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New Science and Old Sources: Why the Ottoman Experience of Plague Matters

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**PANDEMIC DISEASE IN
THE MIEVEAL WORLD**

RETHINKING THE BLACK DEATH

Edited by MONICA H. GREEN

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NEW SCIENCE AND OLD SOURCES: WHY THE OTTOMAN EXPERIENCE OF PLAGUE MATTERS

NÜKHET VARLIK

THIS IS A historic moment for plague historians and scientists. At present, a growing consensus in the international scholarly community identifies the Black Death as a pandemic of plague caused by *Yersinia pestis*.¹ This consensus marks the end of a long controversy over the pathogenic agent of the pandemic—a controversy that occupied the front stage of scholarship for decades.² Having left this behind, plague historians can now afford to explore new issues as well as revisit old questions with a fresh eye. They can draw from a wealth of research supplied by the “new science” of plague—by which I refer to the flurry of studies in the last decade or two in fields such as bioarcheology, microbiology, genetics, and epidemiology—and seek novel ways of integrating it into historical inquiry. In effect, this moment heralds the beginning of a new chapter in plague scholarship as it invites new avenues of inquiry (see Green 2014, in this issue). One such pathway worth pursuing is the task of calibrating the relationships between the new science of plague and the “old sources”—by which I mean the written sources historians are trained to use.

The new science and the old sources do not always concur, unless the historian makes an effort to make them speak to each other. With this in view, this essay will draw from the Ottoman experience during the so-

I owe a tremendous debt of gratitude to Monica Green, who has provided inspiration and encouragement throughout the process of writing this essay. I would also like to acknowledge Ann Carmichael, George Sussman, Carol Symes, Michelle Ziegler, and the anonymous reviewers of *The Medieval Globe*, with thanks for their invaluable comments and suggestions.

1 The consensus is firmly in place in the geneticist community. Multiple groups of researchers have confirmed *Y. pestis* as the causative agent of the Black Death (e.g., Haensch et al. 2010; Tran et al. 2011). Sequences of *Y. pestis* genomes have been reconstructed from the ancient DNA recovered from the Black Death cemeteries in London (Bos et al. 2011). Informed by recent scientific studies, a growing number of historians have acknowledged this consensus (e.g. Little 2011; Bolton 2013). For its significance in bioarcheology see DeWitte (2014, in this issue).

2 A concise presentation of the controversy can be found in Little 2011. Most recently, historian Samuel K. Cohn (2013) remains unconvinced that any currently existing strain of *Y. pestis* caused the Black Death.

called Second Plague Pandemic (i.e., the Black Death and its recurrent waves) and seek to highlight the critical importance of the historian's craft in working with sources that can shed light beyond the spotlight of scientific research. In order to demonstrate why the Ottoman plague experience matters for an understanding of the Second Pandemic, the essay will tackle two sets of intertwined problems. On the one hand, it will engage with a historical and historiographical discussion of why the Ottoman epidemiological experience has been imagined as the European alterity and how this legacy has obstructed this experience from being studied as part of the larger Afro-Eurasian disease zone of the Second Pandemic. My goal here is to underscore the Eurocentric nature of plague studies by demonstrating how spatio-temporal epidemiological boundaries were constructed in the scholarship. On the other hand, this essay will examine the Ottoman plague experience during the Second Pandemic with a view to offering observations and insights about the Ottoman disease ecologies that sustained plague. More specifically, three aspects of this experience are explored in detail: *persistence*, *foci/focalization*, and *patterns of transmission of plague*. My goal here is to illustrate how the new science of plague can be put in dialogue with historical sources.

Part I. New Science and Old Sources: Challenges and Opportunities

From where we stand today, some may believe that the new science of plague puts an end to historical inquiry.³ Because the new science can explain the pathogen and its genetic history, one may wonder why we still need to study the old sources. The reasons for this are to be sought in the very etiology of plague that involves a complex system of entanglements in which every organism (as host, vector, or pathogen) constantly interacts with other organisms, as well as the surrounding environment. Thus historians must now account for variations between the specific ways the disease manifests itself at local and regional levels. Such ecological and environmental variations make it all the more compelling to pay attention to the “local knowledge” of plague, in the form it appears in the historical sources.⁴

3 The recent engagement of the geneticist community in the debate seems to have been taken by some historians as a threat to the territory of their discipline and led them to react. A recent article written with that conviction has suggested: “Historians are uniquely qualified to assess the value and analyse the content of medieval primary sources and should not allow the glamour of science to make us forget our own expertise” (Pobst 2013: 814).

4 The emphasis on the “local knowledge” of plague and “plague experience” in

It is now clear that plague studies will have to transcend the boundaries of individual disciplines; adopting an interdisciplinary approach is practically inevitable. The student of plague therefore needs to face up to the stipulations of interdisciplinary work. For example, there is a pressing need to keep up with the all-too-quickly-changing findings of the scientific literature, especially in the fields of genomics and evolutionary biology. It is necessary to understand, interpret, and utilize the research findings supplied by allied disciplines and fields, ranging from climate history to bioarcheology. It also means reckoning with what appears to be a growing imbalance between the new science of plague and the old sources. Even if one leaves aside differences in content, the disparity between publication cultures in the sciences and in the humanities cannot be overlooked. The former prefers short, rapidly-produced, multi-authored technical notices that may seem impenetrable to the nonspecialist; the characteristics of humanist publications are almost the opposite (except, in some cases, for their degree of impenetrability). Motivated by different questions, concerns, and agendas, the historical and scientific scholarship of plague do not produce research that can be easily reconciled. How, then, can this new science be used in conjunction with historical accounts? How can the historian put them into dialogue? This imbalance becomes all the more challenging in those fields where the historical scholarship of plague is still relatively undeveloped. There is a wealth of primary sources pertaining to plague in non-Western languages, but it is still in manuscript form. Until these sources are edited, published, and translated in a manner accessible to researchers, our knowledge of past plagues will continue to suffer from this imbalance.

As a result, there remain a number of important gaps in the scholarship of historical plague epidemics that need to be filled. One is the Ottoman experience of plague during the Black Death and its recurrent waves. Judging from modern Ottomanist scholarship, the vast area that came under Ottoman control—stretching at its height from southeast Europe to the Persian Gulf and from the Black Sea basin to the Yemen—did not figure as a breeding ground for plague until the last centuries of the empire's history: the only extensive study covers the period between 1700 and 1850 (Panzac 1985).⁵ For the plague outbreaks before this era (i.e., from

this essay has benefited from the concept of “local biologies” developed by medical anthropologist Margaret Lock and the recent discussions of this concept in the context of global health. See, for example, Lock 1993 and 1995; Brotherton and Nguyen 2013.

5 Panzac's study has been largely ignored by mainstream historical scholarship. While it was unanimously recognized as a great accomplishment with respect to its

1347 to 1700), no systematic study has hitherto surveyed their temporal and spatial scope or effects, or even considered how the Ottoman epidemiological experience may be integrated into the broader history of the Second Pandemic in the Afro-Eurasian zone.⁶

This is curious because the spatial and temporal correspondence between the empire and the plague can hardly be ignored. Ottoman history almost squarely coincides with the time frame of the Second Plague Pandemic, and evidence suggests that Ottoman power and the plague coexisted for half a millennium, from the Black Death of the mid-fourteenth century to the mid-nineteenth century or so. Yet the ubiquitous presence of plague in the Ottoman world over that half millennium has remained mostly invisible in both historical and scientific scholarship. In what follows, we shall seek to disentangle the web of historical and historiographical problems that have obstructed the Ottoman plague experience from becoming visible. A critical reading of scientific and historical studies of plague sheds light on how European epidemiological imaginaries fashioned the Ottoman experience as the “other” by constructing spatial and temporal epidemiological boundaries; so it is to the construction of these boundaries that we turn now.

The Historical Fiction of Epidemiological Boundaries

The historical scholarship on the Black Death is largely Eurocentric. In this body of scholarship, Europe has occupied a privileged position, compared to other parts of the world that may have been at least as badly affected by plague, if not more so. Our current knowledge about the plague in East Asia, South Asia, Central Asia, the Middle East, and North Africa before the Third Pandemic is at best fragmentary and disconnected.⁷ As such, extant

documentation of the occurrences of plague outbreaks, their frequency, and methods of spread, its representation of the demographic and economic effects of plague was debated. Historians of the Ottoman empire and the Middle East have been especially critical of the absence of Ottoman sources (e.g., Owen 1986; Dols 1987; Issawi 1988; Fisher 1992). For its absence from European scholarship, see also below.

6 See, e.g., Ünver 1935; Panzac 1973, 1986, 1987, and 2009; Jennings 1993; Lowry 2003; Schamiloglu 2004; Kılıç 2004; Mikhail 2008; 2012; Shefer-Mossensohn 2009 and 2012; White 2010; Varlık 2011; Bulmuş 2012. For a study of the outbreaks between 1347 and 1600, see Varlık (forthcoming). For a call to study the Second Pandemic in this larger Afro-Eurasian disease zone, see Green (2014, in this issue).

7 Even though there are fine historical studies devoted to the epidemiological experience of these areas during the Second Pandemic, they are difficult to bring together in view of their temporal and spatial breadth of coverage. See, e.g.,

scholarship has cultivated a lasting impression that the Black Death was a European phenomenon and that the European epidemiological experience was to be studied *sui generis*. In this epidemiological imagination, non-European epidemiological experiences would only be worthy of scholarly attention if commensurate with that of Europe. In other words, the lacunae in historical plague scholarship are not haphazard; what was studied and what was not can be best understood in the light of European notions of public health and efforts for disease control that came in the form of quarantines, plague commissions, sanitary missions, and international conferences at the dawn of the modern era. Those areas whose plague experience was believed, in the twentieth century, to have been of direct relevance to that of Europe (and perceived as having an impact on European public health concerns) came under the spotlight of scholarship while others remained rather obscure.

The European epidemiological experience thus came to be understood within certain temporal and spatial boundaries, and both are reflected in the periodization of plague, a system that purports to be global but which actually situates Europe at the center and only captures European experiences. By now, it has become commonplace to study three discrete pandemics: the First Pandemic, known as the Justinianic Plague and its recurrent waves (541–c.750); the Second Pandemic, known as the Black Death (1346–53) and its recurrent waves that continued for several centuries; and the Third Pandemic that spread globally in a few years after its appearance in Hong Kong in 1894.⁸ Although the idea that the Plague of Justinian and the Black Death were two separate waves of epidemic

Hrabak 1957; Krekic 1963; Langer 1975; Dols 1977; Norris 1977; Alexander 1980; Schamiloglu 1993; Ansari 1994; Köstēs 1995; Manolova-Nikolova 2004; Anandavalli 2007; Stearns 2009 and 2011; Frandsen 2010; Buell 2012. Also see works cited in notes 5 and 6 above. For a study that ambitiously tries to offer a wider (but still Eurocentric) scope, see Benedictow 2004. For studies that have adopted larger or comparative perspectives, see Biraben 1975; Borsch 2005; Sussman 2011. There is also a substantial body of literature devoted to the First Pandemic, including but not limited to Biraben and Le Goff 1969; Dols 1974; Conrad 1981, 1982, and 2000; Christensen 1993; Stathakopoulos 2000 and 2004; van Ess 2001; Little 2007.

8 For this conventionally accepted periodization, see Little 2011. The term “pandemic” appears to have been used infrequently before 1894: Creighton (1891) references it only three times in over seven hundred pages: for example, “there are instances of what are called pandemics, or universal epidemics, of sickness. The Black Death was one such” (p. 397). Interestingly enough, it was the cholera and influenza pandemics that helped spread its use, and by 1918 the term had become common parlance (Morens, Folkers, and Fauci 2009).

activity was becoming common in the nineteenth century, it was not until the outbreak of plague in (British) Hong Kong and the discovery of the plague bacillus that these epidemics were retrospectively placed in a historical timeline. Twentieth-century epidemiologists and epidemiological historians alike seem to have subsequently adopted this schema.⁹ Nevertheless, this vision of past plagues can hardly be taken to represent the rhythm of plagues as experienced across the Afro-Eurasian zone. It offers little insight for the ebb and flow of epidemic waves in other areas, especially with regard to the “in-between” outbreaks.

The Ottoman case in particular seems to complicate this periodization, as it blurs the assumed boundaries between the end of the Second Pandemic and the beginning of the Third—just as it blurs a supposed distinction between West and East. After plague receded from Western Europe early in the eighteenth century, sporadic outbreaks continued to occur in Southern and Eastern Europe (e.g., 1743 in Messina, 1815 in Bari), in Russia (e.g., 1770–72 in Moscow), and more persistently in the Middle East until the nineteenth century. Those occurrences were noted in many late nineteenth- and early twentieth-century works (e.g., Simpson 1905: 36–39; Sticker 1908). Modern scholarship has also convincingly shown that plague persisted in the Ottoman empire and Russia (Alexander 1980; Panzac 1985; Robarts 2010). Nevertheless, the Great Plague of London (1665) and that of Marseille (1720–22) continued to be seen as marking the end of the Second Pandemic. Plague outbreaks in the eighteenth and nineteenth centuries, outside of Europe, were only recently recognized as being part of the Second Pandemic (Walløe 2008; Cohn 2008; Bolton 2013: 15).¹⁰

9 It appears for the first time around the turn of the twentieth century. For example, Simpson (1905) identified three pandemics: “The first [...] recorded to have originated in Pelusium in Egypt” (p. 5); “The second [...] later called the Black Death” (p. 21); and “The pandemic of the present day” (p. 6). Other early twentieth-century works used the term “pandemic” without a system of enumeration (e.g., Eager 1908; Sticker 1908), but by the mid-twentieth century this system of periodization seems to be in place (see e.g., Hirst 1953). However, it probably did not become conventional until the 1970s (Ziegler 1969: 25; Dols 1977: 14).

10 A similar pattern of persistence of plague can be observed between the First and the Second Pandemic, roughly in areas where the Ottomans would come to rule. These recurrent outbreaks also complicate the parameters of these earlier pandemics. See Dols 1974 and 1977: 13–35; McNeill 1976: 70; Conrad 1981. For a list of outbreaks in Anatolia under Seljuk rule (though the diagnosis of these outbreaks is not always clear), see Arik 1991. For a brief description of an outbreak in Tunisia in 1004–05, see Talbi 1981: 223. For a critique of the year 750 as the definite end of the First Pandemic, see Morony 2007.

The question of when the last outbreak of the Second Pandemic took place therefore seems difficult to answer based on extant sources and prevailing habits of thought. Plague continued in Ottoman areas until the mid-nineteenth century, if not longer, since recorded cases in Mesopotamia and the Arabian peninsula appear until the turn of the twentieth century (Simpson 1905: 38–39).¹¹ Especially in view of the fact that the Third Pandemic also made its appearance around the same time, the question of when the Second Pandemic ended may need to be re-evaluated with the help of scientific studies. In effect, it is possible that the strains of *Y. pestis* involved in the Second Pandemic are still with us today, as demonstrated in the example of a recent outbreak in Libya.¹²

Shifting our focus from temporal to spatial boundaries may also involve questioning what we think we know about plague's past. Once again, the Ottoman case is telling, and it underscores the degree to which the new plague science has maintained or reproduced these spatial boundaries. As noted above, the scarcity of historical studies on Ottoman plagues has rendered it invisible to practitioners of the new science. In the absence of historical studies to guide bioarcheological research, there is no evidence from former Ottoman areas comparable to what has been found for Western Europe.¹³ Obviously, this has implications for studying the genetic history of the pathogen. In the absence of aDNA specimens, the plague history of this particular area/era cannot be integrated into the narrative of the new science because the aDNA specimens of *Y. pestis* mostly come from excavations in Europe (France, Germany, Italy, England, and the Netherlands)—places close to centers of molecular biology, centers of information and calculation (Latour 1987).¹⁴ Reconstructing the phy-

11 Twentieth-century scholarship seems to have grown more confident about announcing the “end of plague.” For example, Pollitzer (1951: 478) hailed “the gradual disappearance of the disease first from Western and then from Eastern Europe until in 1841 Turkey, the last stronghold of the pest, became free.” Drawing from this scholarship, Panzac (1985: 446–517) also held that the last plague was in the 1840s. But at the turn of the twentieth century, news of plague in Istanbul was noteworthy enough to receive international coverage (*British Medical Journal* 1900, 1902a, and 1902b).

12 Recent genetics research on the 2009 Libyan outbreak has demonstrated that a branch of the *medievalis* strain (2.MED) was involved. This strain, independent of the Third Pandemic, could be one that was active during the Second Pandemic (Cabanel et al. 2013; Green 2014, in this issue).

13 Bioarcheology and aDNA research have only recently started being used in the field of Near Eastern studies. For a discussion of the state-of-the-field, including reasons for its belated development, see, e.g., Sołtysiak 2007; Baca and Molak 2008.

14 For a list of the areas of excavation, see “Toward a Molecular History of *Yersinia*

logenetic history of the pathogen depends on identifying modern *Y. pestis* isolates. Some of these specimens have been preserved since the late nineteenth century, others have been isolated more recently. The majority of these modern specimens come from places where plague is (or has until recently been) enzootic. Among these, a large number come from the United States, Russia, Mongolia, and China; fewer from India, Madagascar, Eastern and Central Africa, and elsewhere.¹⁵ For our immediate area of interest, only a small number of isolates from former Ottoman areas (including Turkey, northern Iraq, and western Iran) have been included in recent phylogenetic analyses and studied in relation to where they stand within the evolutionary subdivision of *Y. pestis*.¹⁶ Owing to this imbalance in data collection and analysis, the new science of plague—along with the historical scholarship that informs it—privileges some areas over others.¹⁷

This ongoing Eurocentricity of plague scholarship has been largely determined by research produced in the nineteenth and twentieth centuries—research with a strong colonial pedigree. On the eve of the Third

pestis,” available online at <<http://contagions.wordpress.com/2013/01/05/toward-a-molecular-history-of-yersinia-pestis-aha/>> [accessed September 19, 2014]. See also Haensch et al. 2010: fig. 1. Especially in view of regulations restricting the shipping of pathogenic specimens across national borders, specimens are currently extracted and processed in places close to the centers of molecular biology. For the most recent regulations issued by the World Health Organization (WHO) regarding the transport of infectious substances, see WHO 2012. According WHO’s protocol, *Y. pestis* is listed as a “Category A” infectious substance whose transport is strictly regulated.

15 For information on these isolates and their provenances, see the phylogenetic tree in Cui et al. 2013, reproduced in Green 2014, in this issue; also see Morelli et al. 2010.

16 2.MED1, isolated from this region, evolved sometime before 1775, i.e., before the Third Pandemic. 1.ORI3 is thought to have come from Madagascar during the Third Pandemic, most probably via the pilgrimage route (Morelli et al. 2010: fig. 1). Of the four *Y. pestis* isolates that were preserved in Turkey, three were defined as biotype *orientalis* (Golem and Özsan 1952). One of the four was known to have been isolated from a human case of plague in the Akçakale (Urfa) outbreak of 1947: a small plague outbreak in two Turkish villages on the Syrian border. In the months of February and March, a total of thirteen deaths took place out of a total of eighteen persons affected. This appears to be the last recorded outbreak of plague in Turkey.

17 Either resulting from current concerns about the disease’s reemergence and the assessment of its risks or due to privileging areas that can produce aDNA specimens, the “molecular politics” of *Y. pestis* reflect past and current global inequalities of health rather than representing the breadth and intensity of past plagues as experienced across different areas. For an insightful exposition of the “molecular politics” of HIV demonstrating how the global inequalities of the AIDS epidemic can be observed at the molecular level, see Crane, 2011.

Pandemic, European scientists were concerned with “unusual” plague activity in East and South Asia (Creighton 1891: 166–70, 172–73; Sussman 2011: 324). What they considered a new pandemic then signaled new opportunities for research: as soon as plague broke out in (British) Hong Kong in 1894, as noted above, scientists from different countries rushed there to study the epidemic on site; the discovery of the pathogen followed shortly. In 1896, plague was reported in British India (Bombay, then in Pune, Karachi, and Calcutta, soon to be followed by many major port cities across continents).¹⁸ This situation alarmed European colonial governments, which sent plague researchers and public health officials to the colonies. For example, a special committee was formed to investigate plague in India: observing the plague, producing laboratory experiments, and publishing their findings. The result was an immense body of scholarship that continued to develop over the course of the last century. Both historians and scientists are still dealing with the effects of this problematic legacy in one way or another.

From the Ottoman “Laboratory” of Plague to the Colonial Science of Plague

The body of knowledge drawn from the Third Pandemic, as much as it has informed current research, has also hindered it (Royer 2014). This plague science was the product of a certain configuration of power, which is still reflected in some critical assumptions about plague’s origins and spread. The legacy of colonial plague science also has important implications for the study of Ottoman plagues, because it retrospectively shaped the perception of Ottoman experience in historical scholarship. To understand how this occurred, we need to recognize that early modern observations of Ottoman plague had come to constitute a working knowledge of the disease in Europe. When the Third Pandemic broke out, this body of knowledge lost its primacy at the expense of colonial plague science, backed by the germ theory of disease. And yet, certain epidemiological assumptions drawn from European analysis of Ottoman plague continued to be used in modern scholarship.

Before the Third Pandemic, both scholarly and lay opinion in Europe maintained that the “seat of the plague” was the Near East, the “Orient” which, at that time, largely coincided with dominions of the Ottoman

18 For the origins and spread of the epidemic in China, see Benedict (1996: 1–130). For its global spread, see Echenberg 2007. For plague in India, see Arnold (1993: chap. 5).

empire (Sussman 2011: 324). From the late seventeenth and early eighteenth centuries onwards, Europeans observed that devastating plague epidemics were becoming less frequent on the continent. When Marseille witnessed what is regarded as the last major outbreak of plague in Western Europe, in 1720, this experience only confirmed the already widespread belief that the disease was being imported from the eastern Mediterranean port cities of the Ottoman empire, such as Constantinople (Istanbul), Smyrna (İzmir), and Alexandria (Takeda 2011: 115–17). The writings of early modern European travelers, merchants, diplomats, and naturalists had no small share in shaping this belief. But above all, we can point to the influence of a substantial number of Western European physicians who, after major plague outbreaks receded from Western Europe, went to Ottoman cities to observe plague, gather firsthand information, and write about their experiences.

Among the most prominent of these physicians were the Russell brothers from Edinburgh, who spent several years in Aleppo and published their observations on plague in the latter half of the eighteenth century.¹⁹ Similarly, Mordach Mackenzie, who worked as the physician of the Levant Company in mid-eighteenth-century Istanbul, regularly reported his observations about plague in the Ottoman capital (Mackenzie 1752 and 1764). Such accounts continued to be published in the nineteenth century.²⁰ For example, William Wittman, a Royal Artillery surgeon sent to the Ottoman empire following Napoleon's invasion of Egypt, published his observations on the plague in 1804. A more detailed testimony comes from A. Brayer, a French physician residing in Istanbul between 1815 and 1824, who composed a comprehensive two-volume work, which includes his observations on the causes, types, and treatment of plague (Brayer 1836).

The knowledge acquired in the Ottoman “laboratory” of plague appears to have been well received in Europe, since most of these physicians pub-

19 Alexander Russell worked as physician of the Levant Company in Aleppo from about 1740 to 1753. In 1756, soon after his return to London, the first edition of his *Natural History of Aleppo*—including a special section on plague—appeared in print, going through several editions afterwards. His younger brother Patrick followed in his footsteps, practicing medicine in Aleppo where he lived between 1750 and 1772. In 1791, he published his *Treatise of the Plague*, in which he included his observations during the outbreak of 1760–62 and 120 individual case studies in Aleppo. On the life and works of the Russell brothers, see van den Boogert (2010).

20 Two Italian physicians, Eusebio Valli and Antonio Pezzoni, who served in the Greek hospitals of Istanbul during an outbreak of plague in 1803–4, published their individual observations (Valli 1805; Pezzoni 1842 and 1847). See Sarı and Etker (2000) and Yıldırım (2010: 59); see also below.

lished their work promptly and some of those publications went into several editions and translations. Their impact on European scholarly circles is also discernible in the way that these authors used their knowledge to acquire recognition and advance their careers. For example, Alexander Russell's experience in Aleppo, advertised in his writings, helped him to be elected to the Royal Society of London. Later on, his brother Patrick also became a member. Mackenzie's account of the plague in Istanbul was not only published by the Royal Society, it also opened the doors of membership to him (van den Boogert 2010: 146). A more remarkable case in point is that of Charles Maclean, an English physician whose career stagnated until he traveled to the Ottoman capital in 1815 to observe the plague. His observations were swiftly published in London (Maclean 1817). Since plague had receded from Western Europe, this body of firsthand knowledge was especially valuable in promoting the empirical approach to medicine that was flourishing in early nineteenth-century England; hence the direct observations of physicians with overseas experience came to acquire more weight than theoretical knowledge (Kelly 2008: 569). It was in this context that cases from the Ottoman laboratory, that "last vestige of plague," continued to be observed, studied, and discussed—until the Third Pandemic broke out.²¹

When this occurred, the attention of European scholarship largely shifted from Ottoman areas to European colonies in South and East Asia. (The fact that plague had largely disappeared in the Ottoman empire by this time may have also contributed to this shift.) Nevertheless, certain assumptions about the origins, movement, and directionality of epidemic diseases which had been drawn from the Ottoman laboratory were now being transplanted into a colonial context. One such assumption was that the geographic origin of epidemics could be traced to remote areas, far away from centers of knowledge. The nineteenth-century English physician and medical historian Charles Creighton aptly observed:

According to the dominant school of epidemiologists it is always enough to have traced a virus to a remote source, to the "roof of the world" or to the back of the east wind, and there to leave it, in the full assurance that there must have been circumstances to account for its engendering there, perhaps in an equally remote past, if only we knew them. (Creighton 1891, 1:149; also quoted in Norris 1977: 10)²²

21 There were a series of international "sanitary" conferences from the mid-nineteenth century to the mid-twentieth, although their main focus was cholera rather than plague. The third was held in Constantinople in 1866 (Howard-Jones 1975).

22 In this era, discussion of plague's "origin" usually meant the geographic origin,

From this it followed that disease would spread in a particular direction and, not surprisingly, this spread was conceptualized as being unidirectional: plague flowed from “less civilized” places to the “centers of civilization.” Colonial anxieties thus found a scientific justification in this emphasis on the disease’s place of origin, which confirmed that there was something inherently wrong with such lands or peoples and that their contagion could affect civilized peoples and places.²³

While this framework could conveniently be adopted to explain plague epidemics outside of Europe, it was still difficult to explain past cases of plague in Europe itself. It was not easy to elucidate whether plagues had occurred there spontaneously due to local, regional, or underlying universal circumstances, or whether they had been transmitted from certain “endemic” areas outside Europe.²⁴ It may help to remember that throughout the early modern era, the European imagination of plague’s origin was being constantly replenished by news of plague from the port cities of the eastern Mediterranean, which led to durable associations between plague and the Ottomans. The implications were twofold. On the one hand, the European imagination dissociated itself from plague by projecting the locus of the disease somewhere outside; on the other, it fashioned the Ottoman empire as a plague-exporter, against which Europe had to protect itself. By the Enlightenment, this paradigm was ingrained in scholarly writings and popular opinion alike (Gordon 1999; Lammel 2010; Varlık, forthcoming)—even as the Ottomans ceased to be seen as a military threat in Europe, a turn typically associated with their defeat at the second siege of Vienna in 1683. As the empire’s landholdings in Europe shrank through the course of the eighteenth and nineteenth centuries, it came to be seen as a dead or dying body in the European geopolitics: “the sick man of Europe.” In the contemporary European imagination, the empire’s healthscape not only represented a sickened land and peoples but also an inability to deal with ill-health in a rational and orderly manner.

the “endemic focus,” not the biological origin of the “virus” later named *Y. pestis*.

23 For a discussion of how the site of the plague shifted from the landscape to the human body (the colonized body) in India, see Arnold (1993: 200–39).

24 For example, J. F. C. Hecker (1859: 17–19) attributed plague-causation to atmospheric changes that would have made “spontaneous plagues” possible everywhere, even in Europe. Towards the end of the century, physician Adrien Proust (1897: 113)—father of the celebrated French novelist—did not deny the possibility of spontaneous plagues in Europe altogether, but did not dwell on it much either (see also Panzac 2003).

Some of these nineteenth-century conceptions continue to be reproduced in historical scholarship of the twentieth century. For example, the absence of a known plague reservoir in modern Europe seems to have retrospectively erased that possibility from Europe's medieval past. Modern scholarship has treated plague as a temporary "invasion" or "alien" presence and has focused heavily on the effects of this "foreign" visitor, instead of examining plague's interaction with the natural and built environment. The enduring vision of the European epidemiological past is one of *difference* that singled it out from the rest of the larger disease zone (Carmichael 2014, in this issue; see also Bolton 2013: 34). Historical scholarship accordingly had to develop ways of explaining this difference. Most visibly, since the 1970s, plague scholarship has approached the Mediterranean world with epidemiological divisions in mind, such as "Christian vs. Muslim" or "Oriental vs. Occidental." For example, in his authoritative work on the history of plague, Jean-Noël Biraben posited a divide between regions he calls "north-occidental" and "south-oriental" and legitimized this bipartite view by citing differences in climate, fauna, and attitudes toward disease (Biraben 1975: 106).

Subsequent scholarship seems to have maintained epidemiological zones corresponding to those of the early modern period: that of the Ottomans (read: Muslims) and that of the Europeans (read: Christians), with religion as the single most dividing factor (see, e.g., McNeill 1976; Dols 1977; Panzac 1985).²⁵ These imagined divisions of epidemiological experience have resulted in separate histories of plague in Europe and the Middle East/Islamic world. Even in studies that encompass the Mediterranean, these divisions play an important role in explaining the very differences in the spread of plague and the responses it engendered. This bipartite epidemiological imaginary not only sustains essentialist binaries, it regards the Ottoman epidemiological experience as timeless, uniform, and thus unworthy of historical inquiry.

Part II: The Problem of Plague Persistence in Ottoman Lands

As noted above, plague persisted in Ottoman areas for at least half a millennium: a phenomenon that requires a closer look. By persistence, I refer to recurrences of plague in a given area, resulting from local, regional, or long-distance spread of the infection, either imported from outside or transmitted from local enzootic reservoirs. In studying the persistence

²⁵ Recent studies have shown that religion cannot be accepted as the sole determinant in responses to epidemic diseases (Stearns 2009 and 2011).

of plague, we are at the mercy of our sources. There was no systematic recording of plagues in the Ottoman empire before the eighteenth century, when Western diplomats started regular reporting to quarantine authorities in Europe.²⁶ For earlier centuries, the nature of the sources rarely affords observations on plague's persistence at the local level. First, there is the problem of plague's visibility. In its enzootic form (when the infection is transmitted between partially resistant rodent hosts and their fleas), there is no substantial rodent "die off," which makes it difficult to detect.²⁷ Only when the disease assumes epizootic and epidemic form, causing rodent and human mortality, can historical sources make plague visible to us. Second, only rarely do premodern accounts mention where plague came from, so as to enable us to trace the known (or suspected) origin. Even then, this reflects local rumors and reports, which may result from imprecise knowledge. Third, the importation of the infection to port cities as a result of maritime contacts with other infected cities makes it even more difficult to trace the origins of a particular outbreak. This is further complicated by the likelihood of the infection being introduced from multiple areas and/or through multiple channels. For any given outbreak, it is possible that we are looking at more than one strain of the pathogen circulating through different channels.

Indeed, what can be more confidently ascertained from the sources is that plague spread across the empire along complex sets of trajectories that developed and consolidated over the course of the fifteenth and sixteenth centuries (Varlık 2011). This resulted in the repeated exposure of Ottoman cities to the infection throughout the Second Pandemic, turning them into established centers of plague. For example, Istanbul witnessed at least 230 outbreaks during the Second Pandemic, recurring about 2.2 years on average over half a millennium. Similarly, Salonica witnessed outbreaks about 142 times over the course of the same period, about every 3.5 years on average. Other major urban centers of the empire, such as Alexandria, Cairo, Aleppo, Damascus, and Trabzon all experienced frequently recurring outbreaks (Varlık, forthcoming). It is possible that some of those cities sustained the plague on their own, independent from

26 It was mainly this body of documentation that Panzac (1985) used to reconstruct the Ottoman plagues of the eighteenth and nineteenth centuries.

27 Scientific studies inform us about the critical importance of rodent hosts and vectors for the maintenance of plague. As long as there is a sufficient number of rodents and fleas, plague seems to be maintained indefinitely in enzootic form (Gage and Kosoy 2005). Other ecological factors such as climate also matter significantly (Nakazawa et al. 2007; Stenseth et al. 2006; Ben Ari et al. 2011)

incoming infection—that is, they functioned as urban reservoirs of plague. Some Ottoman cities (or their immediate hinterlands) may have kept the disease alive from one epidemic season to the next, sustained by commensal rodents and/or ectoparasites.²⁸

At this point, it may be helpful to consider whether commensal rodents (specifically colonies of *Rattus rattus*) are capable of sustaining plague over time and can therefore function as temporary reservoirs. The ecological scholarship has placed greater emphasis on the role of ground-burrowing wild rodents in sustaining infection over the long term, and commensal rodents' ability to function in the same manner has not been sufficiently explored (e.g., Keim and Wagner 2009). Nevertheless, there are promising studies which suggest that plague can be maintained over long time periods in small commensal rat subpopulations, without any contact with wild rodents. For example, plague is calculated to persist for a hundred years in a commensal rat population of 60,000, without the need of importing new infection (Gage and Kosoy 2005; Keeling and Gilligan 2000a and 2000b). In other words, even if plague killed a certain population of rats, the infection could be kept alive for a long time. This research also suggests that plague would persist even if quarantine measures were in place, and thus has tremendous implications for explaining the historical persistence of plague in large urban centers such as Istanbul. This means that urban areas with significant commensal rodent populations may have become their own self-perpetuating engines of epidemic activity and as such served as temporary reservoirs of plague.

Plague Foci and the Process of Focalization

But even if urban reservoirs could independently sustain the disease, they were never isolated. On the contrary, early modern Ottoman towns were connected both to their immediate hinterland and to more distant areas through a complex network of maritime and overland routes. It was this set of connections that facilitated the circulation of plague within the empire and beyond it, since at least some of those connections linked the urban areas to rural plague reservoirs (foci). As mentioned above, areas where a sufficient number of wild rodents and ectoparasites live can maintain the disease indefinitely in its enzootic form. Hence, it is important to identify where such foci were located in the empire's vast reach.

²⁸ For example, Panzac (1973) showed that İzmir received the infection from its hinterland in the eighteenth century.

At present, we know of several plague foci in or around former Ottoman areas such as Libya, Yemen, Iran, the Transcaucasian and the north-west Caspian regions (WHO 1999: 16; Anisimov, Lindler, and Pier 2004). These were active plague reservoirs during the Third Pandemic, and perhaps even before. According to Panzac, the highlands between western Iran, northern Iraq, and southeastern Turkey, as well as the mountainous areas of Hijaz and Yemen were *permanent* plague foci that caused outbreaks in the eighteenth and nineteenth centuries. Panzac equally identified what he thought were *temporary* plague foci, including the western Balkans, Moldavia and Wallachia, Istanbul, the Anatolian peninsula, and Egypt (Panzac 1985: 105–33). However, he did not offer an explanation as to when each of these foci came to existence.²⁹

Identifying pre-eighteenth-century Ottoman plague foci is challenging. The fragmentary nature of modern *Y. pestis* specimens isolated from these regions does not allow us to determine how old the foci were and how long they remained active.³⁰ Plague science informs us that enzootic foci are not to be taken as timeless; rather they are dynamic entities that emerge, expand, shrink, or disappear over time. Myriad changes ranging from rodent migration to changes in their predator population, and from fluctuations in climate to modifications in landscape, can affect plague foci (Gratz 1999; Li et al. 2009; Karimova et al. 2010; Eisen and Gage 2012).³¹ All these factors make it necessary to pay attention to the circumstances that favor their formation, that is, the process of focalization—the process by which plague forms reservoirs in the natural environment to perpetuate itself, independent of imported infection.

29 Panzac (1985: 128–33) singles out the focus of Egypt (“le foyer égyptien”) as a nineteenth-century phenomenon. He postulates that plague had been an “importation” to Egypt until the 1820s when it went through a process of focalization. He noted that both permanent and temporary foci in or near Ottoman areas were concentrated in the highlands (Panzac 1985: 105–33). See further discussion below.

30 However, it is interesting to note that most of modern *Y. pestis* isolates of the biovar *medievalis* (2.MED) come from former Ottoman territories or its neighboring areas, such as Turkey, Iraq, Iran, and Libya. These scattered isolates seem to represent a genetically related cluster of strains even though they were isolated from different areas at different times. The links between these strains should be sought in the region’s history during the Second Pandemic, i.e., in the Ottoman plague experience. See for example Cabanel et al. 2013: fig. 4; Achtman et al. 2004: supplementary fig. 7. See nn. 12 and 16 above.

31 For a discussion of problems and biases involved in determining historical foci, see Ben Ari et al. (2012: 8200).

Since the beginning of the twentieth century, there was a certain understanding that at least some plague foci were situated in highlands. Writing in 1905, for instance, English epidemiologist W. J. Simpson suggested that plague originated in some highland areas such as in Assyria in the western Arabian peninsula and in the highlands of what is today southeast Turkey and northern Iraq: “[t]he endemic areas [. . .] are chiefly distinguished for their high altitudes.” But the reason he offered was more a cultural construct of highlanders’ customs than a real observation about the disease ecology of those areas that differentiated them from that of the lowlands. Simpson reasoned that plague occurred in those areas “for the poverty and filth of the inhabitants, and for the promiscuous manner in which the cattle, fowls, and domestic animals are permitted to live in close association with human beings, the former often occupying the same room as the latter” (Simpson 1905: 38, 117–18). About two decades later, the renowned Chinese epidemiologist Wu Lien-Teh regarded highland locations as “endemic” foci. In reference to the Kumaon and Garwhal areas of northern India, in the foothills of the Himalayas, for example, he wrote, “[t]his locality is highly situated and sparsely populated, most of the inhabitants [. . .] are poor and dwell promiscuously with their cattle” (Lien-Teh 1924: 292).

Looking exclusively for human cases of plague, these epidemiologists failed to see enzootic plague in these highland foci and the disease ecologies that governed them. Hence, no clear explanation (free of cultural bias) could be offered as to why focalization took place in highlands. Recent research from Madagascar has since shed light on the mechanisms that support this process. In this island’s ecology, plague is sustained in the highlands (above 800 meters) where flea vectors (*Xenopsylla cheopis* and *Synopsyllus fonquerniei*) are more abundant (Vogler et al. 2011; Andrianaivoarimanana et al. 2013). This research offers new insights for understanding the focalization of plague and the transmission of enzootic plague from the highlands to the lowlands (see also Green 2014 and Carmichael 2014, both in this issue). Certain types of landscapes across all continents favor a high number of rodent reservoirs and their fleas. Most plague reservoirs, including those located on higher altitudes, are found in places with “low annual precipitation, or where dry seasons inhibit the growth of thick woody vegetation and lead to the formation of deserts, semi-deserts and steppes (savannas, prairies, pampas and so on)” (WHO 1999: 13-14). Drawing from this, it is possible to discern the basic outlines of plague foci among diverse eco-regions across the reach of Ottoman domains. The mountain ranges of the Anatolian and Balkan peninsulas, as well as the neighboring highlands of the Caucasus and the Persian plateau, may be identified as areas with ecological factors suitable for the

focalization of plague, once introduced. As we shall see below, several rodent species—currently known to be plague hosts—inhabited these highlands, making them likely ecological zones for plague maintenance.

What remains to be identified is how the plague ecologies of the sparsely populated Ottoman highlands were connected to the densely populated lowlands. One possible link bridging these disease ecologies was the seasonal movement of pastoralist nomads of Anatolia and the Balkans between highland summer pastures and lowland winter encampments. The customs and economic activities of pastoralist nomads could have brought them in close contact with plague-hosting animals and their ectoparasites. An Ottoman document from 1571, reporting high plague mortality among the nomads, may be taken as evidence that plague's focalization had already taken a strong hold in the empire's highlands.³² Despite the general belief expressed in current scholarship, that nomads of Anatolia and the Balkans remained mostly free from plague (e.g., Schamiloğlu 2004; McNeill 2012), recent research on North Africa highlights not only their risk of contracting the disease but also of propagating it across considerable distances (Bitam et al. 2010; Ben Néfissa and Moulin 2010). A similar suggestion was made by the nineteenth-century French physician J. D. Tholozan (1874) with regard to the movement of nomads and the spread of plague in eastern Anatolia, western Persia, and Mesopotamia.

There were myriad ways in which nomads interacted with settled societies in the Ottoman domain, directly or indirectly. For example, nomads were not only indispensable for supplying raw materials for the textile and leather industries (e.g., wool, dyes, and hides), they were also involved in the process of producing carpets, rugs, and various other textile products. Similarly, they were the suppliers of transportation animals, such as donkeys, horses, mules, oxen and buffaloes, and camels—a known plague carrier (Faroqhi 1984: 49–50; de Planhol 1969). They would participate in harvests in western Anatolia, as migrant workers, or could serve in various military undertakings of the Ottoman state (Kasaba 2009: 31–35). Nomads came into contact with town-dwellers most repeatedly in the outskirts of Ottoman towns, where businesses such as tanneries, soap factories, and slaughterhouses were located, and low-income families and day laborers resided (Ayalon, forthcoming). These businesses attracted a great number of commensal rodents, exposed laborers to potentially infected materials, and thus functioned as possible gateways of infection leading to urban outbreaks.³³

32 Document from Mühimme Defteri, dated 14 March 1571, published in Yılmaz and Yılmaz (2006, 2: 60).

33 It is generally held that some professionals in premodern cities were at higher

Patterns of Plague Transmission

Recent research has demonstrated that a number of media and forms of mediation might be concurrently involved in plague transmission—especially during pandemics—along with the basic rodent host-vector-human transmission. For example, it has been shown that *Y. pestis* survives in flea feces, in post-mortem hosts, in soil, and in plants (Gage and Kosoy 2005; Drancourt, Houhamdi, and Ranoult 2006; Eisen et al. 2008; Ayyadurai et al. 2008; Easterday et al. 2012; Pawlowski et al. 2011). Also, it has been recognized that humans may become infected by plague as a result of consumption of infected food, wounds (such as those caused by animal bites or scratches), or exposure to airborne bacteria. With this in mind, there is a growing awareness of the need to complicate the patterns of plague transmission, with a recent plea being that “the epidemiology of plague must be seen in a much less diagrammatic manner than in the past” (Raoult et al. 2013: 19).

Similarly, historical scholarship on plague has very recently moved beyond an exclusive reliance on models of rodent-host-vector-to-human transmission. In particular, the recent turn in the humanities toward recognizing the role of animals and other nonhuman agents has stimulated novel avenues of inquiry in plague historiography (e.g., Catanach 2001; Stathakopoulos 2011; Campbell 2010 and 2011; Kelly 2013). A comparable change can be observed in Ottomanist historiography, which has informed recent studies of Ottoman environmental history (White 2011; Mikhail 2011, 2013a, 2013b). In particular, a recent case study of the 1791 plague outbreak in Egypt illustrates this trend well, by exploring plague’s connections to flooding, rodent behavior, and other climatic conditions, so as to situate it in its environmental context (Mikhail 2008, 2012). While it is imperative to recognize the role of human agency in the spread of plague, it is equally important to broaden our vision to the larger environment.

This is another problem for the historian: the ground-burrowing rodents of the early modern Ottoman landscape are barely visible in the sources.³⁴ An interesting piece of anecdotal evidence comes from the six-

risk of infection. Among these were butchers, bakers, millers, artisans of cloth and paper, by virtue of their handling meat, grains, and textiles, all instrumental media in the dissemination of plague. See Audoin-Rouzeau 2003: 233-8.

34 Further research is needed to clarify the taxonomy of rodents in the Ottoman landscape. A nineteenth-century Ottoman Turkish lexicon (Redhouse 1880) includes the following species: short-tailed field mouse (*arvicola arvalis*); jerboa (*dipus aegyptius*); water vole (*arvicola amphibius*); marmot (*arclomys marmotta*); lemming (*myodes lemmus*); and bank vole (*myodes glareolus*).

teenth-century German traveler Hans Dernschwam, who left a detailed description of an animal he saw in northwest Anatolia:

It is slightly larger than a mouse, smaller than a vole, with delicate and well-proportioned limbs. It looked like a hare. Its head, mouth, and ears were well-balanced; its back was rather long and elegant. It had a very long tail. The tail was like a lion's tail with a little ball on its end. It held up its tail in the air. This way it looked like an African monkey. (Dernschwam [1553–55]/1987: 307–08)

This depiction brings to mind the jerboa, which is known to be a plague carrier. Yet, it is difficult to identify what type of jerboa it may have been. Jerboas do not occur in this part of Anatolia today; only the *Euphrates jerboa* (*Allactaga euphratica*) can be found marginally in southeastern Turkey (Arslan et al. 2012). If this species were indeed a type of jerboa that inhabited Anatolia in the sixteenth century but is now extinct, it would be interesting to reflect on the relationship between the extinction of this animal and the disappearance of plague.

The seventeenth-century Ottoman traveler Evliya Çelebi (c. 1630–83/1996) documented the types of rodents he encountered, such as the bank vole, the ground squirrel, the water vole, and probably the Persian jird (*Meriones persicus*)—known to be a plague carrier.³⁵ Writing in the eighteenth century, Alexander Russell (1794, 2: 180–82) listed different species of rodents occurring in Aleppo at the time, along with their names in Arabic and Latin. Not seeing any reason to discuss commensal rodents, Russell simply noted: “There is nothing remarkable in the Rat, and the Mouse. Most of the houses are infested with them.” As for wild rodents, he mentioned the short-tailed field mouse, the dormouse, the hamster, the water rat, and the jerboa (which supports the above-mentioned observations of Dernschwam). Furthermore, an English traveler in Anatolia testified to seeing marmot-like rodents in Ilgın (modern day Konya, in Turkey) during a plague epidemic in 1836:

The plain swarmed with a species of burrowing animal about the size of a squirrel, which I had also seen in other parts of Asia Minor; but whether a species of marmotte, jerboa, lemming, or hamster, I could not ascertain. . . . Their colour is a light yellowish brown, and they abound in the southern provinces of Russia, where the variety or species is known by the name of “Rat des steppes.” (Hamilton 1842, 2: 189; cf. Panzac 1985: 123)

35 The Persian jird (*meriones*) has been identified as a “real reservoir of plague” by Baltazar et al. (1952), who believed that they were able to keep plague “permanently enzootic.” See also Green 2014 and Carmichael 2014, both in this issue.

This rodent species may be identified as the white-throated woodrat (*Neotoma albigula*), which no longer occurs in this part of the world (Wrobel 2006: 339). What is important to note here is that several rodent species documented by early modern sources are currently known to be plague carriers. The fact that most of those species have now become extinct in Anatolia and the Balkans, where plague no longer occurs, invites further questions. Whether those rodent species became extinct due to plague or by other causes, it may be valuable to consider this connection.

Along with rodents, a number of animals (e.g., cats, dogs, rabbits, camels, and goats) can become infected by plague and transmit it to humans (Fedorov 1960; Ell 1979 and 1980; Christie, Chen, and Elberg 1980; Salkeld and Stapp 2006; Raoult et al. 2013). Some premodern observers of plague may have noticed this phenomenon. One such testimony comes from the English physician Charles MacLean, albeit to mock and discredit such beliefs. In 1815, in Istanbul, he claims to have heard that “Of all quadrupeds, the shaggy horse, or horse with long hair, is alone exempt from contracting the infection of plague. Other animals, and birds of every kind, can receive, and communicate the infection” (Maclean 1817: 202). This point deserves some attention, because Maclean’s informants believed that a wide variety of animals were known to contract the infection and recognized their role as intermediaries in its transmission. At least one other nineteenth-century testimony identified a dog as a putative transmitter of plague. This keen observation comes from the memoirs of H. G. O. Dwight, an American missionary in Istanbul who lost his wife and son to plague during an outbreak in 1837. In one of his letters, Dwight noted that the dog of their neighbor—a family that had recently lost a child to plague—often came to their house yard to play with his youngest son, John, who later contracted the disease and died (Dwight 1840: 23). Such testimonies are rare, yet deserve further attention considering the notoriously large street dog population in Ottoman cities, above all in Istanbul. European travelers often commented on the street dogs of the Ottoman capital as a typical feature of the city until the modern era. Perhaps the best known of these accounts is that of the Italian writer Edmondo de Amicis (1896: 108–13), who noted that “the dogs constitute a second population of the city.”³⁶ This does not necessarily mean that dogs were the principal hosts to plague, but their presence may be taken

36 Their presence, however, came to be seen (at the turn of the twentieth century) as a sign of the Ottoman incapacity to regulate a sanitary urban space. For a discussion of street dogs of Istanbul and the efforts to eliminate them as a “measure of progress,” see Brummett 1995.

into consideration when thinking about the patterns of plague transmission in early modern Ottoman towns.

In addition, the role of mammalian carnivores (feeding on rodents, such as marmots, ground squirrels, and voles) may require further consideration. It has been noted that carnivores can act as transitory hosts, transporting infected arthropods between different rodent populations. Recent research also suggests that mammalian carnivores exhibit some characteristics as plague hosts that can sustain the infection in enzootic form (Salkeld and Stapp 2006). In the Ottoman landscape, these carnivores would include wolves, foxes, jackals, and hyenas. Although these species mostly avoided crowded human settlements, there are references to foxes and jackals sighted in the outskirts of Ottoman towns by early modern observers (Russell 1794, 2: 183–85). Perhaps more to the point is the infamous tendency of hyenas to dig up and desecrate graves. Hyenas were surprisingly common in parts of Eurasia (Meserve 2012), including areas governed by the Ottoman empire, and may deserve closer attention in the context of plague studies. One sixteenth-century testimony comes from the account of the Habsburg ambassador Ogier Ghiselin de Busbecq, who mentioned hyenas that dug up human bodies from graves in Anatolia. Busbecq (1554–62/2005: 48–49) notes that locals of that area placed heavy stones on top of graves to protect them from hyenas. Hyenas were also observed by the Russell brothers in Aleppo and its surroundings in the eighteenth century, where they were commonly known by the locals who sometimes caught them alive “in the hills at no great distance from town” (Russell 1794, 2: 186–88). It appears that the threat of hyenas was still known to the late nineteenth-century town-dwellers on the northern coast of Anatolia, as suggested by an official document.³⁷ Another example of a mammalian carnivore that fed on small rodents is the weasel. The fifteenth-century Spanish traveler Pero Tafur commented on the abundance of weasels—presumably the Egyptian weasel (*Mustela subpalmata*)—in Damietta both in the streets and inside the house (1926: 68). Even though the historical evidence is fragmentary, both intra- and inter-species interactions of carnivores are important for the local transmission of plague, especially in linking the plague ecologies of urban areas to their hinterlands.

37 According to this document, dated 1872, the population of the town Çatalzeytin, west of Sinop, claimed that “a hyena monster was stealing children from houses.” See “The Hyena Monster of Sinop and the Vagaries of Ottoman Population Accounts,” available online at <<http://www.docblog.ottomanhistorypodcast.com/2012/08/the-art-of-not-being-seen-hyena-monster.html>> [accessed September 19, 2014].

Even more significant is the case of animals that can potentially transport infected fleas over long distances and cause metastatic leaps of plague. These are predator birds that feed on rodents, including large birds of prey (such as hawks, falcons, and owls) and migratory birds (Benedictow 2004: 47). Sixteenth-century Ottoman plague treatises loosely observed a connection between the behavior of migratory birds and epidemics. For example, the plague treatise composed by İlyas bin İbrahim, an Iberian Jewish physician who came to Istanbul in the early sixteenth century, reports that outbreaks of disease were preceded by environmental events (e.g., earthquakes, astrological and meteorological events) and the flight of certain animals and birds (1894: 28). Increased visibility of certain species of burrowing animals and insects was also regarded as a sign of a coming plague.

The plague treatise of the sixteenth-century Ottoman theologian and biographer Ahmed Taşköprizade mentioned the arrival of migratory birds, especially that of the white stork, as a precursor to plague (Taşköprizade 1875; Ünver 1935: 70–71). This association between the arrival of migratory birds and that of the plague was a keen observation in the absence of the linking knowledge about the transfer of fleas. White storks (*Ciconia ciconia*) are predatory birds that feed on small rodents (such as voles, and possibly rats) in addition to various sorts of insects. They also feed at garbage dumps and nest on roofs, poles, and straw stacks, making them a prime candidate for carrying diseases (van den Bossche et al. 2002; Hubálek 2004; Malkinson et al. 2001 and 2002). Recent research also suggests that migratory birds can be a factor in disseminating plague-infected fleas (Heier et al. 2011). Furthermore, in the Ottoman case, the trajectories of their migration seem to have coincided with those of plague. The migratory route followed by the white stork from Europe to Southeast Africa crisscrossed the Ottoman lands from northwest to southeast, and largely corresponded to the main pilgrimage and caravan route in the eastern Mediterranean, before crossing over the Sinai peninsula to Egypt, Sudan, and further south into Africa (van den Bossche et al. 2002). Incidentally, this migratory route passed right over Istanbul and across the Bosphorus. Historical sources sometimes mention flocks of storks. For example, Hans Dernschwam ([1553–55]/1987: 44) notes seeing flocks of thousands of storks near Edirne in the mid-sixteenth century. This correspondence between the trajectories of migratory birds and that of pilgrimage and caravan routes seems to further complicate the pathways of plague's diffusion. Given both scientific and anecdotal evidence, it should be possible to surmise that migratory birds can be associated with metastatic leaps of the infection between remote and isolated enzootic foci and urban areas.

This does not suggest that they were the sole agents for transmitting the infection; rather this was one among many routes that helped circulate plague over land, sea, and air. This reminds us of the importance of expanding our vision to develop a “bird’s-eye view” of plague’s diffusion, in addition to envisioning its spread along trade routes or by other means that place human agency at the center.

Conclusion

Studying the Ottoman plague experience during the Second Pandemic offers three important insights. First, it underscores the critical importance of focalization. Such processes may be helpful in studying the plague experience of even those areas that are historically imagined to have received the infection from outside: for example, Europe. Second, it draws attention to the necessity of adopting more complex models of plague transmission, with a special emphasis on interspecies dynamics and the local species that serve as hosts, vectors, and as intermediaries. In order to better understand local plague ecologies, it may be invaluable to expand our vision to include a wider spectrum of rodent species and consider the role of domestic and commensal mammals, mammalian carnivores, predator and migratory birds in plague transmission. Third, it urges the elimination of old models of assumed/imagined epidemiological boundaries and trajectories that have been built on flawed historical constructs, such as those that have been inherited from nineteenth-century Eurocentric notions and colonial plague science. Instead, it highlights the importance of adopting more unified epidemiological perspectives for studying larger disease zones, such as the Afro-Eurasian zone during the Second Pandemic. The Ottoman epidemiological experience is not only eminently comparable to those other contemporaneous experiences, but also indispensable for a full understanding of plague in this larger disease ecology. Finally, the new plague science, as valuable as it is, should be considered as a set of guidelines in studying the plague. Historical sources suggest that the disease could manifest itself in different forms and have different effects, depending on local circumstances. As lesser-known epidemiological experiences are recovered from the past, this evidence will supply increased opportunities not only for the plague historian but for the plague scientist as well.

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Abstract Reconstructing the Ottoman plague experience is vital to understanding the larger Afro-Eurasian disease zone during the Second Pandemic. This essay deals with two different aspects of this experience. On the one hand, it discusses the historical and historiographical problems that rendered this epidemiological experience mostly invisible to previous scholars of plague. On the other, it reconstructs the empire's plague ecologies, with particular attention to plague's persistence, focalization, and transmission. Further, it uses this epidemiological experience to offer new insights and complicate some commonly held assumptions about plague history and its relationship to plague science.

Keywords Anatolia, Black Death, Mediterranean, pandemic, periodization, hyena, *Ciconia ciconia*.

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