Science Studies and Early Modern Ottoman Science

B. HARUN KÜÇÜK
Department of History and Sociology of Science, University of Pennsylvania, Philadelphia, Pa.; e-mail: kucuk@sas.upenn.edu
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This short essay focuses on three issues: how science studies may facilitate the rapprochement between the philological study of scientific texts and Middle East history; how it may help us reconsider ambiguous if not "black-boxed" terms such as the "state," "Islam," and the "West"; and finally, how it may build thematic and theoretical bridges with other histories and geographies of science currently emerging from a more global, and not merely local, perspective.[1]

Broadly speaking, science studies stands in for a battery of disciplines, such as anthropology, ethnography, history, and sociology, all of which help us consider the meaning and scope of scientific disciplines, past and present. In the Anglo-American world, the history of science increasingly stands for using methods of the social sciences alongside those of cultural history.[2] These approaches have raised new research questions about the role of such things as experimentation and measurement, and their relation to both scientific theories and social practices. This turn has been crucial to thinking about science as a social activity and to weaving together the history of science with broader social and historical frameworks. Applying science studies to the Middle East means deploying new methodologies to problematize genres and practices: it invites us, for instance, to look beyond what the texts say to understand what they did in any given context, whose interests they served, and how such purportedly "external" factors might have informed the "internal" content of scientific knowledge. More radically, we might even ask how "science" and "society" were co-constituted in any given time and place. Thus, science studies offers us a large methodological toolkit with which to reframe both our understanding of science and science's role in early modern and modern histories of the Middle East.[3]

My work focuses on Istanbul, a port city that was an imperial seat of power and thus a privileged vantage point from which to view the shifting landscape of science from within the Middle East.[4] Elsewhere I have focused on a host of texts and practices that emerged from the city, but here I would like to focus on one in particular: Yirmisekiz Mehmed Çelebi's (d. 1732) book on intuitionist physics, entitled *Thamarat al-Shajara* (Fruit of the Tree). While several scholars have drawn on this text to illustrate textual continuity in the Islamic tradition, I would like to place it within the context of Ottoman state building.[5]

The 18th century is generally considered to be a period of profound change in Istanbul and in the Ottoman world in general. It witnessed the replacement of the old military households with a civilian and bureaucratic elite, an increasingly affluent *raʿāyā* (taxpayers), a greater emphasis on arts and industry, and the notable enfranchisement of the Ottoman Empire's non-Muslims. Collectively, these were indicative of a modern Ottoman state that had made its peace with the power of capital and commerce in political matters. Without advancing a controversial claim to the necessary or causal relationship between these developments, I focus on a small but technical aspect that emerged in tandem with them.

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The turn of the 18th century was a time when standardization of technical practices and state building went hand in hand. What was standardized, first and foremost, was money, but there were similar efforts to standardize units of measurement, the artillery, and even medical practices.[6] The imperial mint's successive re-coinages in the late 17th and early 18th centuries, as well as the production of standardized *kurushes* and Ahmed III's (r. 1703–1730) standard gold coins, would not have been possible without a great amount of metallurgical skill, a series of legal and administrative efforts to centralize minting, and new machinery.

According to Halil Sahillioğlu, it was Mustafa the Surgeon, an ex-Huguenot convert to Islam, who introduced these machines to the Ottoman mint in the 1690s.[7] However, it was the opening of profitable mines and the liquidation of existing coins—both of which entailed massive legal and administrative challenges—that gave rise to Ahmedian coins, which eventually enjoyed a successful career in international circulation. The man in charge of the imperial mint during the coinage reform of the 1710s and 1720s was none other than Yirmisekiz Mehmed Çelebi, whose role in Ottoman historiography has largely been confined to his work as an ambassador to France and to the view of him as a "Westernizing" actor.

Yet, Çelebi's career involved much more than diplomacy, and his *Thamarat al-Shajara* was hardly a "Westernizing" account of "science." He presented his book as a partial translation, as "the fruit," of al-Shahrazuri's (fl. 1280) philosophical compendium, *al-Shajarat al-Ilahiyya* (Tree of Divinity). Yet the main argument he presented was not in line with Shahrazuri's stance. For Yirmisekiz Mehmed Çelebi, utilitarian and practical knowledge was the pinnacle of all human knowledge, and he cited medicine, astrology, and alchemy as his main examples. His book spoke with the voice of the past and of the East, but it spoke about the present, about the West, and about the future of Ottoman "science."

"Printing books is like minting coins or impressing a wax seal with a signet ring," wrote Ahmed III. As yet another tool of state centralization, the printing press was also a direct outgrowth of the mechanized mint—a device with which Yirmisekiz Mehmed was intimately familiar. When Yirmisekiz Mehmed went to France in 1720, it was machines for minting money and for printing books that he observed most closely. The operation of the Imprimerie Royale conveyed the administrative and political potential of mechanized and standard impressions of books, maps, and pamphlets. It was then, too, that the Ottomans became aware of the effectiveness of Russian printed pamphlets on their Eastern front as the two empires waged war over what would soon become ex-Safavid territory. Ahmed's printer, İbrahim Müteferrika, also claimed printing to be a transformative, almost alchemical, technology, and used the expression "emerald tablet" when referring to the press. All of this points us to a complex set of circumstances that involved new conceptions and practices of science, craft knowledge, legal changes, the fiscalization of the Ottoman administration, and finally, machines as nonhuman actors. Yirmisekiz Mehmed's book was simply part and parcel of this larger picture.

Now let me turn to the question of the "Islamic tradition" and "Westernization." As many scholars have attested, it is becoming increasingly difficult to speak of continuity in Islamic traditions of scholarship over the 17th and 18th centuries, especially in naturalistic fields such as astronomy, natural philosophy, and medicine.[8] Although the study of commentaries is now a flourishing field, we simply do not have the same

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number, size, and quality of commentaries from 17th- and 18th-century Istanbul as we do from the 15th and the 16th centuries.[9] However, this should not lead us, as it did many in the past, to speak of a "decline."[10] If anything, what we observe is a vernacular survival, if not revival, of older texts along with the continued co-articulation of Muslim knowledge traditions with Jewish, Greek, Latin, as well as other traditions in the empire.[11] Furthermore, anyone who has looked at the catalogues of scientific works compiled by the group of researchers led by Ekmeleddin İhsanoğlu will no doubt be surprised by the proliferation of Turkish texts and their overwhelmingly practical nature—instrument manuals, handbooks, medical recipes, and so forth. In other words, both in terms of its textual breadth and its social reach, Ottoman science was a creole enterprise, one that merged artisanal practices with formal knowledge, and one that drew on a multitude of languages and epistemic cultures. The "creolization" of knowledge traditions was most obvious in the *ṭıbb-ı cedīd* (new medicine) literature of the 17th and the 18th centuries. To cite another example, we can also observe a similar development in the construction and use of mathematical instruments.[12] In this creole context, European knowledge did not serve as a replacement but rather as an addition to existing scientific practices. For instance, we can find quadrants fitted with telescopes, astrolabes fitted with magnetic compasses, and portolans merged with Mercator-projection maps. What is also important to note about this crucial century between 1650 and 1750 is the centrality of artisans and literate laymen rather than of the 'ulama'. Both texts and practices from this period depict a picture more complex than the descriptors "Islamic tradition" and "Westernization" allow for.

All of this feeds into our understanding of early modern science itself. At the very least, the Ottoman story invites us to reconsider the virtues and the alleged uniqueness of early modern European science. The structural transformations that took place in the Ottoman Empire were similar to those in Europe but only partly inspired by European concepts and practices of science. What the Ottomans found to be interesting and useful about European science was not philosophy—a central element in the historiography of European science—but rather technical knowledge and practices. From the Ottoman perspective, it was not Copernicus' heliocentric theory itself, but reliable ephemerides that made European astronomy a successful enterprise. It was not Paracelsian philosophy itself, but useful recipes and novel ingredients that attracted practitioners to European knowledge. It was not the cartographic genius of European mapmakers, but their experiential acquaintance with a broad geography that made their maps attractive. In other words, European science seems to have acquired its broad appeal not directly through its internal theoretical discussions, but through its accumulation and synthesis of large amounts of knowledge produced in corners of the world. The Ottoman example can show, in concert with other histories of science around the globe, how we can overturn the Eurocentric narrative and write a history of science in which everyone plays a part.

NOTES

[1]For the global turn in the history of science, see Kapil Raj, "Beyond Postcolonialism and Postpositivism: Circulation and the Global History of Science," *Isis* 104 (2013): 337–47; Warwick Anderson, "Making Global Health History: The Postcolonial Worldliness of Biomedicine," *Social History of Medicine*, 27 (2014): 372–84; and Fa-Ti Fan, "The Global Turn in the History of Science," *EASTS* 6 (2012): 249–58.

[2]Lorraine Daston, "Science Studies and the History of Science," *Critical Inquiry* 35 (2009): 798–813.

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[3]Three very recent studies I would include under this rubric are M. Alper Yalçınkaya, *Learned Patriots: Debating Science, State and Society in the Nineteenth-Century Ottoman Empire* (Chicago: University of Chicago Press, 2015); Marwa Elshakry, *Reading Darwin in Arabic, 1860–1950* (Chicago: University of Chicago Press, 2013); and Gülhan Balsoy, *The Politics of Reproduction in Ottoman Society, 1838–1900* (London: Pickering & Chatto, 2013).

[4]For example, an article focusing on Cairo that has informed my own work is Jane Murphy, "Aḥmad al-Damanhūrī (1689–1778) and the Utility of Expertise in Early Modern Ottoman Egypt," *Osiris,* Second Series 25 (2010)*:* 85–103.

[5]Reza Pourjavady and Sabine Schmidtke, "Some Notes on a New Edition of a Medieval Philosophical Text in Turkey: Shams al-Dīn al-Shahrazūrī's *Rasā'il al-Shajara al-Ilahiyya,*" *Die Welt des Islams* 46 (2006): 76–85. Bekir Karlığa, "Yirmisekiz Mehmet Çelebi'nin Yeni Bulunan Bir Fizik Kitabı Tercümesi ve On Sekizinci Yüzyılın Başlarında Osmanlı Düşüncesi," *Bilim-Felsefe-Tarih* 1 (1991): 277–311. For a preliminary study and partial translation, see Kemal Sözen, "Şehrezûrî'nin *El-Şeceret El-İlahiyye* İsimli Eseri ve Türkçe Tercümesi *Semeret El-Şecere*" (master's thesis, İstanbul: Marmara University, 1989).

[6]Şevket Pamuk, *A Monetary History of the Ottoman Empire* (Cambridge: Cambridge University Press, 2000).

[7]Halil Sahillioğlu, "The Introduction of Machinery in the Ottoman Mint," in *Transfer of Modern Science & Technology to the Muslim World*, ed. Ekmeleddin İhsanoğlu (Istanbul: IRCICA, 1992), 261–71.

[8]İhsan Fazlıoğlu, "Osmanlı Döneminde 'Bilim' Alanındaki Türkçe Telif ve Tercüme Eserlerin Türkçe Oluş Nedenleri ve Bu Eserlerin Dil Bilincinin Oluşmasındaki Yeri ve Önemi, *Kutadgubilig Felsefe-Bilim Araştırmaları* 3 (2003): 151–84; Marlene Kurz, *Ways to Heaven, Gates to Hell: Faẓlīzāde ʿAlī's Struggle with the Diversity of Ottoman Islam* (Berlin: EB-Verlag, 2011); Natalia Bachour, *Oswaldus Crollius und Daniel Sennert im frühneuzeitlichen Istanbul: Studien zur Rezeption des Paracelsismus im Werk des osmanischen Arztes Ṣāliḥ b. Naṣrullāh Ibn Sallūm al-Ḥalabī* (Freiburg im Breisgau: Centaurus, 2012).

[9]See especially *Oriens* 41, nos. 3–4 (2013).

[10]Khaled el-Rouayheb, "The Myth of 'the Triumph of Fanaticism' in the Seventeenth-Century Ottoman Empire," *Die Welt des Islams* 48 (2008): 196–221.

[11]On Greek natural philosophy, see, for example, B. Harun Küçük, "Natural Philosophy and Politics in the Eighteenth Century: Esad of Ioannina and Greek Aristotelianism at the Ottoman Court," *Journal of Ottoman Studies* 41 (2013): 125–59. On Jewish medicine, see, for example, Süleymaniye MS Nuruosmaniye 3512. On translations, see Feza Günergun, "Ottoman Encounters with European Science: Sixteenth- and Seventeenth-Century Translations into Turkish," in *Cultural Translation in Early Modern Europe,* ed. Peter Burke and R. Po-Chia Hsia (Cambridge: Cambridge University Press, 2007).

[12]See, for example, Sonja Brentjes, "Patchwork—The Norm of Mapmaking Practices for Western Asia in Catholic and Protestant Europe as well as in Istanbul between 1550 and 1750?" in *Science between Europe and Asia,* ed. Feza Günergun and Dhruv Raina (Dordrecht: Springer, 2011), 77–102; Mustafa Kaçar and Atilla Bir, "Ottoman Engineer Mehmed Said Efendi and His Works on a Geodesical Instrument (*Müsellesiye*)," in *Multicultural Science in the Ottoman Empire*, ed. Ekmeleddin İhsanoğlu, Kostas Chatzis and Efthymios Nicolaidis (Turnhout: Brepols, 2003), 71–90; David A. King, "An Ottoman Astrolabe Full of Surprises," in *From Alexandria, through Baghdad: Surveys and Studies in the Ancient Greek and Medieval Mathematical Sciences in Honor of J.L. Berggren,* ed. N. Sidoli and G. Van Brumelen (Berlin: Springer, 2014), 329–42.

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