

## Introduction

---

### The Question of Genesis

The first book in Arabic script to be printed with movable type in any Arabic-speaking country appeared in Aleppo, in 1706.<sup>1</sup> The psalter *Kitāb al-zabūr al-sharīf* was printed by the Christian deacon ʿAbdāllāh Zākhir under the guidance of Athanasius Dabbās, the Melkite Patriarch of Antioch. This casual venture in an Ottoman province, though duly recorded in historical annals,<sup>2</sup> has been given less scholarly attention than the printing project launched two decades later in the Ottoman capital by the enterprising Ibrahim Müteferrika, a Christian convert to Islam. In 1727, in the wake of a *firman* by Sultan Ahmet III, which permitted printing in Arabic script in the empire, Müteferrika was given an imperial clearance to launch his own press. It took him two years to publish the first work, a Turkish rendition of an eleventh-century Arabic lexicon in two volumes, and more printed books followed. Müteferrika’s enterprise has been the focus of extensive historical discussion, in which he has often been hailed as “the first Ottoman printer.”<sup>3</sup>

Zākhir and Müteferrika were pioneers, but neither of them could claim the honor of being the world’s first-ever printer in Arabic letters. Their initiatives were preceded by printing schemes in Europe, begun in the early sixteenth century. Presses in Italy, France, the Netherlands, Germany, and England produced printed works in several Islamic languages, including printings of the Qur’ān, for religious-missionary, scholarly, and sometimes commercial purposes, copies of which reached Ottoman collections.<sup>4</sup> Zākhir and Müteferrika were also preceded by

<sup>1</sup> As distinct from Arabic bloc printing and amulets, known at least from the tenth century CE; Schaefer, 1–39.

<sup>2</sup> E.g., Kahhāla; Dabbās-Rashshū, 37–81; Feodorov (I owe this reference to Jacob M. Landau).

<sup>3</sup> Müteferrika’s enterprise is mentioned in almost every work on Muslim printing history. For some recent critical studies, see: Sabev, “First Ottoman”; Sabev, “Virgin”; Kunt; and van den Boogert.

<sup>4</sup> Roper, *Arabic Printing in Malta*, 9–104; Roper, “Early Arabic”; Balagna; al-Sāmarā’ī; Wilson, 32–36.

2 Introduction

printers in the empire itself, non-Muslim subjects of the sultan who produced books in their own languages and scripts. Jewish exiles from Spain opened Hebrew printing shops in Istanbul as early as the mid-1490s, and Jews later set up presses in Salonika, Edirne, Izmir, and Safad. A press in Armenian opened in Istanbul in 1567 and one in Greek in 1627. We also know of printing in a Mount Lebanon monastery which produced at least one item, a prayer book in Arabic (in the Syriac/*karshūnī* script), in 1610, and of several other small plants owned by Jews or Christians elsewhere in the empire.<sup>5</sup> Such sporadic endeavors by non-Muslim minorities aside, it was only in the early eighteenth century that books began to be printed in the languages of Islam under an Islamic-Ottoman rule; to wit, two centuries and a half after Gutenberg.

Mass Arabic printing in the Ottoman Empire was also slower to evolve than its European antecedent, gaining real momentum only in the nineteenth century. Zākhir's 1706 printing initiative yielded a total of eight religious tracts in a modest edition before closing forever five years later. Müteferrika produced sixteen books in some 10,000 copies altogether in his more famous print shop, until his death in 1746 and the folding of his press. Another eight titles with a similar print-run appeared in the Ottoman capital between that last point and the end of the century.<sup>6</sup> On the whole, then, twenty-four books in a total of ca. 13,000 copies were produced in Istanbul from 1727 to 1800, a period stretching over more than seven decades and marked by long intervals of inactivity. Another twenty-nine titles with a comparable number of copies were produced during that time in Syria and Lebanon, according to one count.<sup>7</sup> It was a humble yield. If Zākhir and Müteferrika blazed a trail for Ottoman and Arab printing, that trail remained largely deserted for many more years thereafter. The expectation implied in the 1727 *firman* licensing printing – that a whole new era in text production would soon follow<sup>8</sup> – turned out to be premature; the venture that ensued marked no historic turning point. The appearance of the “first Ottoman printer” in the eighteenth century has recently been described as a kind of historic

<sup>5</sup> Schwartz, 30–32 (with a detailed list of such ventures). See also the studies by Tamari, Pehlivanian, and Glass/Roper in Hanebutt-Benz and others; and Roberts.

<sup>6</sup> The date of Müteferrika's death is in some doubt; see Sabev, “First Ottoman,” 64–65. A list of his printed titles appears on p. 83. The last of his sixteen books (one of them comprising two volumes) was published in 1742. For works published in Istanbul from Müteferrika's death to the end of the century, see Kut and Türe; Oman et al.

<sup>7</sup> Gdoura, 249–64.

<sup>8</sup> An English translation of Sultan Ahmet's *firman* of 1727 appears in Atiyeh, *Book*, 284–92. The *firman* goes to great length in explaining the benefits of printing, laying out as many as ten of them, and anticipates that henceforth books “shall become numerous” through the printing process.

accident, “a pure chance” in an environment that was not ready for him.<sup>9</sup> The history of printing in the Turkish- and Arabic-speaking parts of the Ottoman Empire would begin in earnest only in the subsequent century.

The scope of book production once the machines started rolling under Ottoman sway – thousands of copies within a few years – was impressive for the region. But it looks strikingly modest when contrasted with the pace of European printing in the decades after Gutenberg. There, almost overnight a network of print shops spread all over western and central Europe, from Lisbon to Krakow and from Naples to Stockholm. During the five decades up to 1500 CE (the “*incunabula*” phase), some 30,000 titles in an estimated fifteen to twenty million copies were printed in Europe<sup>10</sup> – conceivably more than all the books produced by man in six millennia of writing. Thereafter, the numbers continued to increase exponentially. Printing came to play a vital role in Europe’s grand historic developments, including the late Renaissance, the Protestant Reformation, and the scientific revolution, the expansion of literacy, and the emergence of reading publics. While its actual role in these changes is a matter of controversy among scholars,<sup>11</sup> even those who tend to play it down acknowledge its major contribution to mankind.

The considerable gap in timing and pace between the two scenes seems to beg some “why” questions: Why did the Ottoman Empire refrain from adopting printing in its own languages before the eighteenth century, despite being amply aware of its existence? Why did the advent of printing, once it had begun under Ottoman rule, generate no excited momentum similar to that of fifteenth-century Europe? Why did it take another century for the endeavor initiated by Zākhir and Müteferrika – its benefits now explicitly acknowledged – to become a mass enterprise? And, we may also ask, what caused the heirs of these two pioneers to be so much more successful in the following century?

Before embarking on exploring these questions, let us briefly consider the methodological validity of such an exploration. Would studying Ottoman printing by contrasting it with the European antecedent help

<sup>9</sup> Sabev, *In Search*, 6–7: “Because the Ottomans themselves were not in a dramatic wait for printing, the time of Müteferrika’s appearance seems to be really senseless.” In a revised published version of his paper, Sabev modified this statement somewhat: “In my opinion, Ibrahim Müteferrika was ‘an agent of change,’ though not an ‘agent of immediate change’”; Sabev, “Waiting,” 105.

<sup>10</sup> Dondi. The British Library’s online *Incunabula Short Title Catalogue* contains 30,375 extant editions printed before 1501; [www.bl.uk/catalogues/istc](http://www.bl.uk/catalogues/istc) (last consulted 16 September 2015).

<sup>11</sup> See e.g., the exchange between Elizabeth Eisenstein and Adrian Johns in the *American Historical Review*, 107, 1 (February 2002), 87–128; Grafton; and Eisenstein, *Printing Revolution*, “Afterword.”

4 Introduction

us in comprehending the Ottoman case? Wouldn't our habitual, almost axiomatic, association of printing with progress perforce impose on us a prejudiced outlook that would preclude a fair-minded appraisal of the Ottoman scene? It has recently been suggested that studying Ottoman printing by asking the above "why" questions would be "ahistorical," in that it would "predicate Ottoman printing on the European experience of print": Applying criteria molded by one historic case to another historic case, such an approach would inevitably produce a distorted understanding of the latter.<sup>12</sup> Would it not be more useful, then, to probe the emergence of Ottoman printing as a facet of Ottoman history, studied from within, with no relation to the European model?

It seems to me that examining Ottoman printing history against the backdrop of the European experience might become ahistorical only if one is oblivious to the methodological pitfalls on the way, which are, admittedly, more real than visible. The risk of such unawareness is ever there when studying a society other than one's own, even when no comparison between cultures is openly attempted, let alone when a comparison is at the heart of the probe. The biased attitude typical of the study of another society through one's own sociocultural prism had, until recently, marred much of the European scholarship on the Muslim world. Among other things, it had been reflected in European views on the "late entry" of printing into the region: Deeming printing as a clear mark of progress and its absence as regression, scholars have tended to interpret the Ottoman shunning of printing as opting for backwardness and to regard their subsequent adoption of printing as a "belated" embracing of modernity. As historian Orlin Sabev has observed, educated Westerners – who "cannot imagine a society without printing" – had been exploring a quandary of their own making when erroneously assuming that the Ottomans were preoccupied with a "dilemma, to print or not to print."<sup>13</sup>

Perpetual awareness of our cultural filters should help us in skirting such dangers. We ought to check and recheck our alertness at every turn – a demanding but attainable requirement. If keen and alert, there would be nothing ahistorical in our comparative inquiry. Grand comparisons between civilizations are too exciting and gratifying to avoid and should not be given up because of avertible methodological hazards. They have much to offer to the inquisitive researcher and often yield insights unobtainable otherwise. Historian David Landes, who chose to investigate the

<sup>12</sup> Schwartz, 18, and extensive discussion in chapter 2 of her thesis. Schwartz argues that much of the existing scholarship on Ottoman printing, including some recent works, is thus tainted.

<sup>13</sup> Sabev, *In Search*, 3–5.

enigmatic absence of scientific and industrial revolutions in China’s history, ascribed his choice of topic to a simple, healthy historical curiosity: “Why should one not expect China to be interested in economic growth and development? . . . to want to do more work with less labor?” Why, we may likewise ask, would the Ottoman state and its subjects in the Middle East turn their backs for such a long time on a device which had proven to hold so many benefits in neighboring Europe? The questions about the long absence of mass printing in the Ottoman Empire are among the historic dilemmas related to the major disparities between European and Middle Eastern civilizations, like those that concern feudalism, nationalism, or democracy. They invite judicious comparisons between their divergent historic courses and choices. These are ever-elusive questions and their probing is intricate. But, as Landes has noted, “that is what history is all about.”<sup>14</sup>

Asking why a certain development, known in one society, did not occur in another entails more methodological difficulties. The sources of a studied society do not usually discuss phenomena or ideas that were not a part of its own experience, and rarely explicate their absence. Such is the case with printing in the pre-eighteenth-century Middle East. The local sources, so rich on so many other matters, say little about the foreign technology and do not care to expound the choice not to adopt it for several centuries. The historian is thus left to rely on indirect evidence and on inferences as much as, or more than, on explicit testimonies and come up with explanations that are inevitably tentative. This will be all too obvious in the discussion below.

### The “Late Début”: Opting for the Sidelines?

Until recently, historians did not examine the reasons for the Ottoman disinterest in printing very closely. Scholars who discussed that historic fact usually did so hastily and were content with certain simplistic explanations. Grounded in some crude assumptions regarding Muslim culture and the Ottoman Empire, their superficial treatment of the issue was uncritically recycled in the literature. It reflected the long-familiar problematic tendency to ascribe one’s own concepts and priorities to another society under scrutiny.

The standard account attributed the Muslim-Ottoman choice to avoid printing to three main causes: government objection, *‘ulamā’* disapproval, and opposition by the many book copyists in the capital. Ottoman sultans were said to have been wary lest printing introduce alien concepts and

<sup>14</sup> Landes, 16.

6 Introduction

habits that would weaken the Islamic order on which their power and the imperial order rested. Two sultans, Bāyezid II and Selim I, were reported to have issued *firmans* (edicts), in 1485 and 1515, respectively, which explicitly prohibited the use of printing in the languages of Islam under penalty of death, and these presumably remained in force in subsequent centuries. The *‘ulamā’*, for their part, were believed to have been opposed to the foreign technology mostly on conservative religious grounds. To them, printing represented a *bid‘a*, objectionable innovation of the worst kind, the kind borrowed from infidels. For these guardians of the faith, it was “veneration of the Arabic language as the medium for revealing the word of God” that made them “oppose the use of a metal object, coming from Christendom, to reproduce the honored language of revelation,” one scholar has suggested.<sup>15</sup> Like the sultans, they must also have been concerned about the threat the imported medium held to their standing as the overseers of all written guidance to the community. Müteferrika’s words about the *‘ulamā’* fearing that printing would place “more than the necessary amount of books” into circulation were taken as an accurate expression of their stance.<sup>16</sup> In the centralized empire, such a shared opposition by sultans and *‘ulamā’* should have sufficed to prevent the entry of printing by an order from above. But there was also opposition from below, by the Istanbul scribes and book copyists. They made up a sizeable group – 80,000 strong in the late seventeenth century, according to one testimony<sup>17</sup> – and hence influential enough to pressure the government to ban the tool that would undercut their livelihood. Both the government and the *‘ulamā’* had high esteem for the scribes and copyists as a vital brick in the edifice of the existing order, and both were keen to protect them. Other possible reasons for the “belated” genesis of Ottoman printing were also mentioned, as subsidiary complements to those noted above: economic factors – the high cost of establishing a press and the dearth of public demand, given the society’s widespread illiteracy and poverty; and, somewhat more hazily, cultural factors – a time-honored preference for oral expression, coupled with a reverence for the written word and for the craft of calligraphy. Both would impede the adoption of printing.<sup>18</sup>

On the whole, this multilayered explanation seemed to make sense, and for a long time scholars accepted it as adequate. It was comfortably consonant with modernization theories, which regarded printing as

<sup>15</sup> Atiyeh, “Book,” 235.

<sup>16</sup> Quoted in Göçek, 113.

<sup>17</sup> The figure is taken from a report by the Bolognese scholar and soldier Luigi Ferdinando Marsigli, who visited Istanbul in 1682 as a young man; quoted in Oman et al. See also the sources cited in Sabev, “Formation,” 313.

<sup>18</sup> Oman et al.; Robinson, 234.

a key to progress and its absence as a mark of underdevelopment. By depriving itself from its benefits, it was assumed, the Muslim Ottoman state opted to remain on the sidelines of human progress, way behind Europe, which was racing ahead. To some observers, this was yet another proof of Muslim societies being intellectually and scientifically “inert” in recent centuries.<sup>19</sup> Only rarely did scholars question the soundness of the explanation or the credibility of its underlying historic evidence.<sup>20</sup> It was thus presented in the article on printing (“Maṭba‘a”) in the authoritative *Encyclopaedia of Islam*, second edition, and was perpetuated as a matter of course in the historical literature, including works as recent as the present decade.<sup>21</sup> “One can avoid the need to explain a great deal by relying on this conviction,” historian Ian Proudfoot has observed.<sup>22</sup>

A closer look at this reading of the issue brings up questions which the above explanation leaves unresolved. One may wonder, how come government disapproval and ‘ulamā’ resentment sufficed to prevent printing by Muslims throughout that vast empire for centuries, while in Europe printing thrived despite similar obstacles. One may also wonder, with regard to the scribes and copiers – who would naturally strive to avert the danger posed by printing – what made those in the Ottoman Empire more effective than the corresponding class in Europe, who had also tried to check the danger to their livelihood and soon lost the battle. In the same vein, illiteracy and poverty, two obstacles to mass production and consumption of written texts, were not unique to the Middle East. They also prevailed in Europe, which was overwhelmingly illiterate when printing appeared and for a long time thereafter and in large part also indigent, but these did not prevent the remarkable success of the printing press. Finally, perhaps most puzzling about the standard interpretation is the historic fact that the Zākhīr and Mūteferrika initiatives of the early eighteenth century had no follow-up for many decades. State approval and ‘ulamā’ consent were already there, as were the eager entrepreneur and the machinery; but the enterprise failed to take off. Why? This last puzzle is

<sup>19</sup> E.g., Huff, 153–59, 307.

<sup>20</sup> Notably André Demeerseman, who, in a seventy-six-page-long study published in 1954, cast doubt on some of the accepted assumptions and proposed a more nuanced analysis. His essay passed largely unheeded, as can be seen from the many works referred to in the next note below, most of which appeared much later.

<sup>21</sup> Oman et al. (article published in 1989). For studies that endorsed this explanation in whole or in part, see, e.g., Pedersen, 133–34; Nasrallah, 17–25; Šābāt, 17, 21–22; Dabbās-Rashshū, 14; Szyliowicz, 251; Atiyeh, “Book,” 234–35; Bagdadi, 85–86; Lewis, *Middle East*, 268; Bloom, 217–24; Finkel, 366–68; Harding, 432; Huff, 307; Wilson, 36–37, and (admittedly) Ayalon, *The Press*, 166.

<sup>22</sup> Proudfoot, “Mass Producing,” 184.



8 Introduction

not accounted for by the regular explanations. Perhaps other, more subtle, factors were at play here, beyond the calculated interests of the usual actors.

In recent years, especially in the last decade, scholars have begun to look into these questions more critically. Doubts have been raised concerning the alleged imperial ban on printing, casting it as, apparently, a myth. It has been noted that no copies of the presumed decrees by Bāyezid II and Selim I have been found in the archives so far, and that the assumption that these two sultans – who were generally known for their favorable view of learning – should issue such a command was unlikely. To be sure, the notion that Ottoman rulers would be distrustful of printing has not in itself been disputed. What has been is the use of this notion as a blanket explanation for the absence of Muslim printing, without trying to probe the roots of that possible distrust. Doubts have also been raised about the likelihood that fifteenth- and sixteenth-century decrees should effectively retain their prohibitive force until the eighteenth century all over the vast and diverse empire.<sup>23</sup> Similar skepticism has been voiced about the notion of *‘ulamā’* opposition to printing. It has been argued that the sources studied so far contain no unequivocal evidence of their hostility to printing and that, moreover, when the practice was seriously considered in the eighteenth century, the stance of many *‘ulamā’* was rather supportive. It could also be shown that, historically, they tended to approve of novel technologies more often than not.<sup>24</sup> “Instead of stating that the *‘ulamā’* were against printing, we may note that printing was opposed by some *‘ulamā’*,” one scholar has suggested.<sup>25</sup> The assumption that printing was rejected from above, through dictates by the community’s rulers and spiritual guides, has thus been rendered questionable.

<sup>23</sup> Ghobrial, 1–4; Sabev, “Formation,” 311–14; Schwartz, 54–55, 62–68. Doubts concerning the authenticity of the sultan’s decrees were voiced already in 1928 by Gerçek, 9, but have passed largely unnoticed. The Tunisian historian Wahid Gdoura (Waḥīd Qaddūra) has traced the roots of the account on the decrees to a report by André Thevet, a sixteenth-century French traveler to the East, which was apparently based on unsubstantiated rumors (Thevet, 515) and which later historians accepted as a fact; Gdoura, 86–89, and see also Sabev, “Virgin,” 392–97.

<sup>24</sup> Gdoura, 81–83; Kunt, 96; Proudfoot, “Mass Producing,” 167; Sajdi, “Print,” 117ff; Skovgaard-Petersen, 77ff. As against this, a forthcoming study by Guy Burak argues that *‘ulamā’* of the established hierarchy did object to Müteferrika’s scheme and to the adoption of printing. They adhered to the traditional “manuscript culture,” with the practice of canonizing texts and their copies as its cornerstone principle; See Burak. I am grateful to the author for allowing me to consult and refer to a draft of this article. Burak is reminding us here that some (or perhaps many) *‘ulamā’* did retain an unfavorable view of printing, an assessment compatible with that of Skovgaard-Petersen’s, quoted immediately below.

<sup>25</sup> Skovgaard-Petersen, 78.



Likewise, the common wisdom on the copyists as a major obstacle to Ottoman printing has been cast in doubt.<sup>26</sup> That this sector had a genuine interest in blocking the entry of printing is obvious, but historians are required to prove, not just conjecture, that these practitioners had sufficient influence, as an organized guild or otherwise, to attain such a goal. Recent studies have reminded us that we still do not know enough about the role of Ottoman guilds to reach such conclusions, and that the little we do know seems to indicate that copyists might not have been thus organized.<sup>27</sup> Similarly, the idea that Muslim reverence for the scriptures and the sacred language led them to object to printing has come under attack. Historians have criticized the notion of “a purported timeless Muslim suspicion of the written word”; there was “no general ‘sacred refusal to print’,” Dana Sajdi has argued, presenting examples of Islamic block-printing of various texts, including the Qur’ān itself from the tenth century onward.<sup>28</sup>

An explanation that once seemed satisfactory has thus been rendered shaky. But if it was not sultanic reluctance, *‘ulamā’* dogmatism, pressures by copyists, or the overriding sacredness of writing, what explains the long abstention of the Ottomans from printing? The difficulty in devising an answer is exacerbated by the silence of local sources on the matter. “We have never set much store on strange and ingenious objects, nor do we need any more of your country’s manufactures,” the emperor of China told King George III of England in 1793, stating his mind explicitly.<sup>29</sup> We know of no like remark by an Ottoman ruler. The recent search by scholars has revealed no more than a handful of references to printing by Muslims before the eighteenth century. We know of two Ottoman authors who addressed the matter sketchily, both in the seventeenth century: Ibrahim Peçevi (1574–1649), who in his history of the empire briefly mentioned the European practice of printing, noting its technical benefits; and Katip Çelebi (1609–1657), who in his universal history (*Cihannüma*) referred to printing in ancient China. Both of them dealt with printing in foreign contexts; neither considered its relevance to Ottoman needs, nor did they openly recommend its adoption.<sup>30</sup> At about the same time, in another corner of the region, Muḥammad bin ‘Abd al-Wahhāb al-Wazīr al-Ghasānī wrote an account

<sup>26</sup> Marsigli’s oft-quoted fantastic figure of 80,000 book copyists in seventeenth-century Istanbul is patently implausible: In a city of some 800,000 souls at the time – namely, ca. 200,000–250,000 adult males – this would make one out of every three breadwinners a scribe or a bookmaker.

<sup>27</sup> Sabev, *In Search*, 3–4; Ghobrial, 2, quoting Eujeong Yi, *Guild Dynamics in Seventeenth-Century Istanbul: Fluidity and Leverage* (Leiden: Brill, 2004). See also Berger, 15–16.

<sup>28</sup> Sajdi, “Print,” 118–20. See also Cole, 348.

<sup>29</sup> Quoted by Landes, 18.

<sup>30</sup> Sabev, “Formation,” 314; Sabev, “Virgin,” 396; Kunt, 91.

10 Introduction

of his 1690 trip to Spain as an official Moroccan emissary, in which he noted the existence of print shops and newspapers there, presenting them as odd curiosities of the infidels.<sup>31</sup> Such fleeting references – there might have been a few more here and there – tell us little about Muslim views on printing as a practical option, beyond reflecting indifference to it. This resonant silence leaves the striking gap between the Muslim world and Europe with regard to printing an open question for anyone to speculate on, cursorily or systematically.

### Another Explanation: Printing Redundant

A sound analysis of the absence of mass printing in the Middle East should take into account cultural, religious, social, and political factors. All of these should be considered, even though their respective weight might be hard to assess. Let us first look at the essence of these different ingredients and then try to understand how they worked to delay the entry of mass printing.

A good place to begin is the cultural sphere. It is a commonplace that Muslim societies accorded a limited role to writing and written texts in the community's routine functioning. To examine this view more closely, we must go beyond simplistic notions such as the Arab "superior oral tradition" and the invariable sacredness of anything inscribed in Arabic. Speech and writing were two modes of retaining and transmitting knowledge which complemented, not negated, each other. There was a role division between them, one that changed according to function. Vocal utterance of written texts was essential in religious contexts: God was believed to have delivered His message to His community in speech, and sacred and doctrinal writings were deemed most valid when cited out loud. This preference for oral usage was extended to other kinds of texts, sometimes only partly sacred and at other times not at all. Such was the case with legal testimonies, which were considered weightier than written ones. Likewise, in Muslim learning and the imparting of traditional knowledge, special value was placed on audible recitation, usually regarded as superior to silent reading, even when written copies were at hand.<sup>32</sup> Poetry and literary prose, too, were considered to be at their

<sup>31</sup> Ghasānī, 67. Wahid Gdoura has suggested that, rather than being silent on the issue, Muslims had engaged in a "*long débat*" on the pros and cons of printing between the sixteenth and eighteenth centuries. As evidence for this extended "debate" he cited a set of episodic and laconic Ottoman references to the importation of European books into the Empire; Gdoura, 83–86. It seems that Gdoura has taken intermittent and unrelated points for a line.

<sup>32</sup> Berkey, *Transmission*, 26–30.