced in the field and going up until the mid-19th century. The discussion revolves around various astronomical discoveries, including the discovery and naming of Uranus, the discovery and naming of asteroids, the discovery and naming of Neptune, and the discovery of satellites. Orhan Güneş does not claim to present a complete or comprehensive history of modern astronomy in this section. His purpose is to provide information about the celestial objects that had been discovered in the sky and some developments related to telescope observations. Thus, Güneş prepares the reader for the next chapters in which he technically examines Ḥayātīzāde's work.

The second part of the book concerns the transmission of modern astronomy to the Ottoman Empire. Considering the content of the chapter, Güneş is seen to

continue the narrative technique he used in the introduction and the first chapter. In other words, to support the main theme of the book, Güneş describes Ottoman works that can be associated with the subject of modern astronomy from the 17th to the mid-19th century in chronological order without entering into a detailed discussion. Information on the subject is generally based on secondary sources cited by many researchers in the literature. This method is quite reasonable, especially considering the period that represents the main discussion topic of the book, and ensures that the reader has general knowledge of the literature accepted by the majority. On the other hand, new contributions to the literature have been made through some studies conducted in the past decade. One example of this is a research note published by Pierre Ageron in 2019 on Tezkireci Köse İbrahim Efendi's *Sajanjal al-aflāk fī ghāyat al-idrāk* and discussed in the context of modern astronomy in the Ottoman Empire in light of newly discovered material of his.[7] In this work, Ageron questions the sources of the treatise, which is thought to represent the introduction of the heliocentric universe model to Islamic countries. Ageron argues that the drawings in this treatise representing the three famous models of the cosmological universe should belong to Andrea Argoli's (1648) *Ephemerides* and not to the geocentric Noël Durret's *Nouvelle théorie des planètes*, as suggested.[8] On the other hand, "new" and "modern" are often used interchangeably to describe astronomy in the Ottoman history of science research. An example of this is how Güneş begins with the phrase "new" astronomy instead of "modern" astronomy in the first sentence under the heading "The Transmission of Modern Astronomy into the Ottoman Empire." When considering the classification and explanations made in the context of astronomy studies in the classical and modern period at the beginning of the book alongside the emphasis on "modern astronomy" and "looking at the old and the new" in the title of the book, what the author wants to state is quite clear. However, although this is a very minor detail and generally common usage, it deserves attention due to the ambiguity it creates regarding certain research topics. At the forefront of the events that led to the transformation of astronomy into a modern science were the introduction of the heliocentric system and the use

7 The research note by Pierre Ageron mentioned here is noteworthy in terms of providing an example of the comparative analysis of Ottoman sources and the use of materials such as travel accounts, letters, and other related documents on the studies of the Ottoman history of science. For more detailed information, see Pierre Ageron, "Note sur le dessin du système de Copernic dans le manuscript Kandilli 403," *Osmanlı Bilimi Araştırmaları* 20/2 (2019): 115–23.

8 Ageron, "Note sur le dessin du système de Copernic", 118–19.

of telescopes for sky observations around 1600. These triggering events are part of a complex historical process in which new answers to questions about the nature of the universe and how to explore, study, and articulate it proliferated and new ways were developed to reach those answers. This process is known as a period of the scientific revolution by historians of science and represents the changes in the way of thinking that had developed against conventional knowledge in Europe. Regarding this situation, Paolo Rossi pointed out in the chapter "Old and New" in his book entitled *The Birth of Modern Science* that the word new (*nova*) is almost obsessively included in the titles of hundreds of scientific publications published in Europe and stated that the theme of innovation had spread throughout European culture in the 17th century. Kepler's (1609) work *Astronomia Nova* [The New Astronomy] is one of these.[9] This process then brought with it many developments that supported a new view and understanding of the sky. The two new planets and the satellites and asteroids that have been discovered in the solar system since the 18th century are just a few examples of these developments. On the other hand, especially since the mid-19th century, questions about the composition of celestial bodies and the origin of the universe started gaining importance. Thus, the course of modern astronomy research has changed rapidly with the increase in the importance given to the power of the telescope, the progress of physics, and the inclusion of the spectroscope in celestial body research. The foreword from Irish astronomer and writer Agnes Mary Clerke's (1885; d. 1907) book, *A Popular History of Astronomy during the Nineteenth Century,* is interesting in this regard. Clerke observed that between 1852 when the Scottish astronomer and astronomy historian Robert Grant published *History of Physical Astronomy: From the Earliest Ages to the Middle of the 19th Century*, and 1885 when Clerke herself released her book, a distinct discipline known as new astronomy had emerged alongside the existing old astronomy. For this reason, Clerke wrote her book with the aim of presenting a view of the progress of astronomy in its most characteristic aspects from Herschel's time until 1885.[10] Her book was received positively by the critics of the period due to the success of her approach to the new discoveries in the field of astronomy, both in reaching the general readership and appealing to astronomers,

9 Paolo Rossi, *Modern Bilimin Doğuşu,* trans. Neşenur Domaniç (Istanbul: Literatür Yayıncılık, 2009), 52.

10 Agnes Mary Clerke, *A Popular History of Astronomy During the Nineteenth Century* (London: Adam & Charles Black, 1908), vii–ix. The Project Gutenberg eBook of *A Popular History of Astronomy During the Nineteenth Century*, by Agnes Mary Clerke.

with later editions published in 1887, 1893 and 1902, as well as a reprint in 1908. Referring to the preface of her book's third edition Clerke expressed the following:[11]

> Since the third edition of the present work was issued for publication, the 19th century has run its course and finished its record. A new era has dawned, not by chronological prescription alone, but to the vital sense of humanity. Novel thoughts are rife; fresh impulses stir the nations; the soughing of the wind of progress strikes every ear. "The old order changeth" more and more swiftly as mental activity becomes intensified. Already many of the scientific doctrines implicitly accepted 15 years ago have begun to wear a superannuated aspect.

As can be seen, the contents of the "old" and the "new" astronomy need two control points in the historiography of science. The first of these is the question of what these expressions of old and new mean to their respective interlocutors based on time and place. The other is what historians of science mean by modern astronomy and new astronomy in the context of causality. So how should these checkpoints be handled in Ottoman studies? Should the concepts of old astronomy and new astronomy in Ottoman science be used in a way that corresponds to their meaning in the West or should these concepts try to be explained in the Ottoman context by considering their relation to the period? In other words, what did old astronomy or traditional astronomy mean to Ottoman scholars in the 19th century and what are the contents of the new astronomy being taught? Questions like these need to be addressed in a multifaceted context that takes into account various types of resources. However, because a sufficient variety of Ottoman sources have yet to be studied, giving clear answers to these questions does not seem possible for now.[12] In this respect, Orhan Güneş's book makes an important contribution to moving these discussions forward.

The third part of the book addresses the life and works of Abbaskulu Ağa and Ḥayātīzāde. The book provides concise information about various aspects related to individuals, including their family backgrounds, services, environment, work, and careers. While the details may be brief, they offer the information needed to trace the connections of the work discussed within the context of the Ottoman

11 Clerke, *A Popular History of Astronomy*, v–vi.

12 For an example study on this debate, see Gaye Danışan's article "Fatin Gökmen: Medrese Öğrenciliğinden Dârulfünun Müderrisliğine (1933-1901)» in *Osmanlı'da İlim ve Fikir Dünyası VI: Dârülfünûn and the Reshaping of Higher Education, from Sahn-ı Semân to Dârülfünûn* (Istanbul: Zeytinburnu Municipality Cultural Publications, 2023) (forthcoming).

Empire. In this regard, this particular section of the book does not aim to offer an extensive prosopographical study.[13] Nonetheless, including a list of other works by Abbaskulu Ağa and Ḥayātīzāde accompanied by brief explanations proves valuable in terms of gaining insights into their respective areas of interest. Concluding this section, Güneş emphasizes that Ḥayātīzāde's work titled *Afkār al-Jabarūt* cannot be categorized solely as a translated work, thus highlighting its significance. Güneş asserts that Abbaskulu Ağa's *Asrār al-Malakūt*, initially a compact work, had been expanded significantly through Ḥayātīzāde's explanations, additional content on ongoing developments, and occasional presentation of evidence against the author's claims. Güneş substantiates this claim by providing supporting evidence in subsequent sections. As a result, Güneş summarizes the information presented in the first three chapters, including the introduction, to bolster the main thesis of the book before delving into the analysis of the work.

The fourth section of the book is dedicated to evaluating Ḥayātīzāde's work and serves as the primary section wherein Güneş substantiates his argument against the thesis suggesting that knowledge transfer from the West primarily occurs through modern educational institutions and progresses at a relatively slow pace. Güneş initiates this section by describing the approaches utilized during the transcription and analysis stage of the project. Among these approaches is the act of summarizing either the entire chapter or specific portions of the project before delving into the analysis. This is done to highlight the contributions made by Abbaskulu Ağa and Ḥayātīzāde. After each summary, relevant comments are provided as necessary. Ḥayātīzāde's work encompasses a preamble, three sections comprising a total of 19 chapters, an afterword, and a concluding poem that praises high-ranking government officials. The chapters have undergone thorough scrutiny by meticulously analyzing their titles and adhering to the work's thematic structure. Güneş's primary objective is to assess the extent to which this work made significant contributions to Ottoman astronomy literature. He believes that achieving this goal necessitates conducting a thorough and detailed technical analysis of the work. With this objective in mind, Güneş places immense importance on this subject and constructs his work primarily around this idea. To achieve

13 For various research suggestions including the prosopographical method that can be employed in studies related to the *İlmiye* field, see Mehmet İpşirli, *Osmanlı İlmiyesi* (Istanbul: Kronik Kitap, 2021), 422–23.

this, he incorporated the use of tables, formulas, and figures as needed that were not originally present in the work. This approach greatly aids in comprehending the technical interpretations, making it the standout feature of Güneş's book. Furthermore, Güneş consulted other primary sources as necessary to assess the extent to which the work reflects the advancements in the field of astronomy. As a result, while readers gain a comprehensive understanding of the content within Hayâtîzâde's work, they also have the opportunity to closely observe Güneş's method as a historian of science.

This section of the book provides detailed information about the sources Ḥayātīzāde referenced in his work. While Ḥayātīzāde explicitly mentioned some of these sources, others are elucidated through Güneş's inferences. While Güneş did not extensively delve into the content of each source apart from a few exceptions, shedding light on the sources the author cited is a highly valuable contribution, particularly for researchers interested in exploring these topics in the future. *Cihānnümā* by Kātib Çelebī (d. 1067/1657) is revealed to be among the referenced sources. However, the work mentioned here most likely was reprinted in 1732 by İbrahim Müteferrika (d. 1160/1745) in the Müteferrika's Printing House. Müteferrika made notable additions to this printed edition, including a section on the systems of Ptolemy (d. ca. 150), Tycho Brahe (d. 1601), and Copernicus. In the third chapter, Güneş provides information about this matter; however, he did not specifically address the issue of which version of *Cihānnümā* Ḥayātīzāde utilized in this section. On the other hand, Güneş highlights the fact that some of the sources employed by Ḥayātīzāde, such as Rifāʿa al-Ṭahṭāwī's *Taʿrîbāt al-Shāfiyya* and Mehmed Mustafa's *Mecmūʿa-i Fenn-i Baḥriyya*, originated from Egypt. According to Güneş's analysis, these two works were first translated from Western languages in line with the modernization efforts in Egypt that had commenced in the 1820s and were published in 1838. Güneş highlights that Ḥayātīzāde's work was written in 1847, and this timeframe can provide insight into the pace of information transfer between Cairo and Istanbul. According to Güneş, research in this field has the capacity to uncover the value of non-Western scientific resources.[14] Furthermore,

14 As an example of studies conducted in this regard, the observation of the solar eclipse that occurred on July 18, 1860 in Dunkirk and the determination of the scientific instruments and methods used during this observation with state support can be cited in the report prepared by Maḥmūd al-Falakī, which was published in French and Arabic. For detailed information, see Solmaz Ceren Özdemir, "Osmanlı Astronomisinde Tutulma Hesapları ve Gözlem (1800-1922)" (Master's thesis, Istanbul University, 2021), 187–92.

Güneş draws attention to Ḥayātīzāde's remark about finding the sources he had utilized unsatisfactory and relates this observation to İshak Efendi's *Mecmūʿa-i ʿUlūm-i Riyāẓiyye*, which was considered a principal source for modern sciences during that era. Güneş suggests that Hayâtîzâde was cautious when referencing İshak Efendi's text, particularly on matters concerning cosmology.

In Ḥayātīzāde's work, various sections, particularly the preamble, preface, and afterword, discuss topics pertaining to models of the universe. Staying true to his methodology, Güneş offers his comments on this subject based on the information presented in the text. When considering these comments collectively, Abbaskulu evidently focused solely on the Ptolemy and Copernican systems, while Ḥayātīzāde supplements these with explanations regarding the Tycho Brahe model. According to Ḥayātīzāde, the reason for this was the lack of popularity of the model Tycho Brahe had proposed. In the explanatory section, Ḥayātīzāde briefly introduces the subject of universe models. He starts by providing a comparative overview, highlighting the Ptolemaic school advocated by Ptolemy and his successors as the old astronomy committee, and the emerging new astronomy committee to be associated with Pythagoras and his followers, later followed by Copernicus. Ḥayātīzāde then mentions the model put forth by Tycho Brahe in a separate sentence, noting that it lacks defenders and is no longer widely recognized. Given that this topic was also covered in other Ottoman works of the period and holds significance in Ottoman astronomy literature, Güneş promptly provides a concise summary of this section and proceeds to an extensive interpretive stage. Güneş offers insights into the historical progression from the geocentric to the heliocentric model of the universe in order to effectively comment on the individuals representing the old and new models Ḥayātīzāde had mentioned, as well as who their successors might be. The detailed account provided at this juncture pertains to the section in the book's introduction explaining the geometric models introduced in the classical and modern eras. In essence, Güneş indirectly refers to the book's introduction when noting that Ḥayātīzāde's concise explanation in this paragraph is associated with celestial mechanics, which encompasses theoretical astronomy. Furthermore, Güneş in another section of the book highlights how Ḥayātīzāde had effectively analyzed the religious and scientific justifications behind the model proposed by Brahe. According to Abbaskulu, the choice should be based on what is deemed suitable for reason and Sharia, which in this case is the Copernican system. Orhan Güneş emphasizes that what is referred to as

reason here pertains to the principles of the mathematical sciences. Ḥayātīzāde evidently endorsed Abbaskulu's ideas in this regard and incorporated them into the categorization of sciences, particularly in the field of astronomy and geography, under the heading of *fāʾide* [beneficial knowledge]. The observations Güneş makes regarding this aspect are also significant. Güneş points out how Ḥayātīzāde had employed the Western equivalent term *astarnûmiya* instead of the Arabic term *ilmü'l-hey'et* for astronomy, and Güneş concludes that Ḥayātīzāde was attentive to the historically accurate etymology on such matters. The term *astarnûmiya* is the specific word Güneş references. However, as the word is not explicitly mentioned in Güneş's commentary, readers who wish to discover it would need to refer to the transcription of the work found in the fifth chapter of the book. Additionally, Güneş underscores how Ḥayātīzāde's explanations regarding astronomy and geography are intertwined and contradictory. Güneş suggests that this might be attributed to Ḥayātīzāde's utilization of sources that hold differing views on the subject matter.

Another observation Güneş makes involves the intellectual harmony that Ḥayātīzāde had established regarding the intersection of religion and science, specifically in the context of modern astronomy. According to Ḥayātīzāde, astronomy does not provide exact knowledge due to its reliance on sensory perception in the acquisition of knowledge. Consequently, as astronomy cannot be the subject of religious knowledge, Ḥayātīzāde sees no need to pass judgment on whether his findings align with or contradict religious beliefs. In order to assess this situation, Güneş conducts an examination of Kuyucaklızāde's work titled *Tashīl al-idrāk Tarjama-i Tashrīḥ al-aflāk*, which was part of the madrasa circle, as well as İshak Efendi's *Mecmūʿa-i ʿUlūm-i Riyāẓiyye*, which served as the principal source for the Engineering School of the Imperial Arsenal. Güneş made comparisons between these works and Ḥayātīzāde's text. According to Güneş, while an attitude is observed in Ḥayātīzāde's work similar to the one seen in Kuyucaklızāde's work, no such assurance is found in the sections of İshak Efendi's *Mecmūʿa-i ʿUlūm-i Riyāẓiyye*, particularly concerning cosmology.[15] Another intriguing aspect is Ḥayātīzāde's statement suggesting that accepting the heliocentric model would cleanse astronomy of its philosophical impurities and pave the way for a more advanced astronomy. Güneş

15 Orhan Güneş's comments on these subjects have been discussed more comprehensively in various articles. For detailed information, see Orhan Güneş, "Kuyucaklı ve Konevî'nin Eserleri Bağlamında 19. Yüzyıl Osmanlı'sında Modern Astronomi", 193–200; and "İshak Efendi'nin *Mecmûa-i Ulûm-i Riyâziyyesi*'nde Güneş Sistemi" *Medeniyet Kültürel Araştırmaları Belleteni* 2/2 (2022): 8–23.

argues that the term "dirt" used in this context to cleanse astronomy from the dirt of philosophy specifically refers to Aristotelian cosmology.

Another significant observation Orhan Güneş makes pertains to Ḥayātīzāde's explanations regarding why the Ptolemaic model had been widely accepted for an extended period. Güneş notes that Ḥayātīzāde nearly verbatim had quoted the arguments presented by İshak Efendi on this matter. This aspect is particularly significant for illustrating the networks of interactions among scholars during that period. Furthermore, when assessing the concise history of astronomy Abbaskulu provided and the additions Ḥayātīzāde made on this subject, Güneş asserts that Ḥayātīzāde had displayed a more advanced understanding of the history of science compared to Abbaskulu.

Another notable aspect concerns Abbaskulu's criticisms of the Ptolemaic model, which he presented as doubtful and objectionable, and Ḥayātīzāde's subsequent additions to these criticisms. Güneş aimed to provide a detailed explanation of these doubts and objections, offering a comprehensive technical analysis of the subject matter. However, a slight printing error occurred that may cause confusion for readers. In the respective section, instead of providing four items for the critique on four different issues, only two items were listed. Furthermore, the third item was mistakenly repeated as the first item, and the discussion continued with the second item. Nonetheless, readers can still grasp the content of these objections by referring to the transcription of the original work, which is provided in the fifth chapter of the book. The key aspect to be mindful of here is the manner of presentation in the original work. While Abbaskulu explicitly stated his initial three objections to the subject, the text becomes intricate with the additions Ḥayātīzāde made. However, apart from not considering this minor printing error, Güneş has evidently analyzed this intricacy in the original work with diligence and effectively conveyed it to the reader.

In conclusion, Güneş's findings on these matters hold significance. However, these comments may at times not receive sufficient emphasis due to the applied analysis technique and Ḥayātīzāde's partial treatment of the subject. One possible solution for addressing this is to present historical information about the universe models used in these chapters in a separate chapter, similar to how the first chapter is dedicated to the period of post-telescopic discoveries. This chapter could then be referenced as needed, providing additional context and clarity. Subsequently, this topic can be comprehended holistically in the context of history of the Ottoman

astronomy. However, this is not a significantly crucial matter, as the reader has the opportunity to engage in comparative reading whenever necessary. By referring to the original content provided in the fifth chapter that presents the work's transcription, readers can conveniently follow the relevant paragraphs and gain a comprehensive understanding.

Güneş's comprehensive technical analysis of *Afkār al-Jabarūt* enables a better understanding of Abbaskulu's and Ḥayātīzāde's expertise in the field of astronomy during that period and the extent to which they had kept up with advancements in the field and acquired relevant information. For instance, Güneş's findings regarding the length measurements provided in relation to the condition and shape of the Earth in the initial part of the work exemplify this clarification. Given the variations in length measurements throughout history, any contribution in this regard holds significant value. In light of Ḥayātīzāde's provision of a length equivalent to 1 degree of latitude while elucidating the mile employed by Westerners, Güneş presents a table displaying the modern counterparts of the length measurements Ḥayātīzāde mentioned for *kıl* [hair], *arpa* (şaīr) [barley], *parmak* (ısbā') [finger], *arşın* (zirā) [cubit] ve *hatve* (adım),[16] considering both European and Islamic miles. Likewise, Güneş aims to ascertain the accuracy of the values presented in Ḥayātīzāde's table of mathematical climates. Through his analysis, the values Ḥayātīzāde provided are discovered to be reasonably accurate. Consequently, the approach Güneş employs not only makes the specific values and information implicitly conveyed by Abbaskulu and/or Ḥayātīzāde more comprehensible and significant to the reader while also bringing forth the discrepancies surrounding certain astronomical values. Furthermore, Güneş's technical analysis has uncovered errors in the counterarguments against the evidence presented by those who refute the notion of Earth's mobility. In certain instances, Ḥayātīzāde appears to evidently rectify the mistakes Abbaskulu had made. However, Ḥayātīzāde is also observed to have reverted to the classification of sciences. Güneş provides a specific evaluation on this matter in the book's conclusion. According to Güneş, the absence of a unified discussion on the classification of sciences in one place and the author's repeated return to this subject disrupt the coherence of the work and constitute a technical flaw.

16 Units of measurement used in Ottoman astronomy.

Another intriguing topic in the initial section of Ḥayātīzāde's work is the segment titled "Directions". Ḥayātīzāde apparently made a comprehensive addition to the information provided by Abbaskulu regarding the different aspects. According to Ḥayātīzāde, the primary and intermediate directions are as follows: North/ Yıldız, South / Kıble, East / Gündoğusu, West / Batı; Southwest / Lodos, Southeast / Keşişleme, Northeast / Poyraz, Northwest / Karayel. In addition to these, sixteen-quarter winds were included, resulting in a total of 32 winds. Güneş provides a summary of this section and highlights it for the reader's attention, yet does not delve into a detailed commentary on the subject. However, upon examining the relevant portion from the transcription text, the following observation appears to have been contributed: the four main directions, eight primary winds, eight intermediate winds, and 16 quarter winds mentioned here are aligned with the compass rose commonly utilized in the Mediterranean region.[17] Furthermore, certain calendars feature illustrations depicting the names of directions, offering insight into the approaches Ottoman scholars made toward this subject.[18] Ḥayātīzāde's mention of books related to geography and specifically *fünūn-ı baḥriyye* [maritime/naval sciences] serves as a significant indication. Mehmed Mustafa's *Mecmūʿa-i Fenn-i Baḥriyya* is notably among the sources Ḥayātīzāde referenced. Moreover, other works are likely to have occurred on this subject within the Ottoman literature.[19] Whether the anonymous short treatises and books on ancient astronomy that are included among Ḥayātīzāde's sources are one of these remains uncertain. Finding the answer to this question

17 Gaye Danışan Polat, "16. Yüzyılda Osmanlılarda Deniz Astronomisi ve Astronomi Aletleri" (PhD Thesis, Istanbul University, 2016), 295–98.

18 The findings regarding this topic were obtained within the scope of the project titled "A Comparative Study on the Theoretical and Practical Aspects of Scientific Activity in the Ottoman Empire: Annual and Perpetual Calendars (1550-1710)", supported by TÜBİTAK 1003 R&D Priority Areas Program (Project No. 119K827). As an example, the calendar compilation of Necmeddīn b. Seydī Mehmed can be cited (Neğm ed-Din ibn Sidi Mohammed, Recueil d'almanachs, Bibliothèque nationale de France, MS Turc 183, 35r. https://gallica.bnf.fr/view3if/ga/ark:/12148/btv1b8550873b/f34). An additional example is the single-page calendar belonging to Derviş Mehmed el-Ḥasīb el-Mevlevī. For detailed information about this calendar, see Gaye Danışan, "An Unusual Example of Ottoman Paper Instruments: The Calendar of Derviş Mehmed el-Hasîb el-Mevlevî," in *Science, Technology and Beauty: Glimpses of Al-Andalus and the Ottoman Empire*, eds. Darina Martykánová & Cumhur Ersin Adıgüzel (Istanbul: Istanbul University Press, 2023) (forthcoming).

19 Among the various sources containing information about directions, examples can be given such as Kātib Çelebi's work *Tuhfetü'l-Kibār fī Esfāri'l-Bihār* and Petros Baronyan's work *Kitāb-ı Cem-nümā fī Fenni'l-Coğrafya*. For detailed information, see Danışan Polat, "16. Yüzyılda Osmanlılarda Deniz Astronomisi ve Astronomi Aletleri," 296–98.

proves challenging at this stage. However, the need to examine and scrutinize diverse scholar profiles and various sources in this field through a multifaceted cross-reading approach becomes evident once more. Additionally, the question of why Ḥayātīzāde felt the need to add such extensive details to this subject is intriguing because the directional information Abbaskulu provided in this chapter appears to be adequate within the scope of the book. However, the inclusion of additional details also holds significance as it offers insights into the interests and knowledge of Ottoman scholars. A similar significance can be attributed to Ḥayātīzāde's inclusion of the Tycho Brahe system. Such clues evidently are essential considerations when interpreting the contributions of various scholar profiles to the literature, particularly in the context of Islamic Civilization.

The second chapter of Ḥayātīzāde's work is titled *Afkār al-Jabarūt fī Tarjamat Asrār al-Malakūt* and concerns celestial bodies with five sections respectively covering the Moon, the Sun, planets and satellites, comets, and stars. Similar to other sections, Güneş reevaluates the astronomical values and explanations Abbaskulu and Ḥayātīzāde provided by recalculating their accuracy and basing his interpretations on these reassessments. On the other hand, and as Güneş stated at the beginning of the analysis phase, he should be noted to provide a summary of the section he identifies and emphasizes in his analysis, rather than presenting an overview of the entire chapter. For instance, the first section addressing the topic of the Moon makes no mention in its introductory sentences explaining why the Moon is discussed before the Sun, the existence of 11 celestial bodies indicated by astronomers in the field of new astronomy, or the subsequent increase to 12 with the discovery of Neptune by the French mathematician Urbain Jean Joseph Le Verrier (d. 1877). As the author also states, these subjects will be addressed in the third section, which focuses on the planets. Therefore, Güneş begins with the three motions of the Moon as described by Ḥayātīzāde. Through his analysis of these three motions, Güneş reveals that Ḥayātīzāde's statement, "13-year motion (tropical month) is equal to 1 lunar year (duration of 12 synodic periods)" is incorrect. On the other hand, Güneş's study indicates that Ḥayātīzāde's contributions to Abbaskulu's statements are the most accurate. According to the information provided, while Abbaskulu offered details about the diameter and size of the Moon, Ḥayātīzāde referred to İshak Efendi's work *Mecmūʿa-i ʿUlūm-i Riyāẓiyya* for ratios concerning the diameter, surface, volume, and mass of the Moon. Another noteworthy observation Güneş makes relates to length measurements. Ḥayātīzāde presented the apogee, perigee, and average distance of the Moon in terms of the French *lieue*

measurement, while Abbaskulu expressed these values in miles. Güneş points out that which unit of measurement Abbaskulu used in this context is unclear. Based on the calculations made later in the work, however, that this should be the German mile becomes evident. This detail is significant, as it indicates the use of different sources by different scholar profiles during the process of assimilating new astronomical knowledge.

Another topic in this section involves lunar and solar eclipses. Güneş highlights the information Ḥayātīzāde provided regarding the solar eclipse that occurred on Shawwal 28, 1263 AH (October 9, 1847). After analyzing the given information, Güneş compares this eclipse data with the eclipse announcement in the *Takvīm-i Vekāyī* newspaper from Shawwal 8, 1263 AH (September 19, 1847). Güneş states that the information Hayâtîzâde provided regarding the timing and duration of the eclipse was more accurate. However, another eclipse report published in the *Cerîde-i Havâdis* newspaper on Shawwal 24, 1263 AH needs to be mentioned. This news article about a solar eclipse included statements from the British astronomer Sang who resided in Beyoğlu. The British astronomer mentioned here would likely be the Scottish mathematician Edward Sang (d. 1890), who taught at the Imperial Engineering School (*Mühendishâne-i Berrî-i Hümâyûn*) between 1841-43. When comparing the data in these two newspaper articles, the difference between them is intriguing.[20] However, the fact that the information provided in the newspaper may have pertained to an unobserved event is important to remember. Considering that Ḥayātīzāde's book was completed before July 7, 1848 (Sha'ban 5, 1264 AH) and printed from November 27 to December 6, 1848 (Muharram 1-10, 1265 AH), the eclipse data he provided is expected to be accurate. On the other hand, the reason Ḥayātīzāde specifically chose this eclipse as an example might be related to the interest it had received in the Ottoman Empire.

Another interesting subject of the work involves sunspots. According to Güneş, Abbaskulu summarized the studies on sunspots by Friedrich William Herschel (d. 1822) and Johann Elert Bode (d. 1826). On the other hand, Güneş's observations about newly discovered celestial objects contribute to the research on whether the new developments in astronomy had entered the sphere of interest of Ottoman scientific circles primarily through modern educational institutions like the engineering school, as assumed, or rather through the ulama of madrasah

20 For eclipse news and comparison, see Özdemir, "Osmanlı Astronomisinde Tutulma Hesapları ve Gözlem (1800-1922)", 176–80.

origin, contrary to expectations. Güneş presents the number of planets and moons mentioned in the work, as well as their orbital periods and other related topics in comparative detail and highlights how Hayâtîzâde incorporated the scientific advancements that had occurred during the translation process into his work. For example, the copy of the work Abbaskulu presented to the sultan is said to have no information about the planet Neptune but does mention that another planet might exist between Uranus and the nearest star. According to Güneş, the reason for this is that this planet had recently been discovered. However, Hayâtîzâde made a note about Neptune along with its historical information. The same applies to the asteroid Hebe, discovered by the German astronomer Karl Ludwig Hencke (d. 1866) on July 1, 1847. Güneş relates this situation to the news published in *Takvīm-i Vekāyī*. With this approach, Güneş once again emphasizes how the importation of scientific knowledge had an alternative channel through newspapers or magazines instead of foreign books. According to Güneş, Ḥayātīzāde referred to İshak Efendi's work whenever needed and additionally acted cautiously when providing the number of satellites in the solar system. In contrast, Güneş points out the discrepancy between the number of celestial bodies Ḥayātīzāde mentions at the beginning of the work and the later increase in number to be due to discoveries made during the writing of the work. Güneş highlights that why the author did not make the necessary revisions by looking back needs to be questioned.

In the second chapter's fourth section discussing comets, Güneş observes how Ḥayātīzāde had established a clear line between Aristotelian philosophy and himself. According to Güneş, this is significant in terms of demonstrating the perception of classical philosophy. Another interesting point here is Güneş's brief comments regarding Hayâtîzâde's use of the term *müneccim*. According to Ḥayātīzāde, although the term *müneccim* had been used for thousands of years both for astronomers and astrologers, astronomers in his time would be more appropriately referred to as *heyevī*, *kevkebī*, *felekī*, or *rāṣıd* to avoid the connotation of deriving predictions from stars, which is now considered a "meaningless interpretation" by people. This is quite an important issue because with this suggestion, Ḥayātīzāde not only emphasized the distinction between astronomy and astrology but also reflected the stance of an Ottoman scholar against the understanding created by the developments in the field of science during that period.[21]

21 For a brief assessment article that discusses the distinction between astronomy and astrology from a historical perspective, see Alexandre Losev, " 'Astronomy' and 'Astrology': A Brief History of an Apparent Confusion," *Journal of Astronomical History and Heritage* 15/1 (2012): 42–46.

In the second chapter's final section discussing stars, Ḥayātīzāde interestingly added information about Tycho Brahe's observation of the supernova in 1572 as an addition to Abbaskulu's explanation of the Milky Way. Ḥayātīzāde's frequent references to Tycho Brahe's work both at the beginning of the work and in this section raise curiosity about the extent to which Tycho Brahe's work had attracted the attention of other Ottoman scholars. Another intriguing aspect of this section is the discussion of other solar systems and the possibility of life in those systems. According to Güneş, Abbaskulu and Ḥayātīzāde shared the belief that other solar systems with life exist. Orhan Güneş finds it interesting and daring that an intellectual trained in the classical educational tradition could openly discuss and accept such views in the text. Güneş is quite right in this regard and once again emphasizes the need for multidimensional studies in research on the Ottoman history of science.

Hayâtîzâde's third section of his work involves the reasons for the harmonious movements of celestial bodies and the laws that ensure this harmony. This section consists of two parts: one about Kepler's laws and the other about Newton's law of universal gravitation. As in the other sections, Orhan Güneş continues with the technical analysis method to determine the extent to which Abbaskulu and Ḥayātīzāde had understood these topics correctly. Through this approach, evidence clarifies which additions and objections Ḥayātīzāde made to Abbaskulu were accurate and/or erroneous.

Orhan Güneş notes that the section in Ḥayātīzāde's work that had attracted the most attention from researchers so far is the final section of the work, known as the "*Hātime*" [Conclusion]. However, Güneş points out that this section is related to the interpretation of Quranic verses and hadiths in light of modern astronomical findings. According to Güneş, this contextualization has led to a decrease in the attention the work deserves, despite it containing important theoretical issues.

In conclusion, Orhan Güneş successfully demonstrates through his detailed technical analysis in his book why Ḥayātīzāde's work *Afkār al-Jabarūt* cannot simply be classified as a translation. Furthermore, through this concrete example, Güneş challenges the assumption that the developments in modern astronomy in the West were only imported to the Ottoman Empire through modern educational institutions, instead suggesting that the solution to this issue lies in the comprehensive evaluation of many overlooked works in Ottoman literature. These valuable contributions are strong aspects of the book. This study hopes to inspire researchers and encourage further investigations supported by prosopographical studies.