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SCIENTIFIC REPERTOIRES IN OTTOMAN

AND TURKISH SOCIETIES:

TRANSFER OF SCIENTIFIC KNOWLEDGE

THROUGH TRANSLATION

Osmanlı ve Türk Toplumlarında Bilim Repertuarları:

Bilimsel Bilginin Çeviri Yoluyla Aktarımı

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Abstract

Historical translation studies have mainly concentrated on literary repertoires in Turkey for more than thirty years, leaving the other repertoires in the shade. This article will focus on scientific repertoires, one of the neglected repertoires, paying attention to their formation through translation. Scholarly studies have shown that Ottoman and modern Turkish societies have hosted a plethora of scientific encounters via translations from eastern and western languages since the 14th century. As the critical reading of secondary sources illustrate, individual and institutional agents of translation have played a pivotal role in selecting, importing and adapting scientific knowledge and models into the Ottoman and modern Turkish scientific systems. The present research has shown that history of science is closely linked to history of translation in Turkey. To this end, this article is an attempt to open up possible research areas for translation historians regarding the scientific repertoires generated in the Ottoman and Republican periods. The article further suggests that three research topics stand out as deserving attention from translation historians: a) conceptualization of translation and diverse practices of translation in the scientific repertoires, b) scientific concepts and nomenclature which were imported and developed through translations and retranslations, and c) the status and roles of individual and institutional agents who were involved in selecting, producing and promoting the translations of scientific texts.

Keywords: historical translation studies, scientific repertoires, agent of translation

Özet

Türkiye’de çeviri tarihi araştırmalarının odak noktasını son otuz yıldır edebiyat repertuarları oluştururken diğer repertuarlar gölgede kalmaktadır. Bu makale çeviri tarihçileri tarafından çoğunlukla göz ardı edilen bilim repertuarları ve özellikle bu repertuarların çeviri yoluyla oluşması konusu ile ilgilidir. Yapılan akademik araştırmalar, Osmanlı ve modern Türk toplumlarının ondördüncü yüzyıldan başlayarak doğu ve batı dillerinden çeviriler yoluyla birçok etkileşimi barındırdığını göstermektedir. Bu araştırmalar üzerinde yapılan eleştirel okuma, bireysel ve kurumsal çeviri öznelerinin bilimsel bilgi ve modellerin seçiminde, ithal edilmesinde ve Osmanlı ve modern Türk bilimsel sistemlerde benimsenmesinde öncü rollere sahip olduklarını ortaya çıkarmıştır. Makalede vurgulanan bir diğer önemli konu da Türkiye’de bilim tarihinin çeviri tarihi ile olan yakın bağlantısıdır. Bu çalışma Osmanlı ve Cumhuriyet dönemlerinde üretilen bilim repertuarları konusunda çeviri tarihçilerine yeni araştırma alanları sunmayı hedeflemektedir. Çeviri tarihi araştırmaları için özellikle önemli olduğu düşünülen üç araştırma başlığı önerilecektir: a) bilim repertuarlarında gözlemlenen çeviri kavramı ve çeşitli çeviri pratikleri, b) çeviriler ve yeniden çeviriler yoluyla

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ithal edilen bilimsel kavramlar ve terimler, c) bilim metinlerinin seçimi, üretilmesi ve yaygınlaşmasında etkin rol oynayan bireysel ve kurumsal çeviri özneleri.

Anahtar Kelimeler: çeviri tarihi araştırmaları, bilim repertuarları, çeviri öznesi

Introduction

The role of translation in the dissemination of scientific knowledge across languages and cultures has attracted scholarly attention mostly from outside the field of translation studies.² Only recently the important status of translation and translators as key “agents of change” (Toury, 2002) in scientific repertoires (Even-Zohar 2002) has become a subject of research with/in the discipline of translation studies.³ Similar to the research in the world, the circulation of scientific knowledge via translations has been widely studied by scholars from the field of history in Turkey. Mostly canonized, but also popular translated literature and the dynamics they have generated in Ottoman and Turkish literary systems have been studied for more than 30 years, notwithstanding non-literary field is still waiting for translation historians for further questioning (Paker et al., 2015).

The research on the role of translation in the literary polysystems in Turkey has mainly relied on Itamar Even-Zohar’s “polysystemic approach” (1990). Saliha Paker’s (1986) early studies on the position of translated European literature in the late Ottoman literary polysystem have paved the way for translation historians to explore the previously unnoticed function and status of translations, translators and institutions in literary, cultural and political history.⁴ This fact is aptly shown in the inclusive introduction Saliha Paker, Şehnaz Tahir Gürçağlar and John Milton wrote to their book published in 2015 (Tahir Gürçağlar et al., 2015). Having employed a systemic approach, many of the studies in Turkey address individual translators as agents of change in “culture planning” (Toury, 2002) activities, most of which focus on the literary translations of these agents⁵, while many others focus on the status and many roles of translations in the Turkish literary⁶ and non-literary⁷ repertoires by contextualizing their textual and paratextual materials.⁸ Recently, the role of translation and the discourse surrounding translations about the reception of authors in the target “culture repertoires” (Even Zohar, 2002) have started to be a subject matter of increasing number of studies.⁹ Academic works on translations have gained a new interdisciplinary perspective after Tahir Gürçağlar’s

² For some of these studies, see Montgomery 2000, 2009; Renn 2012; Elshakry 2013.

³ For instance, Olohan and Salama-Carr 2011;

⁴ For instance, Bengi Öner 1990, 1999; Tahir Gürçağlar 2002, 2008, 2014; Karadağ 2003; Demircioğlu 2005; Berk 2006; Ayluçtarhan 2007; Eker Roditakis 2010.

⁵ For instance, Tahir Gürçağlar 2009; Demircioğlu 2009a; Demirel 2012; Arslan 2016.

⁶ For instance, Balcı 2005; Sabuncu Artar 2007; Erkul Yağcı 2011; Elgül 2011; Karadağ 2014; Bozkurt 2014; Canseven 2015.

⁷ For instance, Akdenizli 1996; Daldeniz Baysan 2004, 2010; Susam Sarajeva 2006; Işıklar Koçak 2007, 2009, 2015; Çelik 2014; Özmen 2016a, 2016b.

⁸ Non-literary text types are subject to many other academic studies focusing mainly on textual analysis, yet these are out of the scope of the present article. For some examples see Kansu Yetkiner, N. (1997). İngilizce ve Türkçe Arasındaki Bilimsel Metinlerin Çevirisinde Terim ve Anlatım Sorunları. *Tömer Çeviri Dergisi, (Özel Kuram Sayısı)*, Vol.10, 127-134; Aksoy, B. (1999). Sosyal Bilimler Metinleri Çevirisi. *Hacettepe Üniversitesi Edebiyat Fakültesi Dergisi*, 16(2), 21-27; Erten, A. (2003). *Tıp Terminolojisi ve Tıp Metinleri Çevirisi*, Ankara: Seçkin Yayıncılık; Eruz, S. (2006). Uzmanlık Alanı Çevirisi. *Varlık*, 24-26; Altay, A. (2011). Harmonising the Translation of EU Documents, Setting Standards and Norms: the Case of Turkey. *Scolia*, Vol 25, 199-206; Yazıcı, M. (2017). Translation Problems in Social Sciences. In E. Sarıtaş (Ed.), *New Researches New Ideas on Social Sciences* (pp. 256-268.). Trafford Publishing.

⁹ For instance Ayhan 2005; Akbatur 2010; Yalçındağ 2014; Eker Roditakis 2016; Koş Postalcıoğlu 2016.

doctoral dissertation where she incorporated sociological perspective by employing Pierre Bourdieu's concept of "habitus" and "capital" into polysystemic approach (Tahir Gürçağlar, 2008). In this dissertation, she analyzes the translational institutions, the habitus of translators and their involvement in intentional cultural planning activities to build a national literature in Turkey in the early republican period, namely between the 1930s and 1960s (ibid.).¹⁰

All these studies have helped to discover the roles of translations and translators in the formation and transformation of mainly literary models, and they have displayed the dynamics literary translations generated in the late Ottoman and modern Turkish literary systems. However, the roles translations played in the transmission and dissemination of scientific knowledge and in the development of different academic disciplines in the 19th and especially 20th century culture repertoires have not been the subject matter of a comprehensive study from the perspective of historical translation studies. In order to fill this gap, the present article is an attempt to unearth the possible research areas in translation history regarding the scientific repertoires in Ottoman and modern Turkish societies.

Periods of scientific acculturation in translation history in Turkey

In the "Introduction" chapter of their edited work, Paker et al. suggest that Turkish translation history witnessed two significant periods of acculturation: the first one in the 14th century and the second in the 19th century (2015, pp. 3-6). In the first period of acculturation, following the adoption of Islam by Turks, various religious and scientific texts from Arabic and poetry from Persian were translated into Turkish, the language of the early Anatolian principalities (ibid.). Paker et al. state that following the conquest of Constantinople in 1453, Arabic and Persian remained to be the central source languages of the literary translation until the 19th century. Complementary to Paker et al.'s findings, this study has shown that translations of scientific texts from Western languages, though small in numbers, also started as early as the 15th century. Ekmeleddin İhsanoğlu indicates that the scientific contact with the west in the field of medicine, for instance, can be observed when around forty Jewish physicians immigrated to Istanbul from France and Spain, some of whom translated books on medicine from Hebrew and Greek into Arabic (2002, pp.418-419). He further suggests that these should be regarded as part of the legacy of the major translation movement of the Abbasids in Baghdad in the 8th-10th centuries. It was argued in many studies that these Jewish physicians "who were able to benefit from the medical literature in Hebrew, Arabic and Greek" (ibid.)¹¹, were the intellectual agents of translation, transmitting the Renaissance medicine into the 16th century Ottoman scientific systems (Gutwirth, 2001; İhsanoğlu, 1992, 2002). In one of his works on the scientific developments in the Ottoman period, İhsanoğlu gave İlyâ b. Abram/Abdüsselam el-Mühtedi as an example who translated a book on astronomy from Hebrew into Arabic in 1503. In another example, in the preface to his translation on the use of tobacco in medical treatment, the Jewish physician İbn Câni el-İsrâ'îli wrote that he had done a detailed research on tobacco, then having found a recent source in French written by Motardis, a Spanish doctor, decided to translate this booklet from French into Arabic (İhsanoğlu, 2010, p.108).

In the light of the above examples, it can be suggested that different from the Ottoman literary systems, by the 16th century, the scientific texts, most of which were medical

¹⁰ Ezber 2004, Erkul Yağcı 2011 and Özmen 2016a are some other examples which incorporate Bourdieu's concepts into Even-Zohar's polysystemic approach.

¹¹ İhsanoğlu wrote an article on ten Jewish physicians migrated in the end of the 15th century and gave detailed information about their *telif* [indigenous] and *terceme* [an umbrella term for translation] practices. See İhsanoğlu, 2010, 79-126.

texts, were not only imported from the east but also from the west, yet in small numbers. Moreover, according to the bibliographies of several scientific fields¹², in addition to the field of medicine, translations from Latin, French and English in the field of astronomy (Şeşen et al., 1997), natural and applied sciences (İhsanoğlu et al., 2006) and geography (Şeşen et al., 2000) were found in the 17th century, and they grew rapidly in number in the 18th century. İhsanoğlu asserts that there were three channels through which western science was transferred into Ottoman culture between the 17th and 19th centuries: **a)** through translated scientific texts from western languages into Turkish and from intermediate languages into Turkish, **b)** through the reports of Ottoman ambassadors who travelled in Europe for official visits, and **c)** through modern educational institutions, of military, engineering and medicine, established in the 18th and 19th centuries (İhsanoğlu, 1992, p. 339). Complementary to İhsanoğlu, I suggest that not only the first channel but also the second and third ones are related closely to translation. One of the Ottoman ambassadors Yirmisekiz Mehmet Çelebi can be given as an example for the second case. During his stay in Paris, Yirmisekiz Mehmet Çelebi visited the observatory, whose director J.D. Cassini gave him a star catalogue which the ambassador brought to Istanbul to be translated (İhsanoğlu, 1992, p.345). Thus the travelling ambassadors appear to have been intermediaries of translation in the way that they brought western scientific improvements to the Ottoman scientific repertoire. As for the educational institutions, Özmen's article on the role of translator-educators in the Ottoman period reveals that the earliest western-style schools with military concerns functioned as translation bureaus in the 18th and 19th centuries and "they played a key role in promoting Turkish at the expense of Arabic in the Ottoman scientific repertoires" (Özmen, 2016b, p.163). In sum, the above studies illustrate that, prior to the 19th century, which is known as the period of innovation, scientific knowledge had already been translated from the imperial languages of Arabic, Persian into Turkish, in addition to the translations made from Hebrew, Greek, Latin and French.

The second acculturation period in the Ottoman culture experience could be observed in the 19th century after the Imperial *Tanzimat* Edict of 1839, when translations of both scientific and literary texts from European languages were abundantly made (Paker et al., 2015, p.5). Several historical studies on the 18th and 19th century's scientific systems have displayed that the mobilization of scientific texts was mainly done through French although Greek, Latin, English, and German texts were met in this period (Aydüz, 2006; İhsanoğlu, 2010; Küçük, 2013; Özmen, 2016b). Hence, the number of scientific translations intensified in the 19th century and gained acceleration in the 20th century following the flow of scientific knowledge via translations from eastern and western cultures. In addition to the increasing number of scientific translations, early 20th

¹² See the seven bibliographies prepared and edited by several scholars (Ekmeleddin İhsanoğlu, Ramazan Şeşen, Feza Günergun, Sevtap Kadioğlu, Meltem Akbaş) in 1985, 1997, 1999, 2000, 2003, 2004, who worked and are still working in the Department of History of Science at Istanbul University. The Department has been issuing an international peer-refereed scientific journal entitled *Studies in Ottoman Science* since 1995. (See <http://www.bilimtarihi.org/OBA/oba.htm/>) Another important institution is the Research Centre for Islamic History, Art and Culture (IRCICA) founded in 1980. Its main aim is to undertake and promote research, publish books, bibliographies and other reference works related to the history of arts and sciences in Islam and all other aspects of Islamic culture and civilisation. (See <http://www.ircica.org/>) In addition to these, there are several other bibliographies on indigenous and translated scientific texts published in Turkey. For instance see İnönü, E. (1982). *1923-1966 Dönemi Türkiye Kimya Araştırmaları Bibliyografyası ve Bazı Gözlemler*. İstanbul: Boğaziçi Üniversitesi Yayınları and Bolay, S. H. & Köz, İ. (2007). *Türkiye'de Düşünce Yayınları Kaynakçası (1839-2007)* Ankara.

century witnessed the migration of many German-speaking academics to Turkey between 1933 and 1945 which contributed to the enrichment of scientific language in modern Turkish through translations (Berk Albachten, 2010).¹³

The literature review, on the secondary sources about the formation and circulation of scientific knowledge in Ottoman and modern Turkish societies, has revealed that the history of science is closely linked to translation history. These sources appear to have disclosed three main research topics for scholars of historical translation studies in Turkey. These are; **a)** conceptualization of translation and diverse practices of translation generated in the scientific repertoires, **b)** scientific nomenclature which were imported and developed through translations and retractions, and finally **c)** the status and roles of individual agents and institutions who were involved in selecting, producing and promoting the translations of scientific texts.

a) Conceptualization of translation and diverse practices of translation

The first research topic is about the concepts of translation and its diverse practices from the 14th to 19th centuries which have been subject to some important analyses in historical translation studies. Among them, Paker's studies were the first to draw attention to the complexity of practices and concepts in the centuries prior to the 19th, which had been mistakenly considered by republican literary historians to mark the beginnings of translations into Turkish. With the help of her Ottomanist colleague, Zehra Toska, Paker opened up the earlier body of work to researchers in translation studies.¹⁴ She worked on translation-related concepts, such as *terceme*, *nazire*, *taklid*, and especially *telif*, in what she hypothesized as “the system of Ottoman intercultural” (Paker, 2002, 2006, 2009, 2014). She analyzed this system as one that had grown out of a hybrid literary-linguistic discourse practiced by poet-translators and composed of Turkish, Persian and Arabic elements, in which the distinction between source and target texts were no longer clear. For Paker, the discourse of Ottoman intercultural had fully emerged by the 16th century and formed the foundation of the general imperial discourse.¹⁵ Her research has revealed that the concept of translation in Ottoman culture needs to be reconsidered in terms of *terceme* [translation in Ottoman Turkish] and related practices, not in terms of the modern concept of *çeviri* [translation in modern Turkish]. Complementing Paker's work on translational practices and concepts, Cemal Demircioğlu has mainly focused on the 19th century and has displayed that the boundaries between translation and original still remained blurred in the Ottoman literary practices at the end of that century (Demircioğlu, 2005). Demircioğlu has further discovered that the relationships between source and target texts were identified and named in an even richer variety in pre-Ottoman and Ottoman periods than the modern concept of translation in modern Turkish denotes (ibid.).¹⁶

¹³ Modern Turkish language using Latin alphabet was adopted in 1928 after the National Assembly passed the law on the new Turkish script. For more information on the alphabet reform and its relation to translation activities within the framework of culture planning see Tahir Gürçağlar, 2008 and Berk Albachten, 2015.

¹⁴ For more information about Paker's and Toska's pioneering studies offering conceptual and methodological frameworks for researchers of Ottoman translation history, see Demircioğlu, 2016, pp. 120-136.

¹⁵ The culture and time-bound concepts in Paker's studies are: *taklit* [imitation], *nakil* [mediated appropriation], *telif* [mistakenly regarded as referring to originality, but a *sui generis* practice covering many kind of translational and creative mediation], *nazire* [emulation], and *terceme* [an umbrella term for translation].

¹⁶ Such as “*nakl*, *iktibas*, *taklid*, *tanzir*, *tefsir*, *şerh*, *tahvil*, *hülasa*”. For more information see Demircioğlu 2005, 2006, 2009b.

The present research has shown that in addition to the rich variety of translation practices existing in the Ottoman literary tradition, the Ottoman scientific systems also harbour a wide range of translation practices. In her study on the role of translator-educators in the Ottoman scientific polysystem in 18th and 19th centuries, Özmen points out that many concepts and practices involved in the process of translation at the time “have passed unnoticed in the discourse of Turkish science historians” (Özmen, 2016b). Following Paker’s arguments, Özmen suggests that these diverse practices of scientific translation lead to “conceptual confusion” in the course of classifications by science historians as can be observed in the bibliographies. She displays that scientific texts were classified under various names as “telif”, “tercüme yoluyla telif edilmiş” [translation-based *telif*], “yarı-tercüme” [semi-translation], or “tercüme-telif” [translation-telif], and she suggest that the confusion is the outcome of not deciding on how to identify mediated texts (ibid.). In addition to Özmen’s findings, I have observed from the bibliographies of astronomy, geography and natural sciences, that many texts were attributed to “müellif-mütercim” [author-translators] in the 18th and 19th centuries (İhsanoğlu et al., 2006). Moreover, İhsanoğlu asserts that, a great number of indigenous geographical works were written as based on French sources; i.e. mediated, while others in the same field were to a large extent, free translations from French sources in the 19th century (İhsanoğlu in Şeşen et al., 2000, p.40).¹⁷

In addition to these mediated texts with indistinct boundaries between translation and original, multilingual texts were imported into Ottoman scientific repertoires. Bilingual and even trilingual text productions were observed for instance in mathematics, astronomy and geography (İhsanoğlu, 2006). From the “paratextual” (Genette, 1997) analysis of the bibliographies, it appears that some texts were produced in two or three languages: such as in Turkish-Persian-Arabic, or Turkish-French-Greek, or Turkish-French-German between 17th and 19th centuries. Complementary to Paker’s arguments on the existence of Ottoman intercultural system of hybrid literary texts composed in Turkish, Arabic and Persian, it seems that such hybrid discourse was also used in the production of scientific texts in the Ottoman scientific systems, yet including more languages than the literary texts.

Diverse practices of producing translations were also observed in the republican period as revealed by several scholars which proves that producing multiple models of translating continued well in the 20th century. Having shown the prevailing diverse practices of “pseudotranslation” and “concealed translation” (Toury, 1995) in Turkey, Tahir Gürçağlar states that “the borders between translation and original writing remained blurred well into the twentieth century” (2010, p.174). She further suggests that pseudotranslators produced these popular literary texts abundantly between the 1940s and 1960s, and it continued even until the 1990s but with shifting intentions behind the production (Tahir Gürçağlar, 2010). These diverse translational practices are also observed outside the literary field such as popular texts on sexuality (Işıklar Koçak, 2007, 2009, 2015). It appears that producing diverse forms of literary and non literary translations has become a prevailing tradition since the 18th century, which may also hold true in scientific fields.

¹⁷ In the 17th century Katip Çelebi wrote that “The majority of the books dealing with philosophy, metaphysics and mathematics are not Islamic, but Greek and Latin, for the bulk of those have remained in the Lands of Christians and have not been translated into Arabic with very rare exceptions. Nor have those that have been translated retained their original meaning, because of the abundant distortions that occur through defective translation: this is an established fact in rendering books from one language to another” (Çelebi, 1957, p.13).

b) Transmission of scientific concepts and nomenclature through re/translations

The second research topic is the transmission of the scientific concepts and nomenclature through translations and retranslations. Antranik Gircikyan, an Ottoman Armenian, who worked as a physics teacher in the Civil School of Medicine (Mekteb-i Tıbbiye-i Mülkiye) in the 1870s, translated Ganot's book of two volumes entitled *Treatise of Physics*¹⁸ (1851) from French into Turkish in order to be taught in the school (Akbaş, 2011). He included a Turkish-French glossary of 269 terms and names of the instruments to his translation of the second volume. Meltem Akbaş suggests that Gircikyan's effort in creating a glossary needs to be evaluated in relation to the rhetoric of scientific translations in the 19th century (2011, p.188). She claims that there was a scholarly community, whose members were trying to improve the scientific terminology by presenting Turkish options for the foreign terms (ibid.). Another example is given by Feza Günergun about chemistry; two translators Derviş Pasha (1817-1878) and Dr. Kırımlı Aziz (Aziz of Crimea) (1840-1878), wrote books fully devoted to chemistry, where they talked explicitly of coining a nomenclature in Ottoman Turkish (Günergun, 2003). She states that both translators rejected the idea of using European chemical terms in Turkish chemistry books, and instead they used Turkish terms as much as possible. Terms which did not exit in Turkish were transliterated by the authors from French (ibid.). Günergun claims that "borrowing elements from Turkish, Arabic, Persian and French, the Ottoman chemical nomenclature became a multi-lingual nomenclature based on classical Islamic and modern European chemical literature" in the 19th century (2003, p. 29).

Similar efforts of terminology planning via translations can also be seen in the 20th century. For instance, in the translation of Erwin Freundlich and Wolfgang Gleissberg's book entitled *Astronomy* published in 1937, a glossary including English, French and German equivalents of the Turkish words was added. Even if this translation seems to have been produced by a single translator on the cover, it was a production of many who were the students of Freundlich and Gleissberg at Istanbul University working together in creating astronomical nomenclature (Günergun & Kadioğlu, 2011a). Günergun and Kadioğlu's example coincides with the second wave of scientific encounter, this time as a result of the immigration of Jewish scholars from Germany in the 1930s and 1940s. Prior to this one, the previous scientific encounter had taken place in the 15th century a result of the forced immigration of the Jewish scholars from Spain and France (İhsanoğlu, 2002). In the republican period, around a thousand Jewish scholars from Germany and Austria immigrated to Turkey and started working in various departments such as Chemistry, Astronomy, Physics and Geography in many universities in İstanbul and Ankara (Berk Albachten, 2010; Günergun & Kadioğlu, 2011a; Seyhan, 2015). The interaction between Jewish and Turkish scholars yielded numerous translational activities: in the form of oral translation practices in classrooms, in their direct involvement in translation activities and in the creation of a new Turkish scientific language (Berk Albachten, 2010). Many of these émigré academicians were actively involved in the selection and promotion of translated texts in a wide range of scientific fields. In her study on the role of these German and Austrian professors, Özlem Berk Albachten claims that cultural models produced by such scholars through translations served the Turkish modernization project in the first half of the 20th century (2010, p.133). Similarly, Aslı Özyar problematizes the impact of the European scholars in

¹⁸ *Traité de Physique*. Paris.1851.

founding the discipline of archaeology and related terminology as an important tool especially in the nation building process in the early republican period (Özyar, 2005).¹⁹

c) Agents of translation in the transmission and dissemination of scientific knowledge

The final research topic focuses on individual and institutional agents who supported, safeguarded and assigned translations of scientific texts. Patrons appear to have been one group of agents of translation which can be observed in the Ottoman scientific tradition since the 15th century. An example is Sultan Mehmed II, who commissioned the translation of Ptolemy's book on geography in the 15th century (İhsanoğlu, 2010). Another example is Sultan Mustafa III who gave instructions for the transfer of books on astronomy from Paris in the second half of the 18th century. Such imperial patrons sometimes commissioned scientific translations to a group of translators. For instance, during the Tulip period in the 18th century; Sultan Ahmed II and Grand Vizier İbrahim Pasha commissioned translations of certain works to a team of scholars; one of the texts was Aristotle's *Physica* which was translated by a team from Latin into Greek and then into Arabic (Ayduz, 2006). Such examples show that Sultans and Grand Viziers were actively involved in selecting texts to be translated, also acted as canonizers and culture planners starting from the 15th century.

In addition to the patronage of the Sultans and Viziers, individual translators were actively involved in transmitting scientific knowledge. For instance, Günergun foregrounds the important role of the Ottoman ambassador Mehmed Said Efendi who purchased an eclipse calculator in Paris showing the solar and lunar eclipses in the Gregorian calendar and brought the device with its manual to İstanbul in the 18th century (Günergun, 2011b, pp.103-124)²⁰. The mathematician Sıdkı Efendi then translated its manual into Turkish and wrote a foreword to his translation, in which he explains how he adapted the device to the Hijri (Muslim) Calendar. In another study İhsan Fazlıoğlu (2003) has analyzed many prologues and epilogues of the translations from eastern and western languages together with original scientific works published between 14th and 20th centuries. He suggests that the strategies translators used contributed to the improvement of Turkish as a language of science (2003, p. 151). Another example is from Devrim Arslan and Müge Işıklar Koçak's article on Beşir Fuad, where they unearth the persistent efforts of Fuad as a voluntary agent of translator in introducing the concepts of realism and materialism as new options into the culture repertoire in the second half of the 19th century (2014, pp. 57-58). In another example, Bilal Çelik's comprehensive research on Haydar Yorulmaz shows that Yorulmaz established an intentional repertoire of socialism and anarchism in Turkish through his translations within the transition period, from Empire to Republic (2014).

Institutional agents constitute another topic of research which has emerged from my survey. Institutional translation activities started in the 18th and 19th centuries with the foundation of government departments. Paker et al. state that institutional translation activity "was resumed as a more concerted effort" in the 19th century, and "from 1870 to 1925 a total of nine government departments or committees were formed to produce educational materials" through translations and mediated indigenous texts (2015, p.6).²¹

¹⁹ In addition to these studies, Yeşim Tükel works on the history of concepts such as nationalism, For more information see Tükel, 2009. In one part of her book, Şebnem Susam Sarajeva critically examines the importation of structuralism and semiotics into Turkish. See Susam Sarajeva, 2006.

²⁰ The device was designed by P. de la Hire in Paris.

²¹ For a list of institutions dealing with translation-related activities in the Ottoman and Republican periods, and their executive board members, see Kayahoğlu, T. (1998). *Türkiye'de Tercüme Müessesleri*. İstanbul: Kitapevi Yayınları.

As for the educational institutions, Ceyda Özmen's article on the role of translator-educators in the Ottoman period reveals that the first systematic, western-style military schools incorporated translator-educators, language courses and printing houses, and they functioned not only as translation bureaus but also as translator-training centres both in the 18th and 19th centuries (Özmen, 2016b). The government institutions producing translations continued until the 1960s, and the widely known and studied one in translation studies is the Translation Bureau established by the Ministry of Education in 1940 with the aim of translating mainly the western literary classics (Tahir Gürçağlar, 2003, 2008). There have also been many long-lasting magazines that can be seen as institutional agents of translation since they prioritized translations over indigenous texts. Tahir Gürçağlar, for instance, investigates three of such magazines –*Yeni Dergi* (1964-1975), *Cep Dergisi* (1966-1969) and *Yeni Ufuklar* (1952-1976)– which contributed to the culture planning activities mainly through translations of western critical theory in Turkey in the 1960s and 1970s (Tahir Gürçağlar, 2002).

The above examples of agents of translation have unraveled the high number of individual translators and institutions who have been actively involved in the importation of scientific thought and knowledge into Ottoman and Turkish scientific repertoires.

Conclusion

The aim of this article is to foreground the roles of translation and translators who have played a part in the formation and transformation of scientific knowledge in the scientific repertoires in Turkey. Studies mostly done outside the field of translation studies have proven that Ottoman and modern Turkish societies have hosted many scientific contacts both from the East and the West harbouring various translations from many languages. As the critical analysis of the sources included in this research illustrate, the formation of scientific repertoires in Ottoman and Republican periods considerably depend on translations. Different from the literary repertoires, Ottoman scientific repertoires evolved on the one hand through translations from Arabic and Persian which were dominant until the end of the 18th century, and on the other hand through translations of Western languages such as Hebrew, Greek, French and Latin from the 16th century onwards. In all times, translation has been a major tool in the formation of scientific nomenclature, in the adaptation of scientific concepts and in the presentation of intellectual thoughts and models.

The analysis of the works, produced by scholars from the field of history together with the ones conducted by translation scholars, has further disclosed that individual and institutional agents of translation have been key actors in the importation of scientific knowledge in Turkey since the 14th century. Sultans, Viziers, ambassadors, professors, teachers, scientists, writers and translators acted as individual agents of translation, and schools, government institutions, printing houses, magazines acted as institutional agents. These agents sometimes become “canonizers” (Sela-Sheffy, forthcoming) involved in culture planning activities as in the case of Sultans and government institutions, and they sometimes stay as voluntary agents assuming the role of “trendsetters” (Sela-Sheffy, forthcoming) as in the case of Beşir Fuad and Haydar Yorulmaz.

Finally this study has revealed that the history of science in Turkey is closely linked to the history of translation. It appears that scientific repertoires may harbour diverse perspectives for researchers of translation history in Turkey. This may prove illuminating for future researchers in both translation history studies and science history studies who are interested in conducting interdisciplinary research.

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