

INTRODUCTION

Re-examining globalization and the history of science: Ottoman and Middle Eastern experiences

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Abstract

For several decades historians of science have interrogated the relationship between empire and science, largely focusing on European imperial powers. At the same time, scholars have sought alternatives to an early diffusionist model of the spread of modern science, seeking to capture the multi-directional and dialogic development of science and its institutions in most parts of the globe. The papers in this special issue illuminate these questions with added attention to particular claims about the exceptionalism – or not – of Islamic societies' approach to science, modernity and politics. Each contribution centres individuals and groups who engaged with science theoretically or practically, taking seriously their analytical categories and how they understood and grappled with the social, economic and intellectual transformations happening around them. Collectively, these studies make the case for Middle Eastern and Ottoman history as useful sites for furthering our field's understanding of processes of the globalization of science and how authority, politics and science have been and continue to be interconnected.

In the second half of the nineteenth century, a view emerged casting Islam and modern science as fundamentally incommensurable; this coincided with the entrenchment of 'modern science' as a dominant epistemology, linked to ideas of universal progress, and moral claims such as asserting a privileged access to reason and objectivity, as well as to economic and military success. These claims and the world view that tied them together developed alongside many European states' imperial ascendancy across West Asia, South Asia and Africa. Then, as now, intellectuals, politicians, reformers and activists have debated the chronological and possible causal relationships connecting modern science, modern religion and modern empire. Operating assumptions about these correspondences heavily influenced one significant strand of twentieth century Euro-American scholarship on the Middle East and North Africa, where Islam was presented as a problem to be overcome by secular reformists like Mustafa Kemal Atatürk, the first president of the Turkish Republic.¹ In this view, the question was how quickly or how reluctantly states would adopt modern science, with assumed implications for their technological progress, increased secularism and support for Euro-American democracies.

1 Bernard Lewis's early admiration of Atatürk reverberates throughout his work, including his book *What Went Wrong? The Clash between Islam and Modernity in the Middle East*, Oxford: Oxford University Press, 2002.

Nineteenth-century claims about the special compatibility or particular incompatibility of Islam and science generated vibrant debate. One widely read published exchange took place in 1883 between Ernest Renan (1823–92), a French scholar and orientalist, and Jamal al-Din al-Afghani (1838–97), a prominent Muslim scholar (*‘ālim*) whose fame as an advocate of reform and unity grew across disparate Muslim-majority regions during his lifetime.² For Renan, particular civilizations were better or worse in terms of their disposition to scientific reasoning and practice. Those societies more suited to the sciences should be given free rein to develop their potential, while other societies should reform or be led. Al-Afghani was willing to engage Renan on those terms, publishing his reply in French the same year.

The year before, al-Afghani had lectured in Albert Hall, Calcutta, where he explicitly delineated in clear terms the crisis of British colonial expansion and the long-standing historical connection he saw between securing political power and scientific achievement, starting with the Assyrian queen Semiramis in the ninth century BCE. Al-Afghani highlighted a long and influential history of Indian scientific and political achievements, asserting that his audience of young Hindu men eagerly seeking knowledge were ‘the offshoots of that India that was the cradle of humanity’. Al-Afghani critiqued European imperial expansion and exploitation of colonial resources that was made possible, according to him, by their scientific advances:

The Europeans have now put their hands on every part of the world. The English have reached Afghanistan; the French have seized Tunisia. *In reality this usurpation, aggression, and conquest have not come from the French or the English. Rather it is science that everywhere manifests its greatness and power.*³

As discussed further below, his line of thinking prefigured a major mode of inquiry in recent scholarship in the history of science, namely the entanglement of European imperial expansion with the globalization of science.

Renan articulated a natural trajectory from religious superstition to scientific reasoning and the particular obstacles he believed that Islam posed to that developmental arc. Just over a century later, political scientist Samuel Huntington took this posited division further, arguing for an irreconcilable clash of beliefs between Islamic civilization and Western liberal ideals.⁴ Although elements of this view have endured and impacted the way scholars have approached the globalization of science in the Middle East, the late twentieth and early twenty-first centuries have made clear that Huntington’s premises have not been borne out. In many regions of the global North and South, ‘science’ has not superseded ‘religion’, nor has ‘religion’ stopped the development and spread of ‘science’. Just as clearly, we have not reached a political stasis that has marked the ‘end of history’.⁵ Instead, the inevitability

2 Ernest Renan, *L’islamisme et la science: Conférence faite à la Sorbonne, le 29 mars 1883*, Paris: Calmann Lévy, 1883; Jamal al-Din al-Afghani, ‘L’islamisme et la science’, *Journal des débats* (1883) 18, p. 3. For more on al-Afghani see Nikki R. Keddie, *Sayyid Jamal ad-Din ‘al-Afghani’: A Political Biography*, Berkeley: University of California Press, 1972; Keddie, *An Islamic Response to Imperialism: Political and Religious Writings of Sayyid Jamal ad-Din ‘al-Afghani*, Berkeley: University of California Press, 1983. English translations are available for teaching: Ernest Renan, *Islam and Science* (trans. Sally P. Ragep), 2011, licensed under a Creative Commons Attribution License 3.0, at https://www.mcgill.ca/islamicstudies/files/islamicstudies/renan_islamism_cversion.pdf (accessed 31 May 2022); Charles Kurzman, ‘Teaching and learning and answer to Renan’, in Kurzman (ed.), *Modernist Islam, 1840–1940: A Sourcebook*, Oxford: Oxford University Press, 2010, pp. 103–10.

3 Kurzman, op. cit. (2), p. 104, emphasis added.

4 Samuel Huntington, ‘The clash of civilizations?’ *Foreign Affairs* (Summer 1993) 72(3), pp. 22–49.

5 Francis Fukuyama, ‘The end of history?’, in Richard K. Betts (ed.), *Conflict after the Cold War*, Routledge, 2015, pp. 16–27; Louis Menand, ‘Francis Fukuyama postpones the end of history’, *New Yorker*, 3 September 2018, pp. 64–8, 66.

of increasing democratization or any intrinsic relationship between science and technology, on the one hand, and any particular form of government, on the other, seems ever more tenuous. Therefore it is crucial that we pose new questions if we seek to improve our understanding of the intertwined histories of science, empire, Islam and the politics of modernization in the Middle Eastern context.

As the papers in this special issue demonstrate, the investigation of regional and local stories and their relation to globalizing the history of science is, to quote Carla Nappi, ‘a field that is hybrid, pulsing, and alive’.⁶ We suggest that the Ottoman Empire and Islamicate societies more broadly offer compelling grounds for thinking through questions of global and local, interconnected histories. These polyvocal, Islamicate societies placed questions of authority, circulation and negotiation at the centre of protagonists’ accounts and therefore are readily available for interested historians to interrogate.⁷ In these ways, the papers and the scholarship that they engage argue for the necessity of privileging local (or a series of local) historiographies of science.

At the same time, these essays show the embeddedness of the local in regional and global cultures, politics and discourses. For these reasons, the authors continue to play with the framework of globalization, inviting readers to view these local studies through a kaleidoscope one should keep shaking and refocusing. Writing this in 2022, it is impossible to ignore the critical crossroads we face as a result of the global COVID-19 pandemic that has killed millions, upended peoples’ lives, revealed profound economic and political fault lines in societies around the world, and impacted understandings of what constitutes scientific knowledge, expertise and political authority.

In this special issue, rather than reweigh the balance of similarity to or difference from a sometimes imagined European trajectory of religion, politics and science, we start from the premise that the very categories of religion, politics and science were in flux over the eighteenth to twentieth centuries. We use the case studies in this issue to trace the connected histories of ‘science’, ‘Islam’, ‘empire’ and ‘the state’ through ideas, practices, institutions and people, in specific times and places. The papers in this collection were first presented at an international conference held in March 2017 entitled *The Globalization of Science in the Middle East, 18th–20th centuries* (College of the Holy Cross, Worcester, MA, USA). Scholars from the Middle East, Europe, the United States and Canada convened to reconsider the relationship between Islam and science, highlighting, among other things, the nuanced appropriation and adaptation of modern science by local actors in Ottoman contexts and the role of local knowledge in such assessments.

Each contribution takes as a starting point the words and deeds of their protagonists – individuals and groups who engaged with science theoretically or practically – and takes seriously their analytical categories and how they understood and grappled with the social, economic and intellectual transformations happening around them. Such close and attentive readings of the primary sources complicate teleological and simple ideas of the advance of science by considering the reception, assimilation, rejection and translation of scientific theories and practices by the peoples of the Middle East through examples from a variety of scientific and calculation-based disciplines including natural

⁶ Carla Nappi, ‘The global and beyond: adventures in the local historiographies of science’, *Isis* (2013) 104(1), pp. 102–10.

⁷ For ‘Islamicate’ as a term see Marshall G.S. Hodgson’s highly influential work *The Venture of Islam: Conscience and History in a World Civilization*, 3 vols., Chicago: The University of Chicago Press, 1974 (vol. 1, *The Classical Age of Islam*; vol. 2, *The Expansion of Islam in the Middle Periods*; and vol. 3, *The Gunpowder Empires and Modern Times*) and a large scholarship engaging Hodgson’s framework. On polyvocality and an introduction to some of the foundational scholarship see Jonathan P. Berkey, ‘Madrasas medieval and modern: politics, education, and the problem of Muslim identity’ in Robert W. Hefner and Muhammad Qasim Zaman (eds.), *Schooling Islam: The Culture and Politics of Modern Muslim Education*, Princeton University Press, 2007, pp. 40–60.

philosophy, economics and medicine. In so doing, the issue begins to uncouple the Middle Eastern history of science from the ideological constraints of Cold War politics, modernization theory, orientalism and the discourses of a ‘clash of civilizations’ by localizing and historicizing processes associated with the globalization of science in the Middle East from the early eighteenth century to the twentieth.

The attempt to geographically define a region such as the Middle East is a somewhat dubious exercise because of its origins as a term reflecting British imperial and later US and Soviet geostrategic concerns.⁸ Internal identities and regional boundaries, while more nuanced, are equally resistant to fixed definitions. Instead, as both participants and scholars of the period spanned in this issue have attested, one finds a history of dynamic understandings of linguistic, ethnic, sectarian and class identities, meeting newer political and legal national ones.⁹ Certainly, al-Afghani and other Muslim reformers of his generation believed that a critical operative category of identity was the *ummah* or the global community of Muslims, whose concerns should transcend territorial borders. This view gained credence in colonized regions as a result of social Darwinist thinking, which racialized Muslims and categorized them as a homogeneous group undeserving of self-rule in the late nineteenth century.¹⁰

In a similar vein, we recognize that ‘modern science’ is not a universally agreed term, but one that is constructed and contested. In this issue, by ‘modern science’ we mean new modes of knowing, observing and conceptualizing the natural world that developed largely from the eighteenth century. These knowledge modalities have traditionally, although not unproblematically, been associated with Europe and its settler colonial satellite states, such as the United States. What are thought of as the origins of today’s mathematical and natural sciences were developed in concert with various phases of globalization – European expansion and territorial conquests in the seventeenth and eighteenth centuries against the backdrop of nation state formation in Europe. In other words, modern science emerged within the context of increased and substantial contact and increased economic and other forms of entanglement between and among Europeans, Indigenous societies of the Americas, Asians, South Pacific Islanders and Africans, and, from the nineteenth century on, greater governmental intrusion in daily lives.¹¹ Drawing on the work of Helen Tilly and Marwa Elshakry, Sujit Sivasundaram reminds us that terms such as ‘Western science’ or ‘indigenous knowledge’ ‘that are central to the definition of the history of science emerged out of globalization.’¹²

8 See Michael E. Bonine, Abbas Amanat and Michael Ezekiel Gasper (eds.), *Is There a Middle East? The Evolution of a Geopolitical Concept*, Stanford, CA: Stanford University Press, 2012. For an insightful conference on this and related questions see Middle of Where, East of What?: New Geographies of Conflict, symposium, ICI Berlin, 14 July 2016, at <https://doi.org/10.25620/e160714>. For several decades scholars in English have used Middle East and North Africa, frequently just as the acronym MENA; more recently an organization of activists and scholars have suggested adopting ‘a decolonial word for the South West Asian/North African (S.W.A.N.A.) region in place of Middle Eastern, Near Eastern, Arab World or Islamic World that have colonial, Eurocentric, and Orientalist origins and are created to conflate, contain and dehumanize our people’. See <https://swanaalliance.com/about>, accessed 5 June 2022.

9 Will Hanley, *Identifying with Nationality: Europeans, Ottomans, and Egyptians in Alexandria*, New York: Columbia University Press, 2017; Molly Greene, ‘The Ottoman experience’, *Daedalus* (2005) 134(2), pp. 88–99; Ussama Makdisi, *Age of Coexistence: The Ecumenical Frame and the Making of the Modern Arab World*, Oakland: University of California Press, 2019.

10 Cemil Aydin, *The Idea of the Muslim World: A Global Intellectual History*, Cambridge, MA: Harvard University Press, 2017. Seema Alavi, *Muslim Cosmopolitanism in the Age of Empire*, Cambridge, MA: Harvard University Press, 2015.

11 For especially generative and thoughtful assessments of the development and future possibilities of globalization and science historiography see Lissa Roberts, ‘Situating science in global history: local exchanges and networks of circulation’, *Itinerario* (2009) 33(1), pp. 9–30; and Nappi, op. cit. (6).

12 Sujit Sivasundaram, ‘Introduction/focus: global histories of science’, *Isis* (March 2010) 101, pp. 95–7, 96.

As a way of explaining the spread of science, scholars have studied the relationship between science and empire in a variety of geographical contexts.¹³ However, this topic has largely focused on European colonization and imperialism in the Americas, Asia and Africa from the seventeenth century. Among other things, this issue focuses on a largely underexamined area of empire and science studies, namely the Ottoman Empire – an imperial formation whose history and periodization do not align with European or North American models. The Ottoman Empire emerged in the early fourteenth century and came to an end in 1923 following the Ottoman defeat in the First World War, making it both a premodern and a modern empire.¹⁴ Beginning as a small principality (*beylik*) in northwestern Asia Minor c.1300 CE, the Ottoman *beylik* expanded to include large regions in the Balkans and Greece. By the mid-seventeenth century, the Ottoman Muslim dynasty not only had conquered the Byzantine capital of Constantinople (1453 CE), but also controlled important waterways including the Black Sea, the eastern and southern Mediterranean, the Red Sea and the Straits of Hormuz and the western Arabian Sea. At its geographical height, its territory straddled three continents – Europe, Africa and Asia – and it became a formidable power that stretched from Bosnia to Basra and from the Crimea to Yemen.

Its subjects were ethno-linguistically and religiously diverse and were employed in a wide variety of occupations and lived in disparate environments.¹⁵ The conquest of the Muslim holy cities of Mecca and Medina in the early sixteenth century and the development of a specifically Ottoman Sunni orthodoxy (and legal system) related to processes of state consolidation catapulted the Ottoman dynasty into a leadership role as protectors of Muslims and Islam. By the early eighteenth century, the Ottomans had created and normalized certain institutions of administration, of governance and of law across their territory. Edicts read in the name of the Ottoman sultans in distant provinces far from the imperial capital of Constantinople reminded their subjects – irrespective of their religious and ethno-linguistic affiliations – that they were somehow connected to a distant geographical centre and political authority. These administrative practices, in turn, shaped peoples' understandings about how their world worked and gave a certain order to their lives.

The period covered in this special issue – the eighteenth to twentieth centuries – encompasses the long and slow process by which the balance of power between the Ottoman Empire and various European states shifted in Europe's favour. While there had been a long history of interaction across the Mediterranean space and between the Ottomans and their European neighbours, the new conditions of European military and economic supremacy in the period under consideration altered relations between those

13 For a discussion of the work of Joseph Needham and George Basalla, whose work framed much of the early scholarship on the transmission of science, see Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, New York: Palgrave Macmillan, 2007. For an excellent and most recent overview of empire/science studies see Andrew Goss, 'Introduction: an imperial turn in the history of science', in Andrew Goss (ed.), *The Routledge Handbook of Science and Empire*, London and New York: Routledge, 2021, pp. 1–9.

14 Sahar Bazzaz, Yota Batsaki and Dimiter Angelov, 'Introduction' in Bazzaz, Batsaki and Angelov (eds.), *Imperial Geographies in Byzantine and Ottoman Space*, Washington, DC: Center for Hellenic Studies. A. Mikhail and C. Philliou, 'The Ottoman Empire and the imperial turn', *Comparative Studies in Society and History* (2012) 54, pp. 721–45.

15 The field of Ottoman history/studies is extremely vast and rich. Important scholarly contributions in the past thirty years have substantially transformed and greatly nuanced our understanding of the empire's history and its place in global history. For a bibliography of English-language scholarship about the Ottoman world and history, see Virginia Aksan, 'What's up in Ottoman studies?', *Journal of the Ottoman and Turkish Studies Association* (2014) 1(1–2), pp. 3–21.

states.¹⁶ By the mid-nineteenth century, the ‘Eastern Question’ – or the fate of the Ottoman Empire within a weakening European state system created at the beginning of the century – largely dictated the relations between the Ottomans and their European neighbours.¹⁷ France conquered Ottoman provinces in North Africa (Algiers 1830, Tunis 1881), while Britain occupied Egypt (1882), and both countries were able to assert direct influence in Ottoman administration and finances through the establishment of debt commissions. By the end of the century, the Ottoman Empire was euphemistically referred to within European diplomatic circles and in the popular press as ‘the sick man of Europe’, indicating its perceived weakness and a belief in its eventual collapse.

The Ottoman Empire offers an interesting lens through which to think about the relationship between science and processes of its globalization due to the increasingly tense status of the Ottoman Empire over the course of the nineteenth century as both an imperial and a semi-colonized territory. Even as the Ottoman state worked to assert itself as a player in the Concert of Europe after 1815 through an extensive programme of administrative, military and legal modernization known as the Tanzimat, it also faced serious threats to its sovereignty due to the expansion of Europe’s power into spheres of influence in the Mediterranean, the Red Sea and the Persian Gulf. Breakaway nationalist movements in the Balkans, and later in the Arab lands, also posed new challenges to the Ottoman imperial framework. Meanwhile, in conjunction with its programme of reform, the modernizing Ottoman state embarked on its own imperial incursions during the nineteenth century in Yemen and Cyrenaica (modern Libya and western Egypt), while Ottoman governors such as Mehmet Ali of Egypt added Sudan into their orbit of control.¹⁸

By the end of the nineteenth century, the Ottoman status as an imperial power, under threat both from European states and from internal nationalist movements, many backed by European nations, meant that European Enlightenment ideals, nationalist politics and ‘modern science’ simultaneously held both promise and peril for Ottoman intellectuals and modernizing bureaucrats. Indeed, as intellectuals from colonized areas such as Jamal al-Din al-Afghani recognized immediately, modern science and technology were touchstones used to justify hierarchies, all while claiming its objectivity and neutrality as a knowledge modality.¹⁹

Islamic classifications of knowledge from the late antique period made a central division between transmitted knowledge or sciences and rational knowledge or sciences

16 See, for example, Avner Ben Zaken, *Cross-cultural Scientific Exchanges in the Eastern Mediterranean, 1560-1660*, Baltimore: Johns Hopkins University Press, 2010; Palmira Brummett, *Mapping the Ottomans: Sovereignty, Territory, and Identity in the Early Modern Mediterranean*, New York: Cambridge University Press, 2015; Sonja Brentjes and Robert Morrison, ‘The sciences in Islamic societies’, in Robert Irwin (ed.), *The New Cambridge History of Islam*, vol. 4, Cambridge: Cambridge University Press, 2010, pp. 564–639; George Saliba, *Islamic Science and the Making of the European Renaissance*, Cambridge, MA: MIT Press, 2007. For early modern Ottoman cross-cultural interactions more broadly see Suraiya Faruqi, *The Ottoman Empire and the World Around It*, London and New York: I.B. Taurus, 2004.

17 For an influential exposition see Karl Marx, *The Eastern Question* (1853), reprint, Abingdon and New York: Routledge, 2013.

18 On Ottoman imperialism see, for example, Mostafa Minawi, *The Ottoman Scramble for Africa: Empire and Diplomacy in the Sahara and the Hijaz*, Stanford, CA: Stanford University Press, 2016; Eve Troutt-Powell, *A Different Shade of Colonialism: Egypt, Great Britain, and the Mastery of the Sudan*, Berkeley: University of California Press, 2003. On Ottoman imperial science, and environmental history in particular, see Alan Mikhail, *Nature and Empire in Ottoman Egypt: An Environmental History*, Cambridge: Cambridge University Press, 2011; Samuel Dolbee, ‘Empire on the edge: desert, nomads, and the making of an Ottoman provincial border’, *American Historical Review* (March 2022) 127(1), pp. 129–58. Dolbee discusses nineteenth-century Ottoman environmental imperialism and the use of civilizational narratives of improvement by state bureaucrats.

19 In addition to al-Afghani, op. cit. (2), see Michael Adas, *Machines as the Measure of Men*, Ithaca, NY: Cornell University Press, 1989; Gyan Prakash, *Another Reason: Science and the Imagination of Modern India*, Princeton, NJ: Princeton University Press, 1999.

(*al-'ulūm al-naqliyya* and *al-'ulūm al-'aqliyya*), distinguishing knowledge transmitted through revelation from knowledge derived by human reason, respectively, with revealed knowledge specific to its religious community, and reasoned knowledge shared across human history.²⁰ By the eighteenth and nineteenth centuries, however, universalist claims of modern science were clearly combined with the threat of foreign intervention. In the wake of European incursions, such factors helped frame Ottoman debates about cultural authenticity, thereby propelling the emergence of 'Islamic civilization' as an analytical category by Muslim intellectuals and spawning notions of a distinctly 'Islamic science'.²¹

By the early modern and modern periods, historical actors crafted arguments about the nature and use of science selecting from these various possibilities, depending on their context and concerns. While the politics of knowledge production occurred in the context of state modernization (as in Ottoman Egypt and the central lands of the Ottoman Empire), on one hand, and the extension of European power into these regions, on the other, the papers in this special edition consider additional social, economic and intellectual developments, which both shaped and were shaped by this process. Included among these developments are the large-scale adoption of communication technologies such as the printing press, the proliferation of Ottoman Turkish- and Arabic-language newsprint journalism, the development and application of new laboratory methods and technologies, the rise of scientific associations, and the emergence of local nationalisms in the Ottoman lands.

Several of the papers in this issue highlight the dynamic processes by which modern science was made legible to peoples of the Middle East and the role of active appropriation and adaptation in extending that legibility. Kenan Tekin's paper analyses one such case in his study of Ahmed Cevdet, a nineteenth-century Ottoman intellectual *'ālim* (Islamic scholar) and bureaucrat, and Cevdet's translation into Ottoman Turkish of the final chapter of Ibn Khaldun's fourteenth-century work the *Muqaddimah* (or *Prolegomena*). Tekin contextualizes Cevdet's translation in the Tanzimat period of self-conscious Ottoman modernization and reorganization, using a close reading of this translation to help us see how Cevdet understood modernization in practice. As Tekin shows, Cevdet willingly appropriated modern science and drew from Ibn Khaldun, and the long-standing Islamic philosophical tenets in Ibn Khaldun's work, to support that appropriation. At the same time, Cevdet also used new medical and astronomical knowledge to refute earlier Peripatetic philosophers' claims about such matters as the nature of the soul and the number of intellects. Ultimately, he argued for empirically grounded science, such as contemporary scientific developments in Europe, and against metaphysical science, which Cevdet had shown to be falsified by recent discoveries and even with great effort led, according to Cevdet, to only 'doubtful and uncertain knowledge (*vehm u şekk*)'.

In Tekin's account, Cevdet not only Ottomanized the *Muqaddimah* but also updated and modernized it. Cevdet's understanding of and support for modern science went hand in hand with that project. Thus, Tekin argues, accounts of the 'globalization of science' should replace older dissemination models, and instead attend closely to the contextualized reasons for the particular adoption and adaptation – the active appropriation – of

20 Sonja Brentjes, *Teaching and Learning the Sciences in Islamicate Societies (800-1700)*, Turnhout: Brepols, 2018; Jane H. Murphy, 'Islamicate knowledge systems: circulation, rationality, and politics', in Armando Salvatore, Roberto Tottoli and Babak Rahimi (eds.), *The Wiley Blackwell History of Islam*, Oxford: Wiley Blackwell, 2018, pp. 479–98.

21 See M. Alper Yalçınkaya, *Learned Patriots: Debating Science, State, and Society in the Nineteenth-Century Ottoman Empire*, Chicago and London: The University of Chicago Press, 2015. On the twentieth-century Islamization-of-knowledge project, pioneered by al-Attas and al-Faruqi, see Seyyed Vali Reza Nasr, 'Islamization of knowledge: a critical overview', *Islamic Studies* (1991) 30(3), pp. 387–400. Despite Nasr's assessment, this project continues.

modern science in multiple locales. Tekin also highlights that modern science and its values of empiricism and positivism enabled intellectuals like Cevdet to advocate for separate realms of religious and scientific authority. As Tekin's essay suggests, this distinction could be appealing to scholars in many locations, holding a variety of theological views.

Alper Yalçınkaya's contribution further develops this line of research by historicizing the formulation of such categories as religion and science. Drawing on recent studies that challenge the treatment of 'science' and 'religion' as universal and transhistorical categories, the author shows how Muslim intellectuals constructed

a 'de-cultured', abstract Islam, treated as distinct from the beliefs and practices of Muslims. Objectifying religion in this way was not an entirely new phenomenon for Muslims, but participating in the global debate on 'science and religion' generated new contours around the category of 'Islam'.

In so doing, Ottoman bureaucrats and literati advanced a specifically textually based and anti-praxis conception of Islam, in which the *ulema* (Muslim scholarly class) came under fire for their failure to properly know or teach its precepts. Ottoman thinkers like Ahmed Midhat were committed to using this conception of Islam to educate Muslims how to be 'modern' – committed to the Ottoman agenda of state centralization and modernization using scientific principles – while also inculcating values of 'authentic' Muslim identity. By looking at debates in the Ottoman press, Yalçınkaya traces the discursive and practical 'construction' of modern Islam. More broadly, he illuminates the role of Ottoman Muslims in the invention of categories such as 'Islamic science' and 'Western science'. In this way, Yalçınkaya's paper demonstrates how key conceptual categories were formed through these very encounters.

Nicole Khayat and Liat Kozma offer commentary and translations of nineteenth-century Arabic-language medical writing, including articles from scientific journals – *al-Muqtataf* and *al-Hilāl*, which were founded in 1876 and 1892 respectively – as well as excerpts from nineteenth- and early twentieth-century writing by Arab doctors. These translations are associated with a vibrant literary and intellectual movement of the mid- to late nineteenth century known as the *nahda* (Arab awakening), which was connected to the rise and proliferation of print journalism (*ṣiḥāfa*). Medical writings of the *nahda* period highlight the interests of *nahda* intellectuals in the role of modern medicine and its power as an idiom for broader discussions of social, political and cultural revival within the context of increased European imperialism in Ottoman lands. This remarkable corpus of materials, very little of which has been translated, illuminates debates about and embrace of modern science as a body of knowledge and as a vehicle for speaking about social, economic, intellectual and political transformations in Ottoman-Arab society and beyond. As Khayat and Kozma argue, 'Rather than a tool for conveying information, literary and scientific journals became dialogical media and hubs for an Arabic-writing literary community.' Their translations and accompanying essay illustrate the ways in which the new print journalism was so critical for bringing debates about science and its role in society to a wider Arabic-speaking audience during a time of rapid change and self-conscious awareness of European influence. In the diary of Ibrahim al-Najjar, for example, Khayat and Kozma highlight al-Najjar's narration of his overcoming an initial aversion to dissection by his own cognition, rather than being convinced by his French instructor, as had been recounted in the widely read French memoirs of Antoine Barthélemy Clot (1793–1868), the French surgeon whom Mehmet Ali hired to reform his military medical services and who was instrumental in the foundation of the medical school.

Circulation, translation and mediation inform some of the papers in this collection, emphasizing not only 'how and why [scientific] knowledge circulate[s]' but also what

happens to scientific theories and practices as they move.²² Victoria Meyer's contribution follows the migration of smallpox inoculation from the Ottoman Empire to Europe and North America in the eighteenth century and back again as a reformulated and 'inherently Western' form of knowledge one century later. Meyer argues that this reformulation, embraced uncritically in some of the contemporary scholarly literature, lays the basis for a narrative 'in which the science of vaccination was "imposed" on non-Western, undeveloped countries in the nineteenth century'. Meyer deftly traces eighteenth-century anglophone and French elite medical physicians' lively debates on the efficacy of 'Turkish' smallpox inoculation, showing how the translation of knowledge and practices depended on source and status as much as on content for authority. Since it was unclear why inoculation worked, arguments against or in favour of the practice took on greater resonance because they converged with ongoing disagreements among natural philosophers concerning empirical versus theoretical methods of proof. Likewise, in her examination of the nineteenth-century Ottoman Egyptian reception of vaccination – a newer and improved form of inoculation in which the patient was injected with cowpox instead of discharge drawn from pustules of people infected with the disease – she surveys new scholarship which emphasizes mediation, translation and local agency in (re)indigenizing vaccination in the Middle East. Using a comparative framework, she convincingly demonstrates how many of the same dynamics – a shifting constellation of authoritative knowledge, knowledge brokers and social and political power – shaped each region's relation to smallpox prophylactics. Rather than science as imposition or imperial domination, her contribution reminds us that 'both Western Europeans and Egyptians across different social hierarchies translated foreign or new medical practices according to the needs of their knowledge and goals, creating cycles of adoption and adaptation'.

Dan Stolz's paper turns toward British perspectives concerning science and calculation pertaining to calculation of nineteenth-century Ottoman debt, emphasizing how late nineteenth-century processes of the globalization of science involved dialogical processes and were shaped by encounters among and between different localities. Stolz considers British bondholders' lobbying efforts in the 1870s during the Ottoman debt crisis, which led to unprecedented British government action on their behalf vis-à-vis the Ottoman state. British bondholders with investments in the substantial Ottoman foreign debt argued that it was possible to accurately calculate both the total size of the Ottoman debt and the specific percentage of it held by them. The possibility of determining these amounts was questionable, if not impossible, according to many financial observers at the time; nevertheless, the bondholders were successful in arguing otherwise. They did so by drawing on resources available through the London-based Corporation of Foreign Bondholders – a 'centre of calculation' founded in 1868 dedicated to the compilation of statistical and financial information related to British foreign investments. Drawing on Latour's emphasis on the relationship between modern science and the development of 'centres of calculation', Stolz argues that 'the corporation's emergence as a key node of financial intelligence was crucial to its efforts to effect a shift in the politics of foreign loans, whereby investments that had long been considered a private concern of individual British subjects would become the duty of the British government to protect.' Equally important, however, was advocates' insistence that 'disinterestedness', a value upon

22 James Secord, 'Knowledge in transit', *Isis* (2004) 95, pp. 654–72, 655. Roberts, op. cit. (11). Fa-ti Fan argues that, on the one hand, 'the image of circulation tends to impose too much unity, uniformity, and directionality on what was complex, multidirectional, and messy', while on the other hand it 'doesn't encourage a critical analysis of, say, power relations in science'. Fa-ti Fan, 'The global turn in the history of science', *East Asian Science, Technology and Society* (2012) 6(2), pp. 249–58; cited in Lynn K. Nyhart, 'Historiography of the history of science', in Bernard Lightman (ed.), *A Companion to the History of Science*, Chichester: John Wiley and Sons Ltd, 2016, p. 13.

which ‘the scientific status of nineteenth-century accounting depended’, was irrelevant in this situation. As Stolz convincingly demonstrates, when it came to the case of the Ottoman default ‘calculation was understood to be inseparable from material interest and political debate’. The result was the establishment of the Ottoman Public Debt Administration (OPDA) in 1881, which allowed British agents to collect up to 25 per cent of Ottoman state revenue to repay bondholders of the Ottoman debt. Not only did this reveal Britain’s ability to secure its considerable geostrategic interest in the region at the expense of the Ottoman state, but it ‘also represented the victory of bondholders in a prior domestic political struggle to make their losses a diplomatic concern’.

Stolz’s case study suggests rich avenues for further research in the globalization of science and empire/science studies. Instead of static and unmutable principles, objectivity and ‘disinterestedness’ were impacted and shaped by encounters between the Ottoman and British empires during the nineteenth century, emphasizing that the globalization of science involved dialogical processes shaped by encounters among and between different localities. While scholars studying a variety of geographic contexts have examined mutually impactful relationships – albeit in contexts of power imbalances – between local knowledge traditions and practices during earlier phases of globalization, Stolz beautifully illuminates how nineteenth-century globalization influenced peoples’ views of science and calculation everywhere – both in colonial centres of calculation and in their ‘peripheries’.

While several of the papers in this collection (Tekin, Yalçinkaya, Meyer, Khayat and Kozma) consider the role of technology in enabling greater participation in the production, dissemination and debate about science in the Middle East, Elise Burton’s contribution highlights a moment when new scientific technologies and institutions aided in the scaling back or de-development of modern science in the region, arguing that there is no natural or inevitable direction of expansion. Burton’s essay concludes this special issue by moving us into the post-First World War period, when the Middle Eastern political landscape was radically altered by the demise of the Ottoman Empire, by the establishment of French and British Mandates resulting in the drawing of national boundaries in the region, and by the development of local nationalisms and national scientific institutions. Against this backdrop, Burton considers in granular detail the ebb and flow of human genetics research at the American University of Beirut (AUB) between the world wars and into the 1960s, highlighting a series of contrasts – the interwar versus the post-Second World War periods, Anglo-American versus French involvement in AUB research, and the experiences of local researchers, both women and men, under these different neo-colonial regimes of scientific research. In the interwar period, local Middle Eastern technicians and doctors associated with AUB efforts were trained by European and American researchers in sero-anthropological techniques of analysis and worked alongside them. Despite non-locals taking the lead in building up the programme, the shared commitment to advance human genetics research resulted in a sizable collection of blood samples from populations across the Middle East amassed through the efforts of local technicians and interlocutors. Following the Second World War, a combination of new technologies associated with blood collection, storage and transport aided efforts by new international organizations to ‘scale up’ – that is, to substantially expand – global human genetics research ‘in the name of global standardization and technological efficiency’. The result was the undermining of the AUB sero-anthropology group’s autonomy, and ultimately the demise of its role in global human genetic research.

Burton’s contribution asks us to historicize ‘globalization’, to recognize that it too is not a static concept but rather an evolving process in both Middle Eastern and wider contexts. As she argues, ‘Our notion of globalizing modern science has often connoted *more* science – that is, sciences characterized by more connectivity, more productivity, more

crossing of borders, than in earlier times'. But as her case study convincingly demonstrates, 'the concept of "scaling up" used to describe post-war genetics calls for equal attention to what social and scientific commitments were simultaneously being "scaled back" or de-developed.' Burton urges attention to dynamic relationships between locales, national and international organizations, and the accumulation of material that undergirds scientific knowledge. This model stands in contrast to one in which scientific relationships and communications move like spokes on a wheel from individual peripheries to the imperial metropole.²³

Lissa Roberts, writing in 2009, framed the challenge to the history of science as one of 'Situating science in global history'. Roberts convincingly concluded that,

To integrate the history of science and global history ... we need to capture the ways in which local exchanges and global circulation simultaneously shaped scientific and technological developments and co-constructively integrated them with the broader developments of political, economic, and cultural history. Only then will we be able to appreciate the role played by science and technology in shaping modernity.²⁴

Carla Nappi wrote to *Isis* readers in 2013 that the larger field of history of science was at a crossroads, ultimately suggesting that 'the history of science is on the cusp of a transformation that is about to leave us with a growing number of local historiographies of science'.²⁵ This problem, central to the historiography(ies) of science today, has been on the minds of historical actors in the Middle East and larger Islamic world for a long time. As Marwa Elshakry argued in 2010, the introduction of 'European sciences' in the Middle East, deemed necessary to shore up Ottoman state and society, led to 'various forms of institutional appropriations that entailed what might best be described as a kind of conceptual syncretism, bridging new conceptions of "Western science" with older forms of knowledge'.²⁶

In the first two decades of the twenty-first century, Euro-American military, political and economic incursions in the Middle East and North Africa rekindled a range of claims about the necessary relationships between support for science and support for democracy.²⁷ Politics in the United States, Russia and elsewhere in Europe, heightened by the global COVID-19 pandemic, make clear that science, religion and democracy are still very much contested in what's been called the global North. For many to have been able to believe otherwise, for however short a period of time, has been a failure to accurately understand these dynamics. We hope these careful case studies, illuminating how earlier Ottoman and post-Ottoman intellectuals, reformers, traditionalists and populists

23 Frederick Cooper, *Colonialism in Question: Theory, Knowledge, History*, Berkeley: University of California Press, 2005. The metaphor of spokes on a wheel comes from Cooper.

24 Roberts, op. cit. (11), p. 25.

25 Nappi, op. cit. (6), p. 103.

26 Marwa Elshakry, 'When science became western: historiographical reflections', *Isis* (March 2010) 101, pp. 98–109, 100.

27 In 2006, a special issue of *Nature* focused for the first time in the journal's history on Islam and science. While largely sympathetic to Muslims and interested in recapturing the history of Islamic scientific contributions, the special issue linked scientific openness, state funding and international exchange to democratic government structures. Herwig Schopper, former director general of CERN, made this relationship explicitly, noting that 'science can be an excellent tool for building trust and promoting peace'. See www.nature.com/nature/journal/v444/n7115/full/444035a.html. Going even further, Nader Fergany, director of the Almishkat Centre for Research in Egypt, argued that the just resolution of conflict is a prerequisite for scientific production, noting that 'human development and freedom in Arab countries are also being restricted by the failure of global governance to help resolve fairly the intensifying conflicts that beset the region, foremost among which is the foreign occupation of Palestine and Iraq'. See www.nature.com/nature/journal/v444/n7115/full/444033a.html.

saw these relationships and sought to create social frameworks to support their goals, offer compelling accounts in their own rights and collectively argue for expanding the range of models that historians of science use to think with.

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