
The Justinianic Plague and Global Pandemics: The Making of the Plague Concept

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PLAGUE OUTBREAKS AND FEAR of their reoccurrence feature prominently in the modern imagination. Historians of the 1890s South Asian plague outbreak point out that “no other epidemic evoked the fear and panic generated by the plague” and that there are “special fears that the word ‘plague’ has inspired in the West.”¹ From academic writings to popular culture, plague is perceived as a powerful threat that can transform the world in the present much as it did in the past. The explanatory power of premodern plague has increased with an explosion in paleogenetics research demonstrating that premodern pandemics were caused by the same pathogen that causes the plague today.²

One historical event was central to creating this idea of plague and its narrative: the increased prevalence and subsequent global spread of plague in the late nineteenth century; in particular, its identification as *Yersinia pestis* in 1894 and its framing as the “Third Pandemic” in the following decade. This double classification—as a unique bacterium and as one of three pandemics—established an equivalency between contemporary plague, the Black Death, and the Justinianic Plague that has gripped the public imagination ever since. Vivian Nutton has traced out these ideas in Black Death scholarship to demonstrate how that pandemic has become central to our way of thinking.³ Through this connection, plague transformed from a one-off event with a localized impact into a concept with causal agency and standard assumed results across time and space. It is simultaneously transhistorical, in that it applies across all time periods, and ahistorical, since it is not defined by a particular set of historical conditions.

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¹ Rajnarayan Chandavarkar, “Plague Panic and Epidemic Politics in India, 1896–1914,” in Terence Ranger and Paul Slack, eds., *Epidemics and Ideas* (Cambridge, 1992), 203–240, here 204; and I. J. Catnach, “Plague and the Tensions of Empire: India 1896–1918,” in David Arnold, ed., *Imperial Medicine and Indigenous Societies* (Manchester, 1988), 149–171, here 151.

² Andrew Cunningham postulated that before laboratory science and germ theory in the 1890s, it was impossible to confirm historical plague based on retrospective diagnoses. Andrew Cunningham, “Transforming Plague: The Laboratory and the Identity of Infectious Disease,” in Andrew Cunningham and Perry Williams, eds., *The Laboratory Revolution in Medicine* (New York, 1992), 209–244, here 242.

³ Vivian Nutton, ed., introduction to *Pestilential Complexities: Understanding Medieval Plague* (London, 2008), 1–16. On the discovery of the bacillus, see Alexandre Yersin, “La peste bubonique à Hong Kong,” *Annales de l’Institut Pasteur* 8, no. 9 (1894): 662–667.

This article examines how medical practitioners and doctors constructed the first historical outbreak of plague (the sixth-century Justinianic Plague) and built it into a broader “First Plague Pandemic.” It surveys a fragmentary process over the past 150 years by which the Justinianic Plague developed particular features and explanatory powers. We argue that Western Europeans’ encounter with plague in the context of the outbreak from 1894 onward catalyzed the formation of a quintessential “plague concept.” Equipped with that concept, scholars gradually transformed a series of local and sometimes ambiguous outbreaks over two centuries during late antiquity (ca. 300–800 C.E.) into a historical pandemic with its own agency, seemingly uniform effects across Eurasia, and outsized causal force. Scholars now use late antique plague to explain demographic, political, social, economic, and cultural changes in late antiquity, providing answers to such looming historical questions as the cause of the fall of the Roman Empire.

The terminology used to describe historical plague was established by the first decade of the twentieth century and solidified over the course of the twentieth century. Today, historical plague is still commonly, if problematically, divided into three pandemics.⁴ The first pandemic (ca. 541–ca. 750) is colloquially known as the Justinianic Plague, although technically the term refers to its first major outbreak (ca. 541–ca. 544). The second pandemic (ca. 1346 to the mid-nineteenth century) begins with the Black Death (ca. 1346–ca. 1353). The last pandemic (the mid-nineteenth to the mid-twentieth century) is dubbed “The Third Pandemic.” These seemingly simple classifications obfuscate more than clarify how plague struck humans, part of an unclear system that helped develop the plague concept.⁵ In what follows, we use the standard pandemic classification system only when scholars at a particular time discuss it themselves or refer to the Justinianic Plague by that name when analyzing its development. Elsewhere, we use neutral language that relies on chronological definitions: *late antique plague* for the first pandemic, *medieval plague* for the second, and *modern plague* for the third.

The creation of the plague concept is best examined through the lens of Reinhart Koselleck’s conceptual history approach, in which an event can evolve and develop its own explanatory powers as a concept.⁶ Scholars have studied the transformation from event to concept in other fields, such as the change from revolution as event to revolution as concept to revolution as actor. Such a change required appealing to human emotion, investing the idea of revolution with authority, and turning it into a mythic concept with its own explanatory agency. Over the past century and a half, plague has become an agent perceived as having a destructive impact by its definition and essence (“the plague concept” as we will refer to it) through cultural myths that scholars have created and perpetuated.⁷ This shift

⁴ The term “pandemic” has no consensus definition: Mark Harrison, “Pandemics,” in Mark Jackson, ed., *The Routledge History of Disease* (London, 2016), 129–146. For a suggested definition that problematizes the uses of the term, see David M. Morens et al., “What Is a Pandemic?,” *Journal of Infectious Diseases* 200, no. 7 (2009): 1018–1021. We define a plague pandemic as an outbreak of plague in humans across a broad region, which applies to the initial outbreak from circa 541–544.

⁵ For example, there is no clear chronological line separating the “end” of the second pandemic, which continued throughout the nineteenth century in Eastern Europe and the Middle East, and the “beginning” of the Third Pandemic, which began in the mid-nineteenth century in East Asia. The Second Pandemic is often said to end with the Marseille outbreak in 1720, but this is a Eurocentric view. See, Nükhet Varlık, “Rethinking the History of Plague in the Time of COVID-19,” *Centaurus* 62, no. 2 (2020): 285–293.

⁶ Outlined in Reinhart Koselleck, “Begriffsgeschichte and Social History,” *Economy and Society* 11, no. 4 (1982): 409–427.

⁷ For scripting a revolution, see Keith Michael Baker and Dan Edelstein, eds., introduction to *Scripting Revolution: A Historical Approach to the Comparative Study of Revolutions* (Stanford, 2015), 1–21; for

highlights the tenacity with which the hypothesis of destructive plague maintains its hold on our imaginations. Even when the empirical data for a particular outbreak's local impact is nonexistent, the plague concept is used to explain historical change in that locality.⁸ The concept is not limited to academic research, but spans popular culture and literature that has amplified its power.⁹ As a result, the concept of plague has itself become an agent of historical change.

The plague concept grips the scholarly imagination with enough force to overcome contradictory evidence. For example, Samuel Cohn's suggestion that modern plague has shaped conceptions of the medieval plague was largely ignored.¹⁰ Critics pointed to Cohn's rejection of *Y. pestis* as the causative agent of the pandemic without confronting his empirical work that demonstrated the lack of established connections between plague and the massive cultural, artistic, and social upheavals it supposedly caused.¹¹

Using the plague concept, the current scholarly consensus on the Justinianic Plague assumes death and destruction on a massive scale without ever proving it. We have defined this elsewhere as the "maximalist" interpretation of the Justinianic Plague.¹² In maximalist narratives, plague was introduced to the Byzantine Empire in the mid-sixth century. The resulting pandemic caused diverse crises and subsequent transformations at all levels of society. Maximalist accounts differ, but they agree that plague killed between 25 and 60 percent of the population of Eurasia or between 15 million and 100 million people.¹³ Plague's unusual persistence—it periodically struck the Mediterra-

the change in the term revolution, see Keith Michael Baker, "Revolutionizing the Revolution," in Keith Michael Baker and Dan Edelstein, *Scripting Revolution*, 71–102; and David Bell, afterword to Keith Michael Baker and Dan Edelstein, *Scripting Revolution*, 345–353, here 346, 352.

⁸ Ann Carmichael has pointed out issues with early modern plague sources building on each other: Ann G. Carmichael, "The Last Past Plague: The Uses of Memory in Renaissance Epidemics," *Journal of the History of Medicine and Allied Sciences* 53, no. 2 (1998): 132–160. And similarly, Christos Lynteris, *Ethnographic Plague: Configuring Disease on the Chinese-Russian Frontier* (London, 2016).

⁹ For a key literature example, see Albert Camus, *The Plague*, trans. Stuart Gilbert (New York, 1948). For a key movie, see Elia Kazan, director, *Panic in the Streets* (Tallahassee, Fla.: 1950 [repr. 2005]), 96 min. This article will not discuss broader culture, but works like *The Plague* or *Panic in the Streets* draw upon, reinforce, and propagate the plague concept.

¹⁰ Cohn described a process by which both historians and scientists "square the circle" by using incommensurable evidence. See Samuel K. Cohn, *The Black Death Transformed: Disease and Culture in Early Renaissance Europe* (New York, 2002); and Samuel K. Cohn, "The Black Death: End of a Paradigm," *American Historical Review* 107, no. 3 (2002): 703–738. For another overview of conceptual problems with the plague, see Faye Marie Getz, "Black Death and the Silver Lining: Meaning, Continuity, and Revolutionary Change in Histories of Medieval Plague," *Journal of the History of Biology* 24, no. 2 (1991): 265–289. For an earlier reassessment that raised similar issues (despite the wrong biological identification of the pathogen), see Graham Twigg, *The Black Death: A Biological Reappraisal* (London, 1984); and for how long-term non-demographic effects have been assumed, see Robert E. Lerner, "Fleas: Some Scratchy Issues Concerning the Black Death," *Journal of the Historical Society* 8, no. 2 (2008): 205–228.

¹¹ For the standard view of the Black Death, see Ole Jørgen Benedictow, *The Black Death, 1346–1353: The Complete History* (Rochester, N.Y., 2004); an example that correctly critiques Cohn's biological conclusions but accepts problematic nonbiological connections is John Aberth, *Plagues in World History* (Lanham, Md., 2011), 36–61.

¹² For a detailed discussion see Lee Mordechai and Merle Eisenberg, "Rejecting Catastrophe: The Case of the Justinianic Plague," *Past and Present*, no. 244 (2019): 3–50.

¹³ For an example of a textbook with large numbers, see Stephen Mitchell, *A History of the Later Roman Empire, AD 284–641*, 2nd ed. (Chichester, 2015), 411–413; and for a scientific use of these dubious numbers, see David M. Wagner et al., "*Yersinia pestis* and the Plague of Justinian, 541–543 AD: A Genomic Analysis," *The Lancet Infectious Diseases* 14, no. 4 (2014): 319–326, here 319; and for a response Lee Mordechai et al., "The Justinianic Plague: An Inconsequential Pandemic?," *Proceedings of the National Academy of Sciences* 116, no. 51 (December 17, 2019): 25546–25554.

nean, Europe, and the Middle East over the following two centuries—further destabilized human societies before unexpectedly disappearing around 750.¹⁴ The maximalist plague narrative has also become increasingly common in broader surveys.¹⁵ Some scholarship has ignored the maximalist narrative by refraining from discussing plague, but none has disputed its empirical foundations or tested its assumptions over the past three decades. There is no “minimalist” interpretation.¹⁶

This article does not attempt to deconstruct the empirical evidence for late antique plague. In two complementary publications, we argue that diverse primary sources from late antiquity do not provide evidence of massive mortality and do not demonstrate that plague had equally catastrophic effects everywhere. We have comprehensively traced the recent historiographical developments in the field elsewhere.¹⁷ This article instead explores the scholarly processes driving plague research. Over time, scholars have expanded the three main features of the Justinianic Plague concept—chronology, mortality, and geography, all of them discussed in our first section—without querying their basis in reality. Our next section shows the concept in action by examining “waves of plague,” a metaphor popularized over the past half century that reinforces the basic features of plague by offering a powerful mythical story of how it behaved. Finally, we examine three key types of empirical interdisciplinary evidence—rats, climate, and paleogenetics—that we refer to as plague truisms; together, they reify the overarching plague concept and reinforce its features.

Each type of evidence has been presented as a breakthrough in plague studies, sometimes spawning seemingly promising new methodological turns that have in fact served only to reify the plague concept. As Gary Wilder has pointed out, new turns are often mere optics “transformed into routine research topics that reaffirmed traditional historiographic assumptions.”¹⁸ The same applies to plague truisms. Presented as a

¹⁴ Key publications include Jean-Nöel Biraben and Jacques Le Goff, “La Peste dans le Haut Moyen Age,” *Annales: Economies, sociétés, civilisations* 24, no. 6 (1969): 1484–1510; Biraben and Le Goff, “The Plague in the Early Middle Ages,” in Robert Forster and Orest Ranum, eds., *Biology of Man in History* (Baltimore, Md., 1975), 48–80. The French and English versions are essentially identical except for the placement of the charts and maps. We will refer to the more commonly cited English edition. Dionysios Stathakopoulos, *Famine and Pestilence in the Late Roman and Early Byzantine Empire: A Systematic Survey of Subsistence Crises and Epidemics* (Aldershot, 2004); Lester K. Little, ed., *Plague and the End of Antiquity: The Pandemic of 541–750* (New York, 2007); Mischa Meier, “The ‘Justinianic Plague’: The Economic Consequences of the Pandemic in the Eastern Roman Empire and Its Cultural and Religious Effects,” *Early Medieval Europe* 24, no. 3 (2016): 267–292; Kyle Harper, *The Fate of Rome: Climate, Disease, and the End of an Empire* (Princeton, N.J., 2017).

¹⁵ For just two examples, see Mitchell, *A History of the Later Roman Empire*, 411–413; Robert Tignor et al., *Worlds Together, Worlds Apart: From the Beginnings of Humankind through the Black Death*, 3rd ed., 2 vols. (New York, 2011), 1: 297.

¹⁶ Only a single author, Jean Durliat in 1989, argued against the plague as a destructive force: Jean Durliat, “La peste du VI^e 16 siècle: Pour un nouvel examen des sources byzantines,” in Catherine Abadie-Reynal, Cécile Morrisson, and Jacques Lefort, eds., *Hommes et richesses dans l’Empire byzantin* (Paris, 1989), 107–119; and for others who disagree with (or downplay) the maximalist position but do not refute it, see Mark Whittow, *The Making of Byzantium, 600–1025* (Berkeley, Calif., 1996), 66–68; Peter Brown, *The Rise of Western Christendom: Triumph and Diversity, A.D. 200–1000*, 10th anniversary rev. ed. (Malden, Mass., 2013), 181; Chris Wickham, *Medieval Europe* (New Haven, Conn., 2016), 43–44.

¹⁷ For these ideas, respectively, see Mordechai and Eisenberg, “Rejecting Catastrophe”; Mordechai et al., “The Justinianic Plague: An Inconsequential Pandemic?”; and Merle Eisenberg and Lee Mordechai, “The Justinianic Plague: An Interdisciplinary Review,” *Byzantine and Modern Greek Studies* 43, no. 2 (2019): 156–180.

¹⁸ Gary Wilder, “From Optic to Topic: The Foreclosure Effect of Historiographic Turns,” *American Historical Review* 117, no. 3 (2012): 723–745, here 723.

groundbreaking turn, paleogenetics—as one example—has not led to greater scrutiny of our underlying assumptions. In fact, none of these new methodologies has changed the conceptual frame in which plague is analyzed.

As a result of the plague concept's construction, scholarship has shifted away from examining evidence for what plague might have done to searching for plague truisms, and then assuming radical changes because that is what plague *must* do. Although late antique primary sources contain only vague and ambiguous references in support of the plague truisms, most scholars have ignored these problems and used the truisms to support, shape, and construct the catastrophic Justinianic Plague narrative around the plague concept. The logic has become circular: finding new evidence—rat bones, climatic change, ancient plague DNA—now proves the plague concept.

Each generation of scholars over the past century has used the plague concept for contemporary-situated historical scholarship. Plague gained renewed attention in the 1890s because of European colonial concerns about the disease spreading to imperial centers. Scientists from the 1890s through the 1920s conducted plague research to stop the global plague pandemic and prevent its future reoccurrence.¹⁹ After plague's containment in the mid-twentieth century, scientists continued to use and build narratives of historical plague to demonstrate how they had stopped similar threats in the present—proof of modern science's power. In the words of Fabian Hirst, in 1953, “victory over man's most ancient and most deadly enemy [the plague] seems now to be at last in sight.”²⁰ After their triumph over plague, colonial scientists forgot about it. It was only in the 1960s that Jean Biraben and Jacques Le Goff applied a historical-philological approach to the written sources of late antique plague, imposing a new structure, plague waves, to solidify the plague concept and its perceived historical impact.²¹

Interest in premodern plague resurfaced in the context of the late twentieth-century AIDS epidemic, and was fueled further by concerns about globalized infectious diseases, bioterrorism, and climate change at the turn of the twenty-first century. As the Justinianic Plague manifestation of the plague concept has become ubiquitous and de-

¹⁹ For a global survey of plague at the turn of the twentieth century, see Myron Echenberg, *Plague Ports: The Global Urban Impact of Bubonic Plague, 1894–1901* (New York, 2007); and on how germ theory was thought about during these plague outbreaks, see Mary P. Sutphen, “Not What, but Where: Bubonic Plague and the Reception of Germ Theories in Hong Kong and Calcutta, 1894–1897,” *Journal of the History of Medicine and Allied Sciences* 52, no. 1 (1997): 81–113, and for another view of germ theory, see Michael Worboys, “Was There a Bacteriological Revolution in Late Nineteenth-Century Medicine?,” *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 38, no. 1 (2007): 20–42.

²⁰ L. Fabian Hirst, *The Conquest of Plague* (Oxford, 1953), 452; and for another key work in this process, Wu Lien-Teh et al., *Plague: A Manual for Medical and Public Health Workers* (Shanghai, 1936); and for the mid-century period, see Thomas Zimmer, *Welt ohne Krankheit: Geschichte der Internationalen Gesundheitspolitik, 1940–1970* (Göttingen, 2017). For the history of medicine context, see J. N. Hays, *The Burdens of Disease: Epidemics and Human Response in Western History*, rev. ed. (New Brunswick, 2009), 243–279. The power of the plague concept can be seen by the early 1970s in Philip A. Kalisch, “The Black Death in Chinatown: Plague and Politics in San Francisco, 1900–1904,” *Arizona and the West* 14, no. 2 (1972): 113–136. A reflection on epidemics in the 1970s shows how different periods perceived disease: Alfred W. Crosby, preface to *America's Forgotten Pandemic the Influenza of 1918*, 2nd ed. (New York, 2003), xi: “In 1976 when this book was first published, it seemed to be a piece of medical antiquarianism, informative and interesting, I hoped, but with little immediate relevancy to our then-current situation.”

²¹ Biraben and Le Goff, “The Plague in the Early Middle Ages”; and for a similar idea, see Emmanuel Le Roy Ladurie, “Un concept: L'unification microbienne du monde (XIV^e 21–XVII^e siècles),” *Schweizerische Zeitschrift für Geschichte* 23, no. 4 (1973): 627–696.

structive, it has developed into a moralistic parable of the past that threatens destruction in the future. The Justinianic Plague has recently become a useful conceptual agent to explain the end of the Roman Empire as a premodern parallel to today's climate change.²² This story of how and why the plague concept was created and gained power has no single nefarious originator. Rather, the plague concept was built as a dialogue among academic disciplines, experts, and the broader public, each for their own needs.

This article makes three key interventions. First, we lay out the plague concept, briefly outline the reasons for its development, and reveal its power to shape the construction of late antique outbreaks of plague. Second, we demonstrate how scholars created the composite plague concept at the turn of the twentieth century, and how they periodically added new evidence, reinforcing the concept without challenging it. Finally, we urge historians to re-center *people*, not bacteria, in future investigations of past disease outbreaks, splitting the monolithic "Justinianic Plague" into its constituent outbreaks instead of using it as a large-scale explanatory agent.

UNDERLYING THE PLAGUE CONCEPT is its tripartite classification into three distinct pandemics. The first two were known and researched for centuries, with little discussion of whether they were manifestations of the same disease. Nineteenth-century scholars reopened the discussion of disease and pandemics, particularly the plague, but tended to discuss them as a series of events that struck repeatedly.²³ In the mid-nineteenth century, J. F. C. Hecker's monograph on the Black Death discussed the earlier late antique plague, but the English translation mentioned only the Black Death.²⁴ The translator, B. G. Babington, suggested that knowledge about the Black Death had "passed out of mind, being effaced from our memories by subsequent events of a similar kind [i.e., more recent outbreaks, e.g., London in 1665 or Marseille in 1720], which, though really of less magnitude and importance have, in the perspective of time, appeared greater."²⁵ Neither Hecker nor Babington conceived of a "second pandemic" as we define it today.

Only at the end of the nineteenth century, as plague mortality in Asia rose sharply and became a matter of pressing public concern against a backdrop of breakthroughs in bacteriology and germ theory, did scholars begin linking discrete historical plagues to

²² The classic summary of the 210 reasons given in the early 1980s for Rome's fall is in Alexander Demandt, *Der Fall Roms: Die Auflösung des römischen Reiches im Urteil der Nachwelt* (München, 1984). For a recent environmental take on the fall of Rome, see Harper, *The Fate of Rome*.

²³ For example, see Alfonso Corradi, *Annali delle epidemie occorse in Italia dalle prime memorie fino al 1850* (Bologna, 1865), 57–74 on late antique disease, including plague, outbreaks listed by year.

²⁴ Just fourteen pages of the German edition (3–16) discussed the late antique period combining plague and other diseases compared to eighty-one for the Black Death (not counting a section for "Die indische Pest," comprising an additional eighteen pages). See J. F. C. Hecker, *Die grossen Volkskrankheiten des Mittelalters: Historisch-pathologische Untersuchungen; Gesammelt und in erweiterter Bearbeitung*, ed. August Hirsch (Olms, 1865).

²⁵ J. F. C. Hecker, *The Epidemics of the Middle Ages*, 3rd ed., trans. B. G. Babington (London, 1859), xx. The first part was originally published on the Black Death alone: J. F. C. Hecker, *Der schwarze Tod im vierzehnten Jahrhundert* (Berlin, 1832). For writings about early modern outbreaks, see Ernest B. Gilman, *Plague Writing in Early Modern England* (Chicago, 2009), esp. 25–26; the context on disease and responses can be found in Alex Chase-Levenson, *The Yellow Flag: Quarantine and the British Mediterranean World, 1780–1860* (Cambridge, 2020). For modern myths about plague today, see Winston Black, *The Middle Ages: Facts and Fictions* (Santa Barbara, Calif., 2019), 222–224, on the children's song "Ring around the Rosie" as one famous example.

create a seamless chronological narrative. The modification can be glimpsed in the revised entry for “plague” in the eleventh edition of the *Encyclopædia Britannica* from 1910–1911, which presented a long historical background to plague for the first time.²⁶ It is notable that historians were generally not part of this conversation and therefore did not connect the plague outbreaks transhistorically. As late as 1923, the medievalist J. B. Bury mentioned the Black Death in his discussion of the plague in the later Roman Empire only in passing and alongside several other historical epidemics.²⁷

The plague outbreaks around the turn of the twentieth century were soon defined as a plague pandemic, while over the next couple of decades, scientists slowly established the earlier two major plague occurrences as historical pandemics, gluing them to the modern pandemic to construct a holistic picture of plague as an agent in human history. The earliest reference we found to the tripartite classification of plague pandemics dates to 1905, a decade after the first serious outbreaks of modern plague. William Simpson (1855–1931), a key figure in the development of tropical medicine who wrote a treatise on the plague and worked in India during the plague’s early outbreak, prefaced his epidemiological and clinical discussions with a detailed historical background.²⁸ He saw late antique plague as “the first well-authenticated pandemic of plague,” and described the Black Death (in the fourteenth century only) as “the second recorded pandemic.”²⁹ This was a major change at the turn of the century. Before the construction of the “Third Pandemic,” physicians, scientists, and scholars used the historical plagues to understand modern disease. Once the bacillus could be found and examined under a microscope, historical evidence based on symptoms was no longer required to diagnose diseases in the present. Instead, modern disease diagnoses began to shape interpretations of historical plague.³⁰

²⁶ The eleventh edition entry has over five pages that begin with Rufus and covered plague chronologically until 1880, and another seven pages covering recent events, epidemiology, and research. Arthur Shadwell, Harriet L. Hennessy, and Joseph Frank Payne, “Plague,” in *Encyclopædia Britannica*, 11th ed., ed. Hugh Chisholm, 29 vols. (Cambridge, 1911), 21: 693–705. The parallel entry from the eighth edition from 1859 included no historical discussion, while the ninth edition listed unconnected historical examples. See, respectively, J. Thomson, “Plague,” in *Encyclopædia Britannica; or, Dictionary of Arts, Sciences, and General Literature*, 8th ed., ed. Thomas S. Traill, 22 vols. (1860), 17: 748–752; Joseph Frank Payne, “Plague,” in *Encyclopædia Britannica: A Dictionary of Arts, Sciences, and General Literature*, 9th ed., ed. Thomas Spencer Baynes, 25 vols. (New York, 1878), 19: 159–168. On the creation of the eleventh edition, see Denis Boyles, *Everything Explained That Is Explainable: On the Creation of the Encyclopædia Britannica’s Celebrated Eleventh Edition, 1910–1911* (New York, 2016).

²⁷ J. B. Bury, *History of the Later Roman Empire from the Death of Theodosius I to the Death of Justinian*, 2 vols. (New York, 1923), 2: 62.

²⁸ William John Simpson, *A Treatise on Plague: Dealing with the Historical, Epidemiological, Clinical, Therapeutic and Preventive Aspects of the Disease* (Cambridge, 1905), 1–48. Simpson was a health officer in Calcutta from 1886 to 1897, during the initial outbreak of plague, and was later appointed professor of hygiene at King’s College London and joined the new London School of Tropical Medicine. For further information on Simpson, see Christos Lynteris, “Pestis Minor: The History of a Contested Plague Pathology,” *Bulletin of the History of Medicine* 93, no. 1 (2019): 55–81, here 58–59, esp. 58 n. 8; and R. A. Baker and R. A. Bayliss, “William John Ritchie Simpson (1855–1931): Public Health and Tropical Medicine,” *Medical History* 31, no. 4 (1987): 450–465.

²⁹ Simpson, *A Treatise on Plague*, 5, 21. Simpson did not believe the sixth century witnessed the first appearance of plague around the Mediterranean. Instead, he identified plague in the Bible during a war between the Israelites and Philistines. Since this biblical evidence was limited, scholars tended to discuss it briefly before moving on to the late antique and medieval outbreaks. See, for example, G. Sticker, *Die Pest I: Abhandlungen aus der Seuchengeschichte und Seuchenlehre* (Gießen, 1908), 17–19.

³⁰ See again, in summary, Nutton, introduction to *Pestilential Complexities*. On retrospective diagnoses: Karl-Heinz Leven, “Von Ratten und Menschen: Pest, Geschichte und das Problem der retrospektiven Diagnose,” in Mischa Meier, ed., *Pest: Die Geschichte eines Menschheitstraumas* (Stuttgart, 2005),

Simpson's synthesis of history and science remained attractive for subsequent generations of scholars, who reinforced the tripartite classification, using it as a shorthand for the long history of plague. This practice remains in place today, helping to explain the division of historical periods, since the first pandemic divides the ancient from the medieval world, while the second pandemic divides the medieval from the early modern world.³¹ The pandemics became an easy way to "prove" and popularize why life was different for people living before and after; *how* this process occurred was rarely stated.³² Moreover, the plague, as Nühket Varlık has shown with reference to the Ottoman Empire, can be linked to the inverse change: the expansion of empire, rather than the cause of its fall.³³

The tripartite classification has failed to clarify a number of problems while overlooking others. The Justinianic Plague and first pandemic terminology are used to describe the same event, even though the Justinianic Plague is also used to refer only to the first phase of the first pandemic. Such unclear terminology has facilitated the use of the plague concept by expanding plague's effects in history. Neither was research on the three pandemics equal. Despite its central role in the construction of the plague concept, the modern plague pandemic does not end a major period of European history, does not play an explicit role in the plague concept (as do the other plague occurrences), and does not drive drastic societal change in the early twentieth-century imperial centers (save some questions of public health and local responses).³⁴

Once colonial empires demonstrated they could prevent plague outbreaks from affecting imperial centers, and as other events such as World War I became more pressing, interest in historical plague declined.³⁵ Regardless, by the mid-twentieth century, plague as a tripartite idea had become a standard way to divide world history, as reflected in the three first classifications of *Yersinia pestis* biovars (physiologically dis-

11–32; and Lester K. Little, "Plague Historians in Lab Coats," *Past and Present*, no. 213 (2011): 267–290. The idea of Germ Theory itself has taken on its own independent power: Nancy J. Tomes and John Harley Warner, "Introduction to Special Issue on Rethinking the Reception of the Germ Theory of Disease: Comparative Perspectives," *Journal of the History of Medicine and Allied Sciences* 52, no. 1 (1997): 7–16.

³¹ The classification has only hardened over time despite its problems. Clifford Gill, *The Genesis of Epidemics and the Natural History of Disease* (New York, 1928), 312, noted that plague became a pandemic at least three times during the Christian era; Lien-Teh et al., *Plague: A Manual for Medical and Public Health Workers*, 2–3, here 2, referred to the late antique plague as "the first known pandemic of plague." Hirst, *The Conquest of Plague*, 10, described the three "great pandemics." See William McNeill, *Plagues and Peoples* (Garden City, N.Y., 1976), 174, for a timely but unheeded warning against the idea of three global pandemics.

³² The title of Little, *Plague and the End of Antiquity*, suggests the First Pandemic's centrality. William Chester Jordan, *Europe in the High Middle Ages* (London, 2001), 289–301, notes the Black Death's role as part of the reason the High Middle Ages ended.

³³ Nühket Varlık, *Plague and Empire in the Early Modern Mediterranean World: The Ottoman Experience, 1347–1600* (Cambridge, 2015).

³⁴ For one public health change, see Lukas Engelmann and Christos Lynteris, *Sulphuric Utopias: A History of Maritime Fumigation* (Cambridge, Mass., 2019).

³⁵ Book-length studies of the modern plague include Charles T. Gregg, *Plague: An Ancient Disease in the Twentieth Century* (Albuquerque, 1985), and Guenter B. Risse, *Plague, Fear, and Politics in San Francisco's Chinatown* (Baltimore, Md., 2012), both of which examine the United States. On China see Carol Benedict, *Bubonic Plague in Nineteenth-Century China* (Stanford, 1996); Echenberg, *Plague Ports*, for the global outbreak of 1894–1901. For the impact on India, which was the epicenter of the pandemic with approximately twelve million deaths, see David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley, Calif., 1993); Pratik Chakrabarti, *Bacteriology in British India: Laboratory Medicine and the Tropics* (Rochester, N.Y., 2012); and Sandhya Polu, *Infectious Disease in India, 1892–1940: Policy-Making and the Perception of Risk* (London, 2012).

inct types) that were named after the three pandemics (*antiqua*, *medievalis*, and *orientalis*). These names persisted even after scientific research revealed that there was no evidence to support them.³⁶

SCHOLARS HAVE SLOWLY EXPANDED the chronological range of late antique plague, implicitly extending its importance by harnessing premodern written primary sources to suggest that a series of outbreaks led to widespread death, destruction, and historical change. Dating the onset of the “Justinianic Plague” to 541 C.E. remains largely undisputed although it obfuscates a messy biological reality.³⁷ Late antique historians rarely discuss the fact that plague existed and affected humans before 541, preferring to concentrate on plague’s noticeable effects in the Mediterranean world. The older evidence of Rufus of Ephesus—that a disease with buboes as a symptom (sufficient for at least a tentative diagnosis as plague) affected Egypt, Syria, and Libya, circa 100 C.E.—has been largely written out of the narrative of Mediterranean plague.³⁸ Furthermore, recent aDNA research has revealed the presence of earlier and genetically distinct plague strains in human remains in the Bronze and Stone Ages (i.e., 3,500 years earlier).³⁹ In this context, 541 reflects the year that scholars first identify plague as a historical event to which they assign major societal impact.

For over three centuries, historically inclined scholars have concluded that plague continued to affect the Mediterranean world in the decades after the 541 outbreak. Early discussions were based on a single primary source, the late sixth-century historian Evagrius, who asserted that after the initial plague outbreak, “this misfortune has been prevalent up to the present for 52 years.”⁴⁰ Around the turn of the twentieth century, interpretations of Evagrius were flexible, providing alternative yet unexplained lengths for the plague’s persistence, such as “50–60 years.” This slippage between Evagrius’s account, on which the new lengths were probably based (Evagrius is often left uncited), represents the earliest case of blurring the plague’s chronological boundaries in scholarship, a process that has continued ever since.⁴¹

³⁶ The three biovars of *Y. pestis* were thought to correspond to the three pandemics: *antiqua* (Justinianic Plague), *medievalis* (Black Death), and *orientalis* (modern plague). This model was suggested by R. Devignat, “Variétés de l’espèce *Pasteurella Pestis*,” *Bulletin of the World Health Organization* 4, no. 2 (1951): 258–259. The terms likely remain in usage partially because they refer to the “great” pandemics and as such are perceived as significant.

³⁷ The start date is based on Procopius’s account. Sticker, *Die Pest I*, 20, 24–28, pushes the starting point back to 531/532 but his date is based on a misreading of the late antique historian Agathias.

³⁸ Rufus was known and discussed in scholarship for centuries before fading from scholarly consciousness in the mid-twentieth century. For a recent discussion of Rufus, see John Mulhall, “Plague before the Pandemics: The Greek Medical Evidence for Bubonic Plague before the Sixth Century,” *Bulletin of the History of Medicine* 93, no. 2 (2019): 151–179.

³⁹ Recent research has found evidence for earlier cases of *Yersinia pestis*: Simon Rasmussen et al., “Early Divergent Strains of *Yersinia pestis* in Eurasia 5,000 Years Ago,” *Cell* 163, no. 3 (2015): 571–582; and Aida Andrades Valtueña et al., “The Stone Age Plague and Its Persistence in Eurasia,” *Current Biology* 27, no. 23 (2017): 3683–3691.e8.

⁴⁰ Evagrius wrote that “an almost complete extermination struck mankind especially in the first or second year of the fifteen-year cycle.” The fifteen-year cycle is a dating system (called the Indiction Cycle) based on tax collection, which counts from year one to fifteen and then starts over. Evagrius, *The Ecclesiastical History of Evagrius Scholasticus*, trans. Michael Whitby (Liverpool, 2000), 4.29.

⁴¹ The first histories to introduce Evagrius into the plague narrative start in at least the late seventeenth century. Accepting his account of fifty-two years of plague verbatim are William Howell, *An Institution*

The worldwide spread of plague at the turn of the twentieth century and the concomitant exponential increase in plague scholarship led to a division between plague (physician and later epidemiological) specialists and ancient and medieval historians, which shaped how historical outbreaks of plague were subsequently analyzed. During the early and mid-twentieth century, growing numbers of scientists accepted that plague's impact lasted about sixty years in the Mediterranean world, though their interventions analyzed the role of late antique plague as part of the history of plague before turning to focus on its present-day implications.⁴² These specialists read widely—using available scientific research and some historical accounts to produce early accounts of late antique plague—and their accounts depended on a set of assumptions about what effects plague had on any society. For example, the influential historian of medicine Henry Sigerist (1891–1957) noted that “the 6th century marks a turning point in the history of the Mediterranean world, and the great plague of Justinian appears as a demarcation line.”⁴³ Yet, this idea of plague's impact was based on unstated reasoning (likely the still popular conception of the decline and fall of the Roman Empire).

These specialists established early versions of the plague concept, which historians would pick up over the last third of the twentieth century. Early research on late antique plague was conducted by scientists looking to stress the importance of their work in their present by examining plague ahistorically. In short, a larger role for plague as a historical actor justified additional scientific research and then, by the mid-twentieth century, validated scientific claims to have “conquered” plague through some combination of antibiotics, modern hygiene, and scientific medicine.

While plague specialists continued to stress its centrality to historical change and its chronological sweep, most historians working on late antiquity either avoided the scientific debate or were seemingly unaware of it. George Ostrogorsky's fundamental *History of the Byzantine State and Society* did not discuss late antique plague at all.⁴⁴ Other political histories preferred to note significant outbreaks in 542, 558, or circa 745–747, treating them as separate outbreaks without mentioning their connection to any outbreaks in between. Bury, a representative of this group, noted a single additional out-

of General History; or, The History of the World (London, 1685), 3: 110; Richard Mead, *The Medical Works of Richard Mead, M.D.* (Edinburgh, 1775), 243; John Freind, *The History of Physick from the Time of Galen, to the Beginning of the Sixteenth Century*, 2nd ed. (London, 1727), 151–152; Edward Gibbon, *The Decline and Fall of the Roman Empire*, 6 vols., ed. Hugh R. Trevor-Roper (London, 1994), 4: 418; Robert Willan, *Miscellaneous Works of the Late Robert Willan* (Cadell, 1821), 3; August Hirsch, *Handbook of Geographical and Historical Pathology*, trans. Charles Creighton (London, 1883), 1: 495–496 has fifty to sixty years. For other numbers, see Noah Webster, *A Brief History of Epidemic and Pestilential Diseases* (Hartford, Conn., 1799), 1: 100–101 (up to 600 C.E.); Arthur Shadwell, Harriet L. Hennessy, and Joseph Frank Payne, “Plague,” in *Encyclopædia Britannica*, 11th ed., 21: 693 (fifty years); Hans Zinsser, *Rats, Lice and History* (Boston, 1935), 147–148 (sixty to seventy years); Lien-Teh et al., *Plague: A Manual for Medical and Public Health Workers*, 2 (fifty to sixty years).

⁴² For some of these, see Simpson, *A Treatise on Plague*; Shadwell, Hennessy, and Payne, “Plague,” 693; Zinsser, *Rats, Lice and History*, 148–149; Hirst, *The Conquest of Plague*, 10; R. Pollitzer, *Plague* (Geneva, 1954), 11–13.

⁴³ Henry E. Sigerist, *Civilization and Disease* (Ithaca, N.Y., 1943), 113–116, here 114. As George Rosen pointed out, the role of political structures in a pandemic is unclear in Sigerist's writings. See George Rosen, “Toward a Historical Sociology of Medicine: The Endeavor of Henry K. Sigerist,” *Bulletin of the History of Medicine* 32, no. 6 (1958): 500–516, here 508; also Elizabeth Fee, “Henry E. Sigerist: From the Social Production of Disease to Medical Management and Scientific Socialism,” *Milbank Quarterly* 67, suppl. 1 (1989): 127–150, here 131.

⁴⁴ George Ostrogorsky, *History of the Byzantine State*, trans. Joan Hussey (Oxford, 1956).

break in 558 that was nonetheless “much less virulent and destructive.”⁴⁵ For these authors, plague was still a series of local outbreaks rather than a long pandemic.

This changed in the late 1960s, as the plague concept gained traction with historians and other non-scientists. In 1968, the medieval demographer Josiah C. Russell expanded the chronology of plague by a century, arguing that “plague seems to have been a minor factor after 700, if not somewhat earlier.” Although the evidence for his claim covered only the last decade of the seventh century and the first half of the eighth century, his article marked the most substantial chronological expansion of late antique plague as a pandemic.⁴⁶

The watershed moment for historical studies of late antique plague occurred a year later, when Jean-Nöel Biraben and Jacques Le Goff extended its chronological scope to 767 C.E., and cemented all the intermediate outbreaks over two hundred years together based on historical-philological criteria. Influenced by the *Annales* school and by the entry of human and social sciences into the history of medicine and disease, Biraben and Le Goff produced the first twentieth-century historical analysis of late antique plague.⁴⁷ As their bibliography makes clear, their article depended heavily on the plague concept scientists had created over the previous seventy years, since few historians had engaged with the primary sources.⁴⁸ They complemented their innovative synthesis with a catalogue (a multi-page table of the different outbreaks) and maps (several pages that visualized how plague moved around the Mediterranean), both of which have since dominated plague studies. Although their influence was not immediately felt, since scientific plague conquest narratives like Hirst’s remained dominant, the plague as a two-centuries-long feature was here to stay.⁴⁹

Biraben and Le Goff’s proposed end point for late antique plague is still disputed. The consensus settled at 750 (or really ca. 750), which is attractive as a round number and coincides with the beginning of Abbasid and Carolingian rule over the Middle East and Europe, respectively.⁵⁰ Nonetheless, other suggested dates continue to circulate, including 746/747 and 767 (in the West).⁵¹ Although subsequent research has called attention to outbreaks that date to 766–767, 773–774, or 841–843, so far there has been

⁴⁵ A. A. Vasiliev, *History of the Byzantine Empire* (Madison, 1928), 162 (for 542 C.E.), 178, 240 (for the mid-eighth-century outbreak); R. J. H. Jenkins, *Byzantium: The Imperial Centuries, AD 610–1071* (London, 1966), 9 (for 542 C.E.), 69 (for the mid-eighth outbreak). Bury, *History of the Later Roman Empire*, 62–66, here 66. Why Bury accepted the 558 C.E. end date is unclear, since the testimony of Evagrius, whom he cites elsewhere, says the plague continued for fifty-two years (which extends beyond 558).

⁴⁶ Josiah C. Russell, “That Earlier Plague,” *Demography* 5, no. 1 (1968): 174–184, here 178. Russell notes at the end of footnote 35 on page 178 that “some central European cemeteries seem to show evidence of plague deaths (in late summer) in the seventh century,” but cites no supporting reference for this claim. He also notes earlier on the same page his reliance on modern scientific data, saying “data gathered from observations of recent study in modern India and elsewhere are illuminating,” and footnote 29 cites Hirst among others. Nutton, introduction to *Pestilential Complexities*, 7–8, for the background.

⁴⁷ For the context, see Corinne Doria, “The Right to Write the History: Disputes over the History of Medicine in France—20th–21st Centuries,” *Transversal: International Journal for the Historiography of Science* 3 (December 2017): 26–36.

⁴⁸ Biraben and Le Goff, “The Plague in the Early Middle Ages,” 77–80.

⁴⁹ The classic 1970s account has some similarities: William McNeill, *Plagues and Peoples*. And for a further history of this period, see Hays, *The Burdens of Disease*, 243–279.

⁵⁰ For example, McNeill read Biraben and Le Goff’s paper but cited it as claiming plague lasted until 750 (as opposed to 767). See McNeill, *Plagues and Peoples*, 123, 322 n. 66.

⁵¹ As an example in the east: P. Allen, “The ‘Justinianic’ Plague,” *Byzantion* 49 (1979): 5–20; on page 14 Allen asserts the mid-eighth century as the plague’s endpoint, but her last dated outbreak is in 716/717. On this date in the west: Michael McCormick, “Toward a Molecular History of the Justinianic Pandemic,” in Little, *Plague and the End of Antiquity*, 290–312, here 292 n. 7.

little further discussion of the possibility that plague persisted as a series of localized minor outbreaks in certain areas of western Eurasia for decades after 750.⁵² The Justinianic Plague's end date has been peripheral to broader debates surrounding the pandemic; since the idea of a centuries-long plague cemented into scholarly consensus, quibbling over an extra few years seemed not to matter to most scholars.

Almost no work has been done on the post-540s outbreaks as distinct historical events. Instead, most scholars prefer to discuss the entire chronological range of the expanded Justinianic Plague construct, assembling a catastrophic composite narrative based on written sources from the first outbreak (ca. 541–544) and borrowing anecdotal evidence from subsequent outbreaks to portray plague as a uniform event over time and space.⁵³ Once the plague concept is assumed, its effects can be copied from one location to another, obfuscating the near complete absence of evidence for many outbreaks after 541–544.⁵⁴ As a result, over the last few decades, most scholars have conceptualized a two-century-long Justinianic Plague and viewed it as a continued demographic catastrophe.

A SECOND KEY FEATURE in the plague concept is mortality estimates: a high death toll is necessary to confirm plague as an agent of historical change that transformed all aspects of life.⁵⁵ The death toll and mortality rate of late antique plague are impossible to calculate using only contemporary sources, since little archival data exists and the numbers mentioned in contemporary literary sources are difficult to interpret.⁵⁶ The few sources that include mortality numbers had a variety of literary aims, but statistical accuracy was not among them. Their authors aimed not to offer census data but to present the world based on their own narratives. Accordingly, they often approximated or exaggerated numbers.⁵⁷ As this section suggests, scholars first used numbers from sixth-century literary writing verbatim, without any critical literary analysis; more recently, they argued that late antique plague mortality percentages directly parallel those of the

⁵² Michael G. Morony, “‘For Whom Does the Writer Write?’ The First Bubonic Plague Pandemic According to Syriac Sources,” in Little, *Plague and the End of Antiquity*, 59–86, here 67–69. The argument is based on the Syriac words used for plague, particularly *mawtana*, which could describe plague and continues to appear into the ninth century. The plague bacteria, *Yersinia pestis*, involved in late antique plague, though not a direct ancestor of second-pandemic *Y. pestis* and now almost certainly extinct, likely persisted somewhere and in some host population(s) after the “end” of the first plague pandemic for a period, but most historians are concerned with where it continued to affect humans on a significant demographic scale in the Mediterranean world.

⁵³ For a similar point see Carmichael, “The Last Past Plague.”

⁵⁴ Mitchell, *A History of the Later Roman Empire*, 490–491.

⁵⁵ For this idea see Kristina Sessa, “The New Environmental Fall of Rome: A Methodological Consideration,” *Journal of Late Antiquity* 12, no. 1 (2019): 233–236.

⁵⁶ In an earlier paper, we analyzed indirect demographic sources and demonstrated that the evidence does not suggest a massive demographic decline. See Mordechai et al., “The Justinianic Plague: An Inconsequential Pandemic?”

⁵⁷ Late antique texts as literature is an enormous topic, but see Cyril A. Mango, *Byzantine Literature as a Distorting Mirror: An Inaugural Lecture Delivered before the University of Oxford on 21 May 1974* (Oxford, 1975); Walter A. Goffart, *The Narrators of Barbarian History (A.D. 550–800): Jordanes, Gregory of Tours, Bede, and Paul the Deacon* (Princeton, N.J., 1988). For army numbers in premodern sources as an example, see John Haldon et al., “Marching across Anatolia: Medieval Logistics and Modeling the Mantzikert Campaign,” *Dumbarton Oaks Papers* 65/66 (2011): 209–235, here 209; and J. France, “Armies: Size,” in *The Oxford Encyclopedia of Medieval Warfare and Military Technology*, ed. Clifford J. Rogers, 3 vols. (Oxford, 2010), 1: 65–67.

medieval plague based on their perceived equivalence, with little evidence and no reasoning.⁵⁸ Since scholars started from this problematic basis, anyone who attempted to calculate the mortality rate has suggested a staggeringly large death toll, characterizing it “the greatest disease event human civilization had ever experienced” until then (surpassed only by the Black Death, as more people were alive in the fourteenth century).⁵⁹

Although plague around the turn of the twentieth century exerted a strong influence on how the late antique pandemic was structured and studied, its mortality remained in the low single percentages. While its total death toll in India reached approximately twelve million over a few decades, in other locations (e.g., Hong Kong, South Africa, Portugal, Australia, and the United States), it remained much lower: in San Francisco from 1900 to 1940, for example, the total number of deaths from plague was less than three hundred.⁶⁰ Yet the discrepancy between late antique and modern plague has been mostly ignored, as the plague concept prompted scholars to assume that late antique plague’s death toll was significant, rather than analyzing the evidence for what it might in fact have been. Twentieth-century scholars depicted a plague that devastated Europe in the past because that period resembled its colonies in the present.⁶¹

Procopius’s account of the first outbreak in Constantinople in his political history *The Wars* supplies a few specific numbers. The outbreak lasted four months, Procopius wrote; three of them with a significant death toll. His next sentence asserts that “the tale of dead reached five thousand each day, and again it even came to ten thousand and still more than that.” In early discussions of the plague’s mortality, these numbers were simply reproduced.⁶² Yet, if Constantinople’s population was 500,000 before the outbreak, Procopius’s numbers prove impossible (resulting in over 675,000 deaths).⁶³ His numbers suggest that many people died, but they cannot be used as a baseline for modeling deaths in Constantinople, not to mention throughout Eurasia.⁶⁴ A recent epidemiologi-

⁵⁸ According to Harper, “Fundamentally everything about our knowledge of the Justinianic Plague is consistent with the conclusion that the mortality also carried off an unfathomable half of the population.” Harper, *The Fate of Rome*, 234. These are not statistical or scientific models, but guesses-termed-models.

⁵⁹ Quote is from Harper, *The Fate of Rome*, 201. See, among others, Bury, *History of the Later Roman Empire*, 62–65, esp. 62, 65.

⁶⁰ Despite plague, India’s population increased from circa 280 million in 1891 to 306 million in 1921; for India’s numbers, see Ira Klein, “Death in India, 1871–1921,” *Journal of Asian Studies* 32, no. 4 (1973): 639–659, here 641; and in more detail Polu, *Infectious Disease in India*, 50–81. For the San Francisco deaths total, see Echenberg, *Plague Ports*, 236–237. Echenberg argues throughout that plague deaths could have been worse.

⁶¹ For this development as it happened at the time, see Sutphen, “Not What, but Where,” which is in many respects the inverse of Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton, N.J., 2000). We thank one of the anonymous reviewers for suggesting this point.

⁶² Procopius, *Wars*, ed. and trans. H. B. Dewing, 5 vols. (London, 1914), 2.22–23 (quote from 2.23). Howell, *An Institution of General History*; or, *The History of the World*, 3: 109–110; Willan, *Miscellaneous Works of the Late Robert Willan*, 13.

⁶³ Bypassing the incalculable over ten thousand a day, Procopius’s text suggests ninety days of significant mortality, which could be divided between forty-five days of 5,000 people a day and forty-five days of 10,000 per day. At this rate, 225,000 people died in the first forty-five days, and a further 450,000 during the second forty-five days. Even 5,000 a day over three months would have almost exhausted the city’s estimated population (450,000 deaths).

⁶⁴ See for example Allen, “The ‘Justinianic’ Plague,” 10–11. Stephen Mitchell, “The Great Plague of Late Antiquity in Asia Minor,” in Celal Şimşek and Turhan Kaçar, eds., *Geç Antik Çağ’da Lykos Vadisi ve Çevresi (The Lykos Valley and Neighbourhood in Late Antiquity)* (Istanbul, 2018), 27–36, here 28. T. L. Bratton, “The Identity of the Plague of Justinian,” pts. 1 and 2, *Transactions and Studies of the College of Physicians of Philadelphia* 3, no. 2 (1981): 113–124; 3, no. 3 (1981): 174–180. Part 2 of Bratton’s

cal attempt to model the first outbreak in Constantinople mathematically resulted in inconclusive results, indicating high variability in mortality. It also suggested that plague mortality would have varied greatly between cities as well as between urban and rural locations.⁶⁵

Procopius's *Secret History*, a polemical account of Justinian's reign, offered a second number. Also impossible, it has likewise influenced scholarship. Procopius claimed Justinian was responsible for the deaths of "a myriad [literally ten thousand] myriads of myriads"—ten thousand cubed, or one trillion—people, through war, disease, and famine. In his (in)famous *Decline and Fall of the Roman Empire*, Edward Gibbon (1737–1794) translated this phrase into a specific number by dropping one of the myriads to reach one hundred million deaths (ten thousand squared), which he believed was "a number not wholly inadmissible."⁶⁶ Gibbon's mortality count demonstrates another attempt to accept Procopius's words verbatim. Scientists used Gibbon's interpretation throughout the nineteenth and twentieth centuries and, as recently as 2014, a scientific article in a prestigious journal, the *Lancet*, cited Gibbon's figure of one hundred million dead as an estimate to the plague's death toll. Widely disseminated visualizations of historical pandemics created during COVID-19 have also used the number one hundred million.⁶⁷

Scholarship sometimes acknowledges the problem with Procopius's numbers, but nonetheless uses them as a touchstone to suggest massive mortality in Constantinople and the rest of Eurasia. According to Peter Sarris, Procopius "describes how at one

article rejected Procopius's calculations as implausible and estimated a mortality rate of 20 percent (57,660 deaths from a population of 288,300). Stathakopoulos, *Famine and Pestilence in the Late Roman and Early Byzantine Empire*, 139–140, similarly rejected Procopius's numbers and also suggested a 20 percent mortality rate with a higher urban population (80,000 deaths from a population of 400,000).

⁶⁵ Lauren A. White and Lee Mordechai, "Modeling the Justinianic Plague: Comparing Hypothesized Transmission Routes," *PLOS ONE* 15, no. 4 (2020): e0231256, <https://doi.org/10.1371/journal.pone.0231256>.

⁶⁶ The Greek phrase is *μυριάδας μυριάδων μυριάς*. The full quote: "It would be easier to number all the grains of sand than those whom this emperor killed. Making a rough estimate of the lands that are now devoid of inhabitants, I would say that ten thousand times ten thousand times ten thousand died." Procopius, *Secret History*, ed. and trans. H. B. Dewing (London, 1914), 18.4. This translation is from Procopius, *The Secret History, with Related Texts*, trans. Anthony Kaldellis (Indianapolis, 2010), 81. Ten thousand cubed is one trillion. For Gibbon's change, see Gibbon, *The Decline and Fall of the Roman Empire*, 4: 419 n. 1.

⁶⁷ Wagner, "Yersinia pestis and the Plague of Justinian, 541–543 AD," 319. The authors add "this history is disputed" but do not cite who disputes it, why they chose that number, or what "this history" refers to (Procopius? Plague? The number of deaths?). Gibbon's number was cited and accepted as a good basis in Willan, *Miscellaneous Works of the Late Robert Willan*, 16 (noted that "some authors calculate" that two hundred million died, but Gibbon offered one hundred million); Charles Creighton, *A History of Epidemics in Britain from A.D. 664 to the Extinction of Plague* (Cambridge, 1891), 2 (noted that Gibbon reduced Procopius's number, but does not offer a precise figure); Wu Lien-Teh et al., *Plague: A Manual for Medical and Public Health Workers*, 2 (accepts Gibbon's one hundred million); R. Pollitzer, *Plague*, 12 (cites Gibbon's one hundred million approvingly). The one hundred million has been cited by the *AFP* during COVID-19. For one example, see "History of Deadly Plagues, Epidemics and Global Pandemics," Microsoft News, May 5, 2020, <https://www.msn.com/en-my/health/medical/history-of-deadly-plagues-epidemics-and-global-pandemics/ar-BB13Bf73>. The other number is John of Ephesus's minimum of 230,000 dead in Constantinople. John is rarely cited for his specific numbers, since he wrote in Syriac and his history survives in fragments. His history requires further research, but see J. J. van Ginkel, "John of Ephesus: A Monophysite Historian in Sixth-Century Byzantium" (Ph.D. diss., Rijksuniversiteit Groningen, 1995); and Kutlu Akalm, "Co-existence and Persecution: Sixth-Century Constantinople according to John of Ephesus" (Ph.D. diss., Princeton University, 2011). Regardless of John's sources and methodology, premodern death counts are unreliable.

point [plague] laid low 10,000 victims in a single day” and “there is no good reason to gainsay these eyewitness accounts.” Yet beyond Procopius, Sarris offers no support for this figure outside Constantinople, other than general problems with Byzantine military operations in the 540s, for which there is no direct evidence. Sarris links plague mortality to the collapse of Britain, “where the arrival of the plague coincided with chronic military and political insecurity, the archaeological evidence points to a staggering demographic collapse, with the population perhaps halving over the course of the fifth and sixth centuries.”⁶⁸ In effect, Procopius and a few other sources are used to assert massive demographic change across the breadth of Eurasia. Plague in such narratives “sucks in” loosely dated archaeological evidence originally dated to the “long fifth century” or “fifth/sixth centuries” and obfuscates the fact that the political end of Roman Britain, beginning in 410 C.E., is the more probable reason for its demographic collapse.⁶⁹

Perhaps in acknowledgment of the problems with using Procopius’s numbers, most recent work discusses late antique plague deaths with percentages modeled on medieval plague percentages. Biraben and Le Goff’s article hesitated to compare the late antique outbreaks with the medieval plague and argued against accepting even a one-third or one-quarter mortality rate for the late antique plague in Europe.⁷⁰ Their prescient caution has been ignored. Pauline Allen wrote the next influential plague article in 1979, stressing the connection between both pandemics, and suggesting that one-third of the population died in the sixth century by citing secondary scholarship on the Black Death. William McNeill’s *Plagues and Peoples* (1976) added support to this comparison by explicitly borrowing the Black Death model for popular writing. Aimed at a broad audience, *Plagues and Peoples* would exert continued considerable influence over scholarly and popular perceptions of late antique plague.⁷¹ Subsequent works have followed this trend by suggesting mortality rates of between one-quarter and one-half of the population, often with a nod toward the medieval plague. As medieval plague percentages have continued to rise over the past half century, late antique estimates have followed, with recent estimates reaching as high as 70 percent.⁷² Scholars of the late antique plague avoid investigating medieval plague mortality rates, which are themselves uncertain, vary widely, and depend on local factors.⁷³ Black Death scholars

⁶⁸ Peter Sarris, *Empires of Faith: The Fall of Rome to the Rise of Islam, 500–700* (Oxford, 2011), 158–159.

⁶⁹ Sarris, *Empires of Faith*, 159 n. 139; for “sucking in,” see M. G. L. Baillie, “Suck In and Smear: Two Related Chronological Problems for the 90s,” *Journal of Theoretical Archaeology* 2 (1991), 12–16. This connection was noted first in Sessa, “The New Environmental Fall of Rome,” 236–237.

⁷⁰ Biraben and Le Goff, “The Plague in the Early Middle Ages,” 62.

⁷¹ Allen, “The ‘Justinianic’ Plague,” 11–12. McNeill, *Plagues and Peoples*, 127. McNeill, however, is rarely cited in academic literature on late antique plague.

⁷² Warren T. Treadgold, *A History of the Byzantine State and Society* (Stanford, Calif., 1997), 214–216, 278–279, has different percentages (a quarter per outbreak, and over 60 percent in Constantinople); Harper, *The Fate of Rome*, 234, has 50 percent; Kyle Harper, “Invisible Environmental History: Infectious Disease in Late Antiquity,” *Late Antique Archaeology* 12 (2018): 116–131, here 128, believes 50–60 percent; Mitchell, “The Great Plague of Late Antiquity in Asia Minor,” 29, suggests 55–70 percent mortality rate (citing Benedictow, *The Black Death*), which he implies was equivalent.

⁷³ For the Black Death as 40–60 percent, see Monica H. Green, “Editor’s Introduction to Pandemic Disease in the Medieval World: Rethinking the Black Death,” in Monica Green, ed., *Pandemic Disease in the Medieval World: Rethinking the Black Death* (Kalamazoo, Mich., 2015), 9–26, here 9; and for a restatement of the problems with percentages, see Lerner, “Fleas: Some Scratchy Issues Concerning the Black Death.”

likewise use demographic decline to argue for widespread cultural, economic, and political change across Europe.⁷⁴ Scholars from both fields will then often accept plague-induced mortality as an explanation for change.

Late antique plague mortality rates, as they currently exist, are based on medieval plague models, which assume equivalences in mortality without any basis in late antique sources. Plague outbreaks have long conjured up images of the dead piled in plague pits, as Procopius described them 1,500 years ago. Scholars have used these images to argue that plague killed huge percentages of people in Eurasia, while death-rate estimates have not advanced past Gibbon's decision that Procopius's number in *The Secret History* must be incorrect, and that his own arbitrary number (one hundred million) must be substituted.⁷⁵ Yet behind the catastrophic accounts, the only change since Gibbon has been to replace a set of unprovable numbers with a set of dubious percentages. Citing medieval plague mortality rates as a proxy is not a suitable basis for understanding the late antique plague's demographic impact, but only demonstrates how mortality rates of both pandemics have been conflated and inflated as part of the plague concept. As the outbreaks at the turn of the twentieth century reveal, late antique plague need not have led to apocalyptic mortality rates. Only our preexisting assumptions, derived from the plague concept, require such dire results.

THE VIEW OF THE GEOGRAPHICAL EXTENT of the late antique plague has followed a pattern much like the interpretation of the other two features of the plague concept. Over the past few centuries, scholars first followed Procopius's literary account and then looked to other written sources and used non-textual sources to add new regions. As with plague mortality, so have scholars "gone looking" for plague evidence, which they interpret as a devastating event in ever more places with little critical scrutiny of the evidence.

Early authors accepted Procopius's geography as exact. According to his narrative in *Wars*, plague began in Egypt and spread throughout the Middle East before reaching Constantinople and, eventually, the rest of the world. Plague was everywhere, even if Procopius provided few specific examples.⁷⁶ Over the course of the nineteenth century, scholars found (and rediscovered) new written sources and used them to elaborate on Procopius's vague rhetorical statement in *Wars* that "the whole human race came near to being annihilated . . . it embraced the entire world."⁷⁷ The Latin-language accounts of Bishop Gregory of Tours (d. 594) from Gaul, Paul the Deacon (d. 799) from Italy, Bede the Venerable (d. 735) from England, and others, were used to corroborate Procopius.⁷⁸ Each source had its own literary agenda that rarely played a role in its in-

⁷⁴ As Guy Geltner has suggested, "there is a sense of inertia in scholars' attachment to a pre-/post-Black Death periodization—one that cuts across fields as diverse as social and economic history, politics, medicine, art, religion and literature." G. Geltner, "The Path to Pistoia: Urban Hygiene Before the Black Death," *Past and Present*, no. 246 (2020): 3–33, here 3, and see 3 n. 1 for secondary scholarship on this point.

⁷⁵ See, again, Gibbon, *The Decline and Fall of the Roman Empire*, 4: 418–419 n. 1.

⁷⁶ For a few examples, see Howell, *An Institution of General History; or, The History of the World*, 3: 109–110; Mead, *The Medical Works of Richard Mead*, 243; Gibbon, *The Decline and Fall of the Roman Empire*, 4: 415–419, who approvingly cites Mead as his basis for his own discussion. All citing Procopius, *Wars*, 2.22.1–5.

⁷⁷ *Wars*, 2.22.1–3.

⁷⁸ For an introduction to these writers, who each have a massive historiography, see Goffart, *The Narrators of Barbarian History*.

terpretation. Gregory, for example, wrote about the first outbreak in Arles in 543 to support the city of Clermont's claim to a religious procession against Arles, while Procopius used Thucydides's description of a disease outbreak in Athens a millennium earlier as a model for his classicizing account. These critical pieces of information are rarely noticed or factored into accounts of the plague's geographic spread.⁷⁹

Scholars at the turn of the twentieth century included or excluded specific sources and outbreaks based on unspecified source criticism parameters. There was no pattern, or reason, whereby scholars included particular late antique sources, other perhaps than simple awareness of some sources and not others.⁸⁰ Some scholars changed their minds about whether or not specific outbreaks were plague over the course of their careers, leading to further confusion. William MacArthur noted in 1926 that the outbreak in 664 in England, as described by Bede, was "too general to allow of identification." In 1949, MacArthur reversed course, stating definitively that Bede's "whole description to my mind is unmistakably indicative of plague."⁸¹ By the mid-twentieth century, there was little consensus on which outbreak references referred to plague rather than another disease.

As with other late antique plague features, Biraben and Le Goff's groundbreaking article synthesized the existing written sources within a critical and cohesive framework, while spatial visualizations supplemented their argument.⁸² Their systematic approach excluded certain primary sources, since they acknowledged that vague vocabulary such as "lues" (disease) encompassed a wide range of possible diseases. Their analysis included only primary sources that contained specific Latin modifiers such as "inguinariarius" (groin) and "glandolariarius" (gland).⁸³

Scholars over the last half century accepted that catalogue as the definitive baseline, but then started filling in the geographical gaps by ignoring its historical-philological classifications. This approach has added new locations where outbreaks occurred, replicating in each the now-standard massive mortality and destruction of the plague concept. A potential plague outbreak in the British Isles, debated inconclusively for over two centuries, was removed by Biraben and Le Goff from their list of plague outbreaks because Bede's discussions did not contain the necessary modifiers.⁸⁴ But in 1997,

⁷⁹ Gregory's goal is subsumed as positivist support for plague geography. On this example, see Bishop Gregory of Tours, *Gregorii Episcopi Turonensis: Libri historiarum X*, ed. Bruno Krusch and Wilhelm Levison, 2nd ed. (Hanover, 1951), 4.5. For Procopius: Procopius, *Wars*, 2.22–23; Averil Cameron, *Procopius and the Sixth Century* (Berkeley, Calif., 1985), 168–169; Anthony Kaldellis, *Procopius of Caesarea: Tyranny, History, and Philosophy at the End of Antiquity* (Philadelphia, 2004), 210–213.

⁸⁰ See the many sources already described by Baynes, *Encyclopædia Britannica*, 19: 164; Creighton, *A History of Epidemics in Britain*, 1–8 (who used Bede). For one account, see Raymond Crawford, *Plague and Pestilence in Literature and Art* (Oxford, 1914), 78 and 104, but few historians have read him; Albert Colnat, *Les épidémies et l'histoire* (Paris, 1937), 30–32, has lists. Émile Rébouis, *Étude historique et critique sur la peste* (Paris, 1888), 23–28, has plague spreading throughout the west.

⁸¹ William P. MacArthur, "Old-Time Plague in Britain," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 19, no. 7 (1926): 355–372, here 358; cf. William P. MacArthur, "The Identification of Some Pestilences Recorded in the Irish Annals," *Irish Historical Studies* 6, no. 21 (1949): 169–188, here 176. Scholars can, of course, change their minds.

⁸² This compares to the power of "fall of Rome" barbarian migration maps. For an article on this topic, see Walter Goffart, "The Map of the Barbarian Invasions: A Longer Look," in Marc Anthony Meyer, ed., *The Culture of Christendom: Essays in Medieval History in Commemoration of Denis L. T. Bethell* (Rio Grande, 1993), 1–27.

⁸³ Biraben and Le Goff, "The Plague in the Early Middle Ages," 58, and for the catalogue, 72–77. They were noting that the bubonic form of plague appears near glands and particularly the groin.

⁸⁴ Included by among others: Webster, *A Brief History of Epidemic and Pestilential Diseases*, 1: 101, 104; Creighton, *A History of Epidemics in Britain*, 4–8; and for a summary of the debate through 1944:

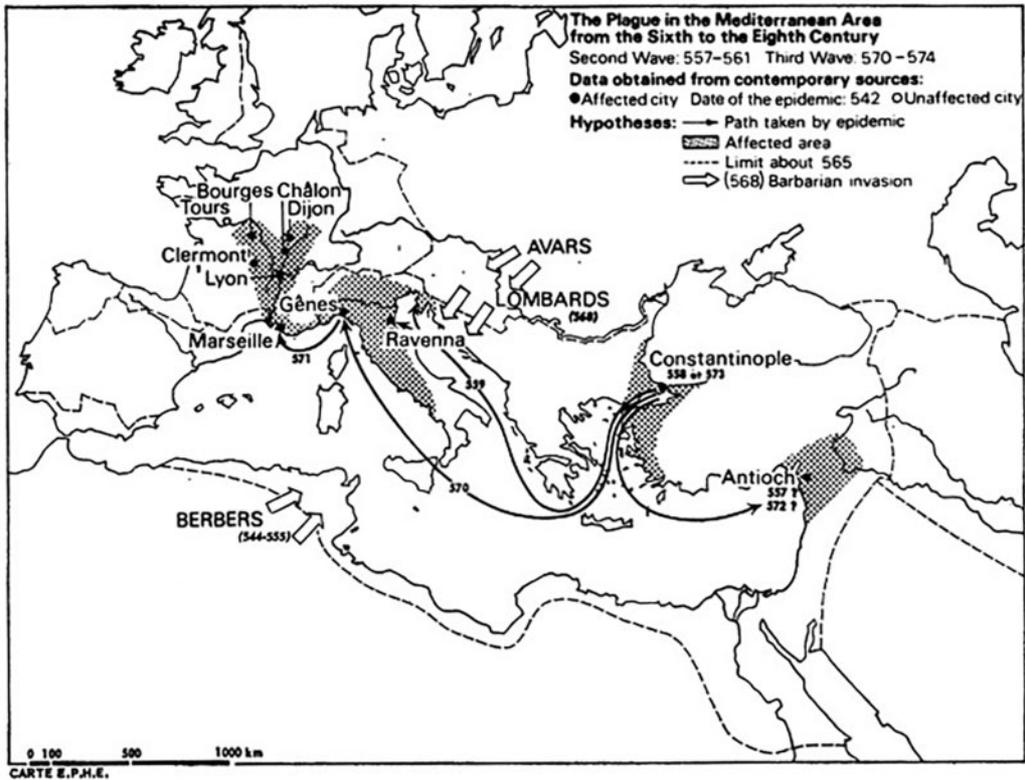


FIGURE 1: The second and third waves of plague according to Biraben and Le Goff. Map from Biraben and Le Goff, “The Plague in the Early Middle Ages,” in Robert Forster and Orest Ranum, eds., *Biology of Man in History* (Baltimore, Md., 1975), 65. Reprinted with permission of Johns Hopkins University Press.

J. R. Maddicott (re)discovered plague in Bede’s writings, suggesting that he wrote the late twentieth-century article because of the plague’s “almost complete neglect by modern historians.” The rediscovery of England’s plague outbreak expanded plague’s geographical scope.⁸⁵

Recent research has turned to new sources. Texts about general cultural and religious changes involving death that do not explicitly mention plague are seen to confirm

Wilfrid Bonser, “Epidemics during the Anglo-Saxon Period (Reginald Taylor Prize Essay),” *Journal of the British Archaeological Association* 9, no. 1 (1944): 48–71, here 49–50. This case was hotly debated, falling in and out of accounts multiple times over the nineteenth and twentieth centuries. The British interest increased due to outbreaks in British-controlled India during the modern plague pandemic and the language Bonser uses reflects on why Britain was not struck worse in the past based on his present.

⁸⁵ For the exclusion of England, see Biraben and Le Goff, “The Plague in the Early Middle Ages.” For its re-inclusion, see J. R. Maddicott, “Plague in Seventh-Century England,” *Past and Present*, no. 156 (1997): 7–54, here 8. For its re-inclusion in a broad narrative, see Paul Slack, *Plague: A Very Short Introduction* (New York, 2012), 18. And across late antiquity, see Sarris, *Empires of Faith*, 159, 200–201, and 370. Ancient DNA evidence has recently confirmed plague was in England, but this has been largely accepted anyway in the twenty-first century due to Maddicott’s article; see Monica H. Green, “When Numbers Don’t Count,” *Eidolon*, November 18, 2019, <https://eidolon.pub/when-numbers-dont-count-56a2b3c3d07>. For the DNA evidence see now: Marcel Keller et al., “Ancient *Yersinia pestis* Genomes from across Western Europe Reveal Early Diversification during the First Pandemic (541–750),” *Proceedings of the National Academy of Sciences* 116, no. 25 (June 18, 2019), 12363–12372.

the sparsely written datable record in various locations, such as the Iberian Peninsula.⁸⁶ Although the Middle East has not factored significantly into the geographic scope of the plague—partially due to a dearth in research by Near Eastern historians and a lack of relevant linguistic skills by medieval and Byzantine historians—some descriptions of outbreaks in Syriac and Arabic written sources have been added as further proof of the plague concept.⁸⁷ Other regions outside the frontiers of the Roman Empire, for which we have no textual evidence, have been added as well. In the early twenty-first century, northern Gaul and Germany were added as outbreak locations using ancient DNA evidence.⁸⁸ Further vague and non-literary evidence has connected plague to Yemen, East Africa, and Scandinavia.⁸⁹

The latest syntheses combine locations to offer evidence of plague everywhere at various times throughout its two centuries of existence.⁹⁰ Although these interpretations derive from Biraben and Le Goff's work, they mark a return to earlier discussions of plague that lack a robust classificatory system. The plague's presence everywhere has, *de facto*, returned to Procopius's idea: plague struck the entire world. More importantly, using the plague concept, scholars perceive its broader geographical scope as evidence of its massive impact, even though plague reached a global scale only at the turn of the twentieth century but had vastly uneven impact both temporally and spatially.

ONE KEY WAY TO ENACT the three features (chronology, mortality, geography) is through the belief that plague periodically reemerged (in "waves"), which finds some grounding in both ancient evidence and modern epidemiology. Plague waves are rare in late an-

⁸⁶ For Iberian plague, see Michael Kulikowski, "Plague in Spanish Late Antiquity," in Little, *Plague and the End of Antiquity*, 150–170; and on indirect evidence see Henry Gruber, "Indirect Evidence for the Social Impact of the Justinianic Pandemic: Episcopal Burial and Conciliar Legislation in Visigothic Hispania," *Journal of Late Antiquity* 11, no. 1 (2018): 193–215.

⁸⁷ Syriac sources are understudied and no one has compiled a comprehensive catalogue, while Arabic sources have complex transmission problems. For Arabic see Michael W. Dols, "Plague in Early Islamic History," *Journal of the American Oriental Society* 94, no. 3 (1974): 371–383; and Lawrence I. Conrad, "The Plague in the Early Medieval Near East" (Ph.D. diss., Princeton University, 1981); and Lawrence I. Conrad, "Epidemic Disease in Central Syria in the Late Sixth Century: Some New Insights from the Verse of Assān Ibn Thābit," *Byzantine and Modern Greek Studies* 18, no. 1 (1994): 12–59. Harper, *The Fate of Rome*, depends on Conrad's work for Middle Eastern plague outbreaks. As far as we are aware, no one has ever looked into Armenian, Georgian, Aramaic, Persian, or other languages.

⁸⁸ For the two sites in Bavaria, see Ingrid Wiechmann and Gisela Grupe, "Detection of *Yersinia pestis* DNA in Two Early Medieval Skeletal Finds from Aschheim (Upper Bavaria, 6th Century A.D.)," *American Journal of Physical Anthropology* 126, no. 1 (2005): 48–55; and Michaela Harbeck et al., "*Yersinia pestis* DNA from Skeletal Remains from the 6th Century AD Reveals Insights into Justinianic Plague," *PLOS Pathogens* 9, no. 5 (2013): e1003349, <https://doi.org/10.1371/journal.ppat.1003349>.

⁸⁹ For Scandinavia, see Tapio Seger, "The Plague of Justinian and Other Scourges: An Analysis of the Anomalies in the Development of the Iron Age Population in Finland," *Fornvännen*, no. 77 (1982): 184–196; for Yemen see Christian-Julien Robin, "Guerre et épidémie dans les royaumes d'Arabie du Sud, d'après une inscription datée (II^e 89 s. de l'ère chrétienne)," *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres* 136, no. 1 (1992): 215–234. A suggested expansion is to Africa in Monica H. Green, "Putting Africa on the Black Death Map: Narratives from Genetics and History," *Afriques*, no. 9 (2018), but no new primary source evidence is offered to support this claim. Other scholarship that makes this suggestion relies either on the inscription from Yemen or Greco-Latin sources, such as Procopius.

⁹⁰ Harper, *The Fate of Rome*; Harper, "Invisible Environmental History: Infectious Disease in Late Antiquity."

tique sources. Evagrius's written narrative suggested that the plague returned to Antioch every fifteen years to devastate each new generation, but early scholarship did not attend to the disease's spatial movement, lacking perhaps the specific evidence of waves after Evagrius's writing.⁹¹ The epidemiological metaphor of a disease wave has existed since at least the mid-nineteenth century, reflecting British imperialist ideology among other ideas. The metaphor captured the sense of a disease returning to a single place in a cyclical manner—a temporal return—and was used to discuss several different diseases.⁹² It also referred to the plague in India at the turn of the twentieth century, as a way to describe, more specifically, the shape of graphs depicting annual plague mortality (Figure 2).⁹³

At some point over the twentieth century, the idea of a plague wave changed from a solely temporal idea into a discrete event affecting multiple distinct geographical locations. This occurred through a process of slippage, in which scholars misinterpreted earlier references to waves. In short, the wave metaphor changed from a temporal to a spatial meaning.⁹⁴ Outbreaks that occurred simultaneously across disparate regions were now considered part of the same wave.⁹⁵ This change in meaning required scholars to explain why plague spread geographically; their reasons included trade, war, or human migration to various regions of the Mediterranean (or Eurasia), even if few instances of these movements could be proven. Regardless, the wave metaphor has become a standard part of the plague narrative, fusing together all three plague features into a powerful metaphorical structure, which is used as a shorthand to summon plague's effects.

Biraben and Le Goff played a key role in solidifying this change as well, since they were the first to place specific outbreaks on a timeline and map all the disparate outbreaks of the plague's spread (Figure 1). Thereafter, these geographically dispersed locations have been grouped together as waves occurring at the same time, cementing the impression of a spatial plague washing across the Mediterranean.⁹⁶ The centrality of waves was reiterated in subsequent catalogues and then codified in general histories of late antiquity.⁹⁷ Waves

⁹¹ Evagrius, *The Ecclesiastical History of Evagrius Scholasticus*, 4.29. Earlier works suggest the plague lasted for a specific period as an ongoing phenomenon: Webster, *A Brief History of Epidemic and Pestilential Diseases*, 1: 100–101 (542–600 C.E.); and Crawford, *Plague and Pestilence in Literature and Art*, 78. Russell, "That Earlier Plague," 179, calls them periods and intervals.

⁹² For a recent detailed discussion of the emergence of the wave metaphor in the nineteenth century, see David S. Jones and Stefan Helmreich, "The Shape of Epidemics," *Boston Review*, June 26, 2020, <https://bostonreview.net/science-nature/david-s-jones-stefan-helmreich-shape-epidemics>. Early on, the metaphor was used to describe various aspects of pandemic; see, for example, Arthur Ransome, "On the Form of the Epidemic Wave and Some of Its Probable Causes," *Transactions: Epidemiological Society of London* 1 (1883): 96–107.

⁹³ Gill, *The Genesis of Epidemics and the Natural History of Disease*, 328, for waves as a temporal concept. Gill cites the Plague Advisory Committee, "XXXI: On the Seasonal Prevalence of Plague in India," *Journal of Hygiene* 8, no. 2 (1908): 266–301; and M. Greenwood, "XLV: Statistical Investigation of Plague in the Punjab; Third Report: On Some of the Factors Which Influence the Prevalence of Plague," *Journal of Hygiene* 11, supplement (1911): 62–156 (note that Greenwood uses "wave" once, apparently as a spatial metaphor, on page 86).

⁹⁴ Sigerist, *Civilization and Disease*, 114, for an early case of slippage in which the waves are used to describe a geographic metaphor.

⁹⁵ The ubiquitous discussion of COVID waves focuses on infection and death *within* a country, or even in specific regions of a country. See Jones and Helmreich, "The Shape of Epidemics."

⁹⁶ Biraben and Le Goff, "The Plague in the Early Middle Ages," 58–59, for a timeline, but see their maps, which likewise play a central role in depicting the spread of waves: 64–71.

⁹⁷ The second main catalogue is Stathakopoulos, *Famine and Pestilence in the Late Roman and Early Byzantine Empire*; for an example in a general narrative, see Treadgold, *A History of the Byzantine State and Society*, esp. 276 and 370, which (at 276) argues against plague being endemic; Peter Brown, *The*

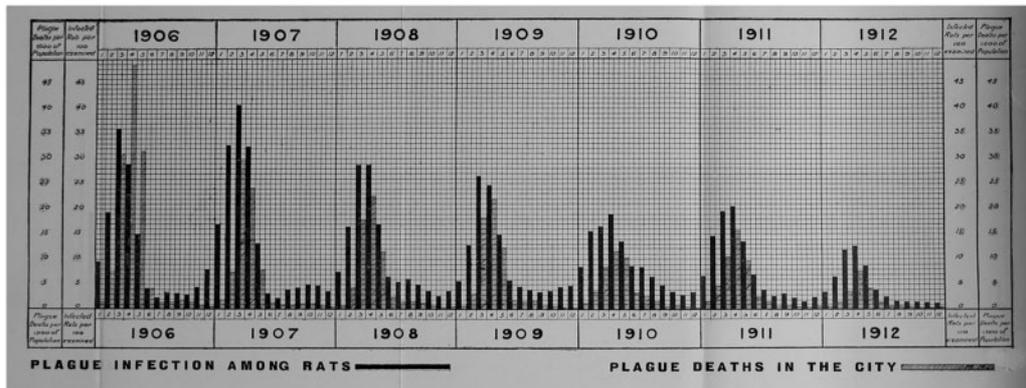


FIGURE 2: Relations between plague in humans to plague in rats, 1906–1912. The shape of the diagram resembles waves. John Andrew Turner, *Sanitation in India* (Bombay, 1914), 542–543.

thereby became the dominant metaphor of post-540s plague outbreaks in scholarship. New research on the late antique plague, such as DNA work or discoveries of multiple burials (i.e., supposed mass graves), seeks to associate these types of evidence with specific plague waves, *de facto* rejecting alternative explanations, such as the enzootic presence of the disease based on a twentieth-century plague model.⁹⁸

In a recent development, Kyle Harper rejected the wave metaphor for most outbreaks, suggesting it be replaced with “amplification” events based on local outbreaks that became regional. Yet he still connected outbreaks in different locations in the same year without providing evidence for direct connections between them. This terminological change has not modified the overarching model whereby repeated outbreaks continued to strike multiple locations and spread throughout Eurasia over the course of two centuries.⁹⁹

The idea of plague waves provides an easy but unsubstantiated way to explain continued and sustained outbreaks across the Mediterranean. An evocative metaphor, it allows scholars to correlate contemporaneous outbreaks in different places as part of the same disease event, despite the absence of concrete evidence linking one to another.

Rise of Western Christendom, 181, notes that plague repeatedly struck. For an example of how the waves spread see Michael McCormick, “Bateaux de vie, bateaux de mort: Maladie, commerce, transports anoniâires et le passage économique du bas-empire au Moyen Âge,” in *Morfologie sociali e culturali in Europa* (Spoleto, 1998), 35–118.

⁹⁸ For DNA, see Michal Feldman et al., “A High-Coverage *Yersinia pestis* Genome from a Sixth-Century Justinianic Plague Victim,” *Molecular Biology and Evolution* 33, no. 11 (2016): 2911–2923, here 2912, insists on dating victims to either the first or third wave. Historians have used the initial outbreak of the Black Death scientific evidence to model the initial outbreak of the Justinianic Plague and then scientists use the subsequent historical work to confirm DNA evidence. For mass burials and waves, see Michael McCormick, “Tracking Mass Death during the Fall of Rome’s Empire (I),” *Journal of Roman Archaeology* 28 (2015): 325–357, here 346, with evidence for Aschheim, where plague DNA was identified. For an example in specialized literature of endemic (as he referred to it) plague at an early date, see E. H. Hankin, “On the Epidemiology of Plague,” *Journal of Hygiene* 5, no. 1 (1905), 48–83, here 50; and as endemic also: Baynes, *Encyclopædia Britannica*, 19: 161.

⁹⁹ Harper, *The Fate of Rome*, 235–244 (esp. 236). His amplifications still move outward from center to periphery, which he indicates through maps not dissimilar to Biraben and Le Goff. He is more cautious in Harper, “Invisible Environmental History: Infectious Disease in Late Antiquity,” 128.

The result contributes to the perceived extent and impact of plague.¹⁰⁰ The wave model allows scholars to sidestep a series of seemingly intractable issues: whether the *Y. pestis* responsible for late antique plague outbreaks was enzootic, the interaction between climate and plague, and the connection between plague and trade networks. Since the empirical evidence for a plague wave is both unprovable and impossible to falsify based on the current state of evidence, it should be treated as conjecture rather than fact.

TO SUPPORT THE PLAGUE CONCEPT, plague truisms—rats, climate, and most recently paleogenetics—are used as empirical evidence. Even if one assumes the plague was a destructive agent that caused historical change, none of these truisms provide sufficient evidence to prove that destructive impact. Though rats crawling off ships often play a starring role in the plague concept, the connection between plague and rats is recent. As Katherine Royer has noted, observers made the association from the early nineteenth century, but the evidence remained inconclusive into the twentieth century.¹⁰¹ Rats became integral to the plague concept only after the Indian Plague Research Commission in the first couple of decades of the twentieth century. Building on the research and experiments of Paul-Louis Simond (1858–1947) and others from the late 1890s and the early 1900s, the commission concluded that plague is inherently a rat disease, with fleas as the pivotal vector and humans as its incidental victim—an idea that remains prominent today.¹⁰² Work has challenged the centrality of rats and their fleas to plague outbreaks, and proposed other possibilities, such as a wide variety of mammals as hosts, human ectoparasites as a vector (i.e., human fleas and lice), and pneumonic plague (i.e., human to human spread).¹⁰³ But these discussions have not changed the dominant notion that rats are pivotal to plague's spread. Whether through texts or zooarchaeological

¹⁰⁰ Again, see Harper, *The Fate of Rome*; or more generally, see Sarris, *Empires of Faith*, 158–160, 295, 354.

¹⁰¹ Katherine Royer, “The Blind Men and the Elephant: Imperial Medicine, Medieval Historians and the Role of Rats in the Historiography of Plague,” in Poonam Bala, ed., *Medicine and Colonialism: Historical Perspectives in India and South Africa* (London, 2014), 101–102 esp. n. 19. She notes over twenty-four outbreaks of plague from 1812 to 1894, many of which referred to rat mortality. Her article discusses the conflation between the modern and medieval plague pandemics with regard to rats and the unitary explanation for rats as key hosts. For the background to this debate: Netten Radcliffe, “Memorandum by Mr. Netten Radcliffe on the Progress of Levantine Plague in 1878–79, Including the Reappearance of the Disease in Europe,” in *Ninth Annual Report of the Local Government Board, 1879–80* (London, 1881), 1–89, here 45–48. On the problem with the medieval evidence, see David E. Davis, “The Scarcity of Rats and the Black Death: An Ecological History,” *Journal of Interdisciplinary History* 16, no. 3 (1986): 455–470. With one ambiguous exception, the primary sources do not mention rats in the context of late antique plague.

¹⁰² Hugo Kupferschmidt, “History of the Epidemiology of Plague: Changes in the Understanding of Plague Epidemiology since the Discovery of the Plague Pathogen in 1894,” *Antimicrobics and Infectious Diseases Newsletter* 16, no. 7 (1997), 51–53, here 52. For the first rat-flea connection, see Paul-Louis Simond, “La propagation de la peste,” *Annales de l'Institut Pasteur* 12 (1898): 625–687; and for the history of Simond and the discovery, see Edward A. Crawford Jr., “Paul-Louis Simond and His Work on Plague,” *Perspectives in Biology and Medicine* 39, no. 3 (1996): 446–458; this hypothesis was not immediately accepted, see Royer “The Blind Men and the Elephant.”

¹⁰³ Biraben and Le Goff, “The Plague in the Early Middle Ages,” 54, claim to cite Yersin's original 1894 article, but we were unable to find the quotation. For other vectors spreading plague, see Katharine R. Dean et al., “Human Ectoparasites and the Spread of Plague in Europe during the Second Pandemic,” *Proceedings of the National Academy of Sciences* 115, no. 6 (February 6, 2018): 1304–1309. Royer, “The Blind Men and the Elephant,” points out that many of these recent additions to the discussion had been suggested already at the turn of the twentieth century.

remains, the presence of rats confirms the existence of an outbreak and, in turn, reinforces the plague concept.¹⁰⁴

The notion that rats and fleas are central to the spread of plague was established and disseminated through two major works in the early twentieth century. Between 1906 and 1911, *The Journal of Hygiene* dedicated six special journal issues totaling over 1,200 pages to the Plague Research Commission's reports on plague in India. These publications concluded that plague spreads through rats and the fleas that live on them, results that were included in the eleventh edition of the *Encyclopædia Britannica* (1911).¹⁰⁵ As a result, public health measures to prevent plague outbreaks at the turn of the twentieth century aimed specifically at exterminating rats, which linked fleas and humans. Media campaigns, public health workers, and academics further cemented the connection between rats and plague, even as killing rats failed to stop plague, led to unexpected outcomes, and may have intensified twentieth-century outbreaks by spreading infected fleas to new hosts.¹⁰⁶

Still, the rat-plague link entered the discussion of historical plague outbreaks as a truism. By 1949, MacArthur could confidently assert that "everyone knows" rats played a central role in spreading historical plague. In subsequent decades, scholars either emphasized the role rats played or simply assumed they were responsible for past plagues.¹⁰⁷ Not all mid-twentieth-century scholars agreed. If plague was around for centuries, they asked, why was there so little evidence to corroborate its link to rats? The written and archaeological sources that supported the connection received significant attention in scholarship but were (and remain) few and far between.¹⁰⁸

The reservations about rats' rarity appear to have been overcome less by conclusive evidence for rats' connection to plague than by repetitive arguments about their alleged ubiquity and the necessary role they played in spreading plague. Everyone using the plague concept "knew" that plague required rats to spread and, since everyone accepted plague was in particular places, rats must have been there, too. In a case of circular reasoning, the evidence for plague (i.e., if rats then plague) had now become evidence for rats (i.e., if plague then rats). Almost all major research since the 1960s that discusses late antique plague accepted the rat idea; none made note of the general absence of rats

¹⁰⁴ For a discussion of rats and plague in contemporary literature, see Michael McCormick, "Rats, Communications, and Plague: Toward an Ecological History," *Journal of Interdisciplinary History* 34, no. 1 (2003): 1–25.

¹⁰⁵ On the Plague Research Committee's importance, see Royer, "The Blind Men and the Elephant." Shadwell, Hennessy, and Payne, "Plague," 703, refers to the *Reports on the Plague Investigations in India* as "by far the most important communication on the role of rats in the spread of plague." The eleventh edition of the *Encyclopædia Britannica* sold 225,000 copies by 1921 (just ten years) as opposed to the ninth and tenth editions, which sold fewer than half that number. See Boyles, *Everything Explained That Is Explainable*, 380–381.

¹⁰⁶ For one example of rats and their modern plague history along with failure of rat killing campaigns, see Michael G. Vann and Liz Clarke, *The Great Hanoi Rat Hunt: Empire, Disease, and Modernity in French Colonial Vietnam* (New York, 2018).

¹⁰⁷ MacArthur, "The Identification of Some Pestilences Recorded in the Irish Annals," 170, making a broader point, but the article is focused on the late antique British Isles; also Sigerist, *Civilization and Disease*, 112–113.

¹⁰⁸ See the debates in William P. MacArthur, "The Occurrence of the Rat in Early Europe: The Plague of the Philistines (1 Sam., 5, 6)," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 46, no. 2 (1952): 209–212; William P. MacArthur, "The Medical Identification of Some Pestilences of the Past," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 53, no. 6 (1959): 423–439.

in late antique primary sources or the intense scholarly debate on the subject only a couple of decades earlier.¹⁰⁹

Although archaeologists made more efforts to locate rat remains in the last decades of the twentieth century, the hundred-year debate over the role of rats and plague remains an open question. The hope that rat bones might provide scholars with strong independent evidence to trace the movement of plague or its extent—for any outbreak—remains unfulfilled.¹¹⁰ Archaeological catalogues of rat bones have been around for a quarter century, but actual rat bone finds remain scarce. Recent zooarchaeological attempts to collect and visualize the patterns of rat bones in premodernity are problematic, since the bones do not survive in large numbers in excavations and they are difficult to date with precision.¹¹¹ Despite the continued hope that new finds might serve as evidence for plague, it is surprising that the rat hypothesis continues to play such a prominent role in the plague concept despite decades of research yielding so little evidence to support it. The Justinianic Plague does not require evidence of rats, but the idea of rats has sidetracked scholars for over a century. After all, even if limited evidence for rats is found during late antiquity, it tells us only that rats, not plague, were there. Similarly, even the paleogenetic identification of *Y. pestis* in late antique rat remains will tell us little, since we cannot be certain that the plague affected human populations in the same location as well.¹¹²

A SECOND PLAGUE TRUISM is the much-postulated connection between climate and plague. Although the connection dates back centuries, the particular type of causal connection between the two remains unclear, though for reasons that differ from the connection posited between rodents and plague. While climate is almost certainly causally linked to plague, how it affects the plague cycle remains uncertain. Contemporary evidence suggests that microclimate conditions play a key determining factor if, and how, plague becomes enzootic in a location. Scientists have proposed a series of hypothetical causal connections, but numerous variables must still be tested.¹¹³ Historians, especially

¹⁰⁹ Russell, “That Earlier Plague,” 178, 180; Biraben and Le Goff, “The Plague in the Early Middle Ages,” 54–55; Dols, “Plague in Early Islamic History,” 376; McNeill, *Plagues and Peoples*, 123–127. For the exception, see Allen, “The ‘Justinianic’ Plague,” 16, who avoids discussing rodents almost completely; for the Black Death discussion, see Philip Ziegler, *The Black Death* (New York), 15–18. For a similar conclusion, see Royer, “The Blind Men and the Elephant,” 106–107.

¹¹⁰ Michael McCormick, “Rats, Communications, and Plague,” on the problems that exist.

¹¹¹ See the examples in the Harvard Dataverse Digital Atlas of Roman and Medieval Civilizations, eds. Michael McCormick, Ece Turnator, Brendan Maione-Downing, Giovanni Zambotti, et al. See especially Michael McCormick, Alex M. More, and Brendan Maione-Downing, “Archaeological Finds of Rats: AD 1–1500” (2007): <https://doi.org/10.7910/DVN/NARKTE>; see also the rat map in Harper, *The Fate of Rome*, 214. For a specific argument over rats, plague, and the Islamic conquests, see David Woods, “Jews, Rats, and the Battle of Yarmuk,” in A. S. Lewis and P. Pellegrini, eds., *The Late Roman Army in the Near East from Diocletian to the Arab Conquest* (Oxford, 2007), 367–376.

¹¹² During the modern plague in Bombay, five hundred thousand rats were killed every year in organized rat killing campaigns. Less than 3 percent were infected with plague. See John Andrew Turner, *Sanitation in India* (Bombay, 1914), 557–558.

¹¹³ For local scales as key, see Nils Christian Stenseth et al., “Plague Dynamics Are Driven by Climate Variation,” *Proceedings of the National Academy of Sciences* 103, no. 35 (August 29, 2006): 13110–13115; Tamara Ben Ari et al., “Plague and Climate: Scales Matter,” *PLOS Pathogens* 7, no. 9 (September 15, 2011): e1002160, <https://doi.org/10.1371/journal.ppat.1002160>; Lei Xu et al., “Nonlinear Effect of Climate on Plague during the Third Pandemic in China,” *Proceedings of the National Academy of Sciences* 108, no. 25 (June 21, 2011): 10214–10219; and Lei Xu et al., “Wet Climate and Transporta-

those studying late antiquity, assume that global and continental climate patterns must have affected plague outbreaks without specifying the particular subregional, local, and micro conditions that contemporary scientists suggest are more germane.¹¹⁴ Climate is the only underlying truism that has undergone radical reappraisal over the last century—from a paradigm assuming that a hot and humid climate was vital to plague’s development to a paradigm that assumes cold temperatures are required.

Scholarly methodology in the early to mid-nineteenth century cobbled different natural events together (e.g., earthquakes and weather), facilitating the connection between plague and climate. Scholars scouring primary sources for natural events found some that were inevitably correlated in time, suggesting a causal relation between plague and contemporaneous climatic events.¹¹⁵ Environmental paradigms played a significant role in the work of Valentin Seibel, for example, who began his mid-nineteenth-century analysis of late antique plague with a then-popular discussion of telluric revolutions (a theory about the earth’s rotations) and atmospheric and cosmic phenomena.¹¹⁶

The seasonal pattern of plague at the turn of the twentieth century prompted scholars to develop alternative explanations. As rats became further associated with plague, scholars connected climate to plague through its effects on rat populations or the fleas they carried.¹¹⁷ Using the assumed plague concept, early twentieth-century scholars retrojected their research on contemporary plague onto the late antique past. Basing their analyses on the climate of India (particularly Bombay), they suggested that similar climate conditions in the sixth century facilitated the spread of plague. Many scholars identified some combination of warm and humid climate as factors that enabled late antique plague to develop.¹¹⁸ Sigerist, for example, asserted that seasons determined the type of plague (with bubonic plague more frequent in summer; pneumonic plague in winter).¹¹⁹ Russell agreed, emphasizing the idea that warm and humid climates affected flea populations.¹²⁰

tion Routes Accelerate Spread of Human Plague,” *Proceedings of the Royal Society B: Biological Sciences* 281, no. 1780 (2014): 20133159.

¹¹⁴ For a similar series of questions on climate and plague see now J. Luterbacher, et al., “Past Pandemics and Climate Variability across the Mediterranean,” *Euro-Mediterranean Journal for Environmental Integration* 5, no. 46 (2020): <https://doi.org/10.1007/s41207-020-00197-5>.

¹¹⁵ For example, in 557–558 Webster noted that a major earthquake, a comet, a severe winter, and plague occurred in the same year. Webster, *A Brief History of Epidemic and Pestilential Diseases*, 1: 95; and on these connections, see Christian Friedrich Schnurrer, *Chronik der Seuchen in Verbindung mit den gleichzeitigen Vorgängen in der physischen Welt und in der Geschichte der Menschen*, 2 vols. (Tübingen, 1823). Volume 1 contains discussions of late antiquity.

¹¹⁶ Valentin Seibel, *Die große Pest zur Zeit Justinians I. und die ihr voraus und zur Seite gehenden ungewöhnlichen Natur-Ereignisse* (Dillingen, 1857), 7–19.

¹¹⁷ For just a few examples across the twentieth century: H. H. King and C. G. Pandit, “A Summary of the Rat-Flea Survey of the Madras Presidency with a Discussion on the Association of Flea Species with Climate and with Plague,” *Indian Journal of Medical Research* 19, no. 2 (1931): 357–392; Dan C. Cavanaugh, “Specific Effect of Temperature upon Transmission of the Plague Bacillus by the Oriental Rat Flea, *Xenopsylla cheopis*,” *American Journal of Tropical Medicine and Hygiene* 20, no. 2 (1971): 264–273; and Russell E. Ensore et al., “Modeling Relationships between Climate and the Frequency of Human Plague Cases in the Southwestern United States, 1960–1997,” *American Journal of Tropical Medicine and Hygiene* 66, no. 2 (2002): 186–196.

¹¹⁸ For warm and humid climate, see Gill, *The Genesis of Epidemics and the Natural History of Disease*, 369–374. For warm climate, see MacArthur, “The Identification of Some Pestilences Recorded in the Irish Annals,” 171.

¹¹⁹ Sigerist, *Civilization and Disease*, 114, states the seasonal connection as a fact, without explanation.

¹²⁰ Russell, “That Earlier Plague,” 179–180.

Other scholars argued on behalf of some vaguely defined climate in the mid-sixth century: warmer but not “too hot.”¹²¹ The few specifics that were proposed were debated. For example, although Biraben and Le Goff agreed that climate determined flea activity, they offered different temperature ranges than Russell.¹²²

The specific nature of the climate-plague connection remained elusive into the twenty-first century, and scholars continued to cite different authorities for their claims. “Warm” climate continued as an important potential explanation.¹²³ Some scholars preferred “moderate” climate; others believed that precipitation and humidity were more important.¹²⁴ Vaguely defined periods of increased precipitation after drought, or droughts after increased precipitation, were also thought to increase the presence of plague.¹²⁵ Everyone agreed that some connection to climate existed, but the precise nature of that connection remained a mystery.¹²⁶

In 2011, a high-profile paper by Ulf Büntgen and his coauthors reconstructed European climate over the past 2,500 years and argued that the first outbreak of late antique plague followed hemispheric *cooling*. Although a few scholars had already postulated a connection between plague and cooling, this explanation had been overlooked.¹²⁷ The Büntgen paper—one of whose authors was the historian Michael McCormick, a central voice in discussions surrounding late antique plague—dramatically shifted how schol-

¹²¹ MacArthur, “The Identification of Some Pestilences Recorded in the Irish Annals,” 171; Hirst, *The Conquest of Plague*, 301–303.

¹²² It is difficult to discern from where both articles derived their information. Biraben and Le Goff, “The Plague in the Early Middle Ages,” offers no reference; Russell, “That Earlier Plague,” 179 refers to Hirst, *The Conquest of Plague*, 302, who does not include these details.

¹²³ Peregrine Horden, “Mediterranean Plague in the Age of Justinian,” in Michael Maas, ed., *The Cambridge Companion to the Age of Justinian* (Cambridge, 2005), 134–160, here 149.

¹²⁴ Stathakopoulos, *Famine and Pestilence in the Late Roman and Early Byzantine Empire*, 130, thinks climate is of “primary importance,” requiring temperatures between 8 and 27 degrees centigrade.

¹²⁵ McCormick, “Rats, Communications, and Plague,” 20–21, identified the precipitation-drought link; also Michael McCormick et al., “Climate Change during and after the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence,” *Journal of Interdisciplinary History* 43, no. 2 (2012): 169–220, here 198–199, for a potential connection between dryness and plague. Ioannis Antoniou and Anastasios K. Sinakos, “The Sixth-Century Plague, Its Repeated Appearance until 746 AD and the Explosion of the Rabaul Volcano,” *Byzantinische Zeitschrift* 98, no. 1 (2008): 1–4, mentioned various theories and settled on climate leading to heavy rain.

¹²⁶ Scholars found connections between precipitation in different seasons and plague: e.g., Russell E. Ensore et al., “Modeling Relationships between Climate and the Frequency of Human Plague Cases in the Southwestern United States, 1960–1997,” *American Journal of Tropical Medical Hygiene* 66, no. 2 (2002): 186–196; for connections between prairie dog colony extinction and the El Niño Southern Oscillation, see Paul Stapp, Michael F. Antolin, and Mark Ball, “Patterns of Extinction in Prairie Dog Metapopulations: Plague Outbreaks Follow El Niño Events,” *Frontiers in Ecology and the Environment* 2, no. 5 (2004): 235–240; and for connections between plant productivity and proportion of gerbils with the disease, see Kyrre Linné Kausrud et al., “Modeling the Epidemiological History of Plague in Central Asia: Palaeoclimatic Forcing on a Disease System over the Past Millennium,” *BMC Biology* 8, no. 1 (2010): <https://doi.org/10.1186/1741-7007-8-112>. Additionally, Nils Chr. Stenseth et al., “Plague Dynamics Are Driven by Climate Variation,” found that an increase of 1 degree during summers resulted in a sharp increase (over 50 percent) in plague prevalence among gerbils. Myron J. Echenberg, *Black Death, White Medicine: Bubonic Plague and the Politics of Public Health in Colonial Senegal, 1914–1945* (Oxford, 2002), 140–142, shows how plague likely became localized in one place in Senegal due to a microclimate.

¹²⁷ Ulf Büntgen et al., “2500 Years of European Climate Variability and Human Susceptibility,” *Science* 331, no. 6017 (2011): 578–582. William Rosen, *Justinian’s Flea: The First Great Plague and the End of the Roman Empire* (New York, 2007), 200–203, accepted the cooling connection, but his book was not well received among historians, and his claims were ignored. Others, such as Robert Sallares, “Ecology, Evolution, and Epidemiology of Plague,” in Little, *Plague and the End of Antiquity*, 231–289, here 284–285, noted earlier ideas but minimized their importance. J. D. Tholozan, *Histoire de la peste bubonique en Mésopotamie* (Paris, 1874), 2–3, noted cool climate as a key part of its spread based on direct observations, but his work has been cited almost nowhere.

ars connected climate and plague.¹²⁸ Earlier ideas about warm temperatures vanished overnight, while a newly constructed consensus was built on the correlation between cooling and plague.¹²⁹ The possibility of increased precipitation, linked to cooling, re-emerged as well.¹³⁰

The cooling hypothesis fit well with twenty-first-century interest in climate change and was linked to a similar occurrence in the past: the 536 “Dust Veil” event. This atmospheric event explained the phase of global and hemispheric cooling that Büntgen had found (along with evidence for it in written sources), following a series of volcanic eruptions. The temporal proximity between the Dust Veil event and the outbreak of plague led scholars to hypothesize and then assume a causal relationship between them. Earlier attempts to explain the causal link between plague and global climate largely disappeared, replaced with definitive statements based on unstated evidence that global climate cooling was a central factor in the first outbreak of plague.¹³¹

Recent scholarly consensus draws a direct line from the Dust Veil event, through subsequent continental cooling, to the first outbreak of the plague. As with rats, the presence of empirical evidence—in this case, paleoclimate proxies—is enough to conjure up the plague concept, even though no one has proven the connection between large-scale cooling and plague today, let alone in the sixth century. A preference for continental or regional climate reconstructions—instead of subregional or, even better, microclimate reconstructions—dominates, even though scientific research and evidence from the twenty-first century suggests that global climate changes cannot determine why regional and subregional plague outbreaks occurred.¹³² Although climate evidence has not demonstrated a clear causal relationship with plague, the environment retains its role in the plague concept. Current scholarship has simply replaced Seibel’s telluric revolutions as an explanation for late antique plague with allusions to twenty-first-century anthropogenic climate change.

THE MOST RECENT AND RENOWNED TRUISM in the construction of the plague concept is paleogenetics. This field’s discoveries have had a significant effect on how plague historians approach sources and the questions they ask, while paleogenetics researchers have followed historians in turn, using the plague concept to shape the narrative arcs of their articles.¹³³

¹²⁸ For more on the post-2000 historiographical trends, see Eisenberg and Mordechai, “The Justinianic Plague: An Interdisciplinary Review.”

¹²⁹ For further work on the topic, Michael Sigl et al., “Timing and Climate Forcing of Volcanic Eruptions for the Past 2,500 Years,” *Nature* 523, no. 7562 (2015): 543–549, on cooling. The argument was cemented through more scientific research and another article: Ulf Büntgen et al., “Cooling and Societal Change during the Late Antique Little Ice Age from 536 to around 660 AD,” *Nature Geoscience* 9, no. 3 (2016): 231–236.

¹³⁰ Wagner, “*Yersinia pestis* and the Plague of Justinian, 541–543 AD,” 325; Sigl et al., “Timing and Climate Forcing of Volcanic Eruptions for the Past 2,500 Years.”

¹³¹ Timothy P. Newfield, “Mysterious and Mortiferous Clouds: The Climate Cooling and Disease Burden of Late Antiquity,” *Late Antique Archaeology* 11, no. 1 (2018): 89–115. See also Büntgen et al. “2500 Years of European Climate Variability and Human Susceptibility”; Harper, *Fate of Rome*; and more popularly, Ann Gibbons, “Why 536 Was ‘the Worst Year to Be Alive,’” *Science*, November 15, 2018, <https://www.sciencemag.org/news/2018/11/why-536-was-worst-year-be-alive>.

¹³² An example of a direct link without specifics is Harper, “Invisible Environmental History: Infectious Disease in Late Antiquity,” 128. These different climates are made clear in Echenberg, *Plague Ports*; and in Echenberg, *Black Death, White Medicine*.

¹³³ On this development and historical work, see Lester K. Little, “Plague Historians in Lab Coats.” We define plague paleogenetics here as examining the molecular composition of the plague bacterium, *Yersinia pestis*.

Although paleogenetics as a historical tool has been discussed at a theoretical level, its impact on plague scholarship has escaped scrutiny. Paleogenetic research has transformed how scholars approach the plague and find empirical evidence of it without challenging the plague concept.¹³⁴ Ancient DNA research requires, and attains, far more institutional infrastructure and funding than premodern history scholarship. Genetics research is more visible than academic historical work, since publications in top-tier science journals frequently make global news headlines.¹³⁵ This financial and public attention has created a feedback loop in which genetics is perceived to “finally” answer questions that have stymied humanists for centuries.¹³⁶ Yet paleogenetics research in plague studies has tended to confirm rather than overturn existing paradigms.¹³⁷ The remainder of this section examines contemporary debates about plague and outlines one potential future of paleogenetics in plague studies. While paleogenetics has made headlines due to broader public prominence, it has done more to reify than to challenge the plague concept.

The first key paper on the paleogenetics of *Y. pestis*, published in 1998, reconstructed the bacteria’s DNA from human remains from the sixteenth and eighteenth centuries. The paper’s lead author, Michel Drancourt, also presented at a 2001 conference on the Justinianic Plague held at the American Academy in Rome.¹³⁸ The conference and ensuing volume laid out how to incorporate paleogenetics into the Justinianic Plague narrative. As McCormick noted in his contribution, “the implications of the disease allow us to formulate a series of observations and questions, inspired by and

¹³⁴ See the introduction to the *AHR* Roundtable for a similar debate: History Meets Biology, *American Historical Review* 119, no. 5 (2014): 1492–1499; see also, notably, Kyle Harper, “The Sentimental Family: A Biohistorical Perspective,” *ibid.*: 1547–1562; John L. Brooke and Clark Spencer Larsen, “The Nurture of Nature: Genetics, Epigenetics, and Environment in Human Biohistory,” *ibid.*: 1500–1513; and for a critique of using biology, see Michael D. Gordin, “Evidence and the Instability of Biology,” *ibid.*: 1621–1629; and Julia Adeney Thomas, “History and Biology in the Anthropocene: Problems of Scale, Problems of Value,” *ibid.*: 1587–1607.

¹³⁵ One can compare our empirical plague work in the *Proceedings of the National Academy of Sciences* and *Past and Present* as representative of these larger trends. As of July 7, 2020, the *PNAS* article has been viewed 37,612 times online and 3,931 times as a PDF in seven months, while the *Past and Present* article has been viewed 5,515 times in one year, with the latter open access from January to April 2020, which exponentially increased its views during the first few months of the COVID-19 pandemic. In paleogenetics, competition is fierce; allegations of flawed research are public and acrimonious; and careers are quickly made (and lost). For the public outcomes of arguments in the field, see Gideon Lewis-Kraus, “Is Ancient DNA Research Revealing New Truths—or Falling into Old Traps?,” *New York Times*, January 17, 2019, <https://www.nytimes.com/2019/01/17/magazine/ancient-dna-paleogenomics.html>. And for the debate within science, see Didier Raoult, “A Personal View of How Paleomicrobiology Aids Our Understanding of the Role of Lice in Plague Pandemics,” *Microbiology Spectrum* 4, no. 4 (2016): 10.1128/microbiolspec.PoH-0001-2014.

¹³⁶ Just two examples are the scientific “proof” of the Habsburg inbreeding causing their famous jaw: Román Vilas et al., “Is the ‘Habsburg Jaw’ Related to Inbreeding?,” *Annals of Human Biology* 46, no. 7–8 (2019): 553–561; and for determining the disease that Jean-Paul Marat had, see Sarah Zhang, “A Hint about the Affliction That Kept Marat in the Bath tub,” *Atlantic*, November 20, 2019, <https://www.theatlantic.com/science/archive/2019/11/fascination-marats-skin-affliction/602284/>.

¹³⁷ Monica H. Green, “When Numbers Don’t Count.”

¹³⁸ Michel Drancourt et al., “Detection of 400-Year-Old *Yersinia pestis* DNA in Human Dental Pulp: An Approach to the Diagnosis of Ancient Septicemia,” *Proceedings of the National Academy of Sciences of the United States of America* 95, no. 21 (October 13, 1998): 12637–12640. Although he did not publish his article in the volume, he influenced other articles, such as Michael McCormick’s and Robert Salares’s. Michael McCormick, “Toward a Molecular History of the Justinianic Pandemic”; and Robert Salares, “Ecology, Evolution, and Epidemiology of Plague.”

addressed to researchers working in biology, medicine, and the brand new field of molecular archaeology.”¹³⁹

Instead, paleogeneticists initially pursued their own questions, which in turn drove many of the questions asked by historians. The first priority was to identify the pathogen responsible for the late antique and medieval plague pandemics, a matter hotly debated in the late twentieth and early twenty-first centuries.¹⁴⁰ Given the more abundant archaeological and paleogenetic evidence of the medieval plague, scholars confirmed its identity as the *Y. pestis* bacterium first, in the early 2000s.¹⁴¹ This confirmation was confirmed with more robust paleogenetic analyses about a decade later and just before establishing that *Y. pestis* was also the causal agent of the late antique pandemic.¹⁴² The key paper on late antique plague, published in 2013, surveyed discoveries at Aschheim (in Bavaria, Germany). Subsequent research expanded the evidence of the bacterium spatially and temporally, finding late antique plague evidence from burial sites in France, Germany, Spain, and England.¹⁴³ While scientists have accepted these findings, interpretations of the genetic relationships between individual late antique plague “genomes” remain open to modification and nuance.¹⁴⁴

Historians have built on the paleogenetic evidence to reinforce a catastrophic narrative, with scientific “fact” overwhelming critiques of the plague’s alleged effects. “If the plague was *here* [in Bavaria, outside the Roman frontiers and major population centers],” the most forceful argument on the maximalist side stressed, “it must have been in many other places which lie in the dark zones on our map.”¹⁴⁵ The author, Kyle

¹³⁹ McCormick, “Toward a Molecular History,” 291 (for the discussion of the later Roman Empire, 303). This is an allusion to his earlier innovative work, Michael McCormick, *Origins of the European Economy: Communications and Commerce, A.D. 300–900* (Cambridge, 2001).

¹⁴⁰ Contradicting views can be found in Cunningham, “Transforming Plague: The Laboratory and the Identity of Infectious Disease”; on this point, see Monica H. Green, “Taking ‘Pandemic’ Seriously: Making the Black Death Global,” in Monica H. Green, ed., *Pandemic Disease in the Medieval World: Rethinking the Black Death* (Kalamazoo, Mich., 2014), 27–61, here 52; this scientific find silenced so-called “plague deniers” such as Cohn, *The Black Death Transformed*.

¹⁴¹ See Michel Drancourt et al., “Genotyping, Orientalis-like *Yersinia pestis*, and Plague Pandemics,” *Emerging Infectious Diseases* 10, no. 9 (2004): 1585–1592; and Michel Drancourt et al., “*Yersinia pestis* Orientalis in Remains of Ancient Plague Patients,” *Emerging Infectious Diseases* 13, no. 2 (2007): 332–333.

¹⁴² V. J. Schuenemann et al., “Targeted Enrichment of Ancient Pathogens Yielding the pPCP1 Plasmid of *Yersinia Pestis* from Victims of the Black Death,” *Proceedings of the National Academy of Sciences* 108, no. 38 (September 20, 2011): E746–E752. Kirsten I. Bos et al., “A Draft Genome of *Yersinia Pestis* from Victims of the Black Death,” *Nature* 478, no. 7370 (October 2011): 506–510.

¹⁴³ For Germany: Wagner et al., “*Yersinia pestis* and the Plague of Justinian, 541–543 AD.” For other locations in western Europe see Marcel Keller et al., “Ancient *Yersinia pestis* Genomes from across Western Europe Reveal Early Diversification during the First Pandemic (541–750).” Earlier cases of plague were identified in third century C.E. central Asia, while the molecular history of *Y. pestis* has been reconstructed back into the Stone Age. For connections to central Asia and the Huns, see Peter de Barros Damgaard et al., “137 Ancient Human Genomes from across the Eurasian Steppes,” *Nature* 557, no. 7705 (2018): 369–374; for pushing plague back to the Bronze Age, see Maria A. Spyrou et al., “Analysis of 3800-Year-Old *Yersinia pestis* Genomes Suggests Bronze Age Origin for Bubonic Plague,” *Nature Communications*, no. 9 (2018): 2234; and the Stone Age: Aida Andrades Valtueña et al., “The Stone Age Plague and Its Persistence in Eurasia.”

¹⁴⁴ An earlier paper referred to *Yersinia pestis* in Aschheim as early as 2005, although their work is featured less prominently: Wiechmann and Grupe, “Detection of *Yersinia pestis* DNA in Two Early Medieval Skeletal Finds from Aschheim (Upper Bavaria, 6th Century A.D.).” The French team of Drancourt has been ostracized due to suspicions of contamination in their earlier results, although later teams have built upon their methodological foundations.

¹⁴⁵ Harper, *The Fate of Rome*, 230; and for a critique of using metaphors to fill in the gaps of knowledge: Sessa, “The New Environmental Fall of Rome.”

Harper, uses the plague concept to argue for a catastrophic demographic decline of 50 percent over the course of a few years throughout the Mediterranean. Despite the paucity of empirical data, such reasoning employs the plague concept to argue for perceived catastrophic effects. Finding evidence for plague—textual, genetic, or other—in one place says little to nothing about the presence of plague elsewhere, or even about plague’s effects on societies where it was found.¹⁴⁶

An alternative approach, led by geneticists and some historians, places less emphasis on human mortality, focusing instead on reconstructing the history and evolution of the bacterium using phylogenetic trees. These trees are reconstructed “stemma” type graphs (see Figure 3) that establish the evolutionary connections between *Y. pestis* genomes based on genetic composition, allowing scholars to establish the genetic and temporal relationship between different bacteria strains.¹⁴⁷ Once this data is coupled with geographic data (i.e., where each specimen on the tree was found) and temporal data (i.e., the dating of each specimen based on archaeological or radiocarbon data), it is possible to follow Monica H. Green’s lead and ask new questions that “real epidemiologists do: ‘Why is this specific disease presenting here? Why in these populations? Where did it come from in the first place, and by what pathways did it (will it) spread?’” More research is required for the first two questions—since scientific evidence cannot alone answer them with certainty even for present-day plague—so most historians have focused on the latter two, which focus on one aspect: establishing plague transmission routes.¹⁴⁸

The phylogenetic evidence offers the beginning of an answer to these two questions. A recent paper revealed that the plague specimen from late antique Britain was basal (i.e., earlier in evolutionary terms) to other known late antique specimens from Europe. These specific finds suggest that plague made its way into Britain early in the first pandemic.¹⁴⁹

Viewed from a broader perspective, however, the paleogenetics turn is reminiscent of earlier truisms that promised to “solve” plague questions without rethinking the plague concept. The ability of paleogenetics to answer these questions is also constrained by practical, financial, and even legal and ethical challenges. For example, geneticists have prioritized searching for late antique plague in mass graves, where medieval plague victims were often buried. Yet to date scholars have found plague in less

¹⁴⁶ On this point, see broadly Wilder, “From Optic to Topic.”

¹⁴⁷ The plague tree has continued to grow over the twenty-first century. For early versions see Mark Achtman et al., “*Yersinia pestis*, the Cause of Plague, Is a Recently Emerged Clone of *Yersinia pseudotuberculosis*,” *Proceedings of the National Academy of Sciences of the United States of America* 96, no. 24 (November 23, 1999): 14043–14048; Mark Achtman et al., “Microevolution and History of the Plague Bacillus, *Yersinia pestis*,” *Proceedings of the National Academy of Sciences of the United States of America* 101, no. 51 (December 21, 2004): 17837–17842. For a current version, see Figure 3 in the present article, based on Zheming Zhou et al., “The Enterobase User’s Guide, with Case Studies on *Salmonella* Transmissions, *Yersinia pestis* Phylogeny, and *Escherichia* Core Genomic Diversity,” *Genome Research* 30, no. 1 (2020): 138–152.

¹⁴⁸ Green, “When Numbers Don’t Count.”

¹⁴⁹ The excitement such discoveries evoke has led some scholars to accept these claims when they are published in preprint form (i.e., pre-peer review), setting new precedents for evidence. See the back and forth debate over these discoveries: Marcel Keller et al., “Ancient *Yersinia pestis* Genomes Provide No Evidence for the Origins or Spread of the Justinianic Plague,” *bioRxiv*, November 12, 2019, <https://www.biorxiv.org/content/10.1101/819698v2>; and Simon Rasmussen et al., “Response to Keller et al. on Justinianic Plague,” November 12, 2019, <https://doi.org/10.6084/m9.figshare.10290275.v1>.

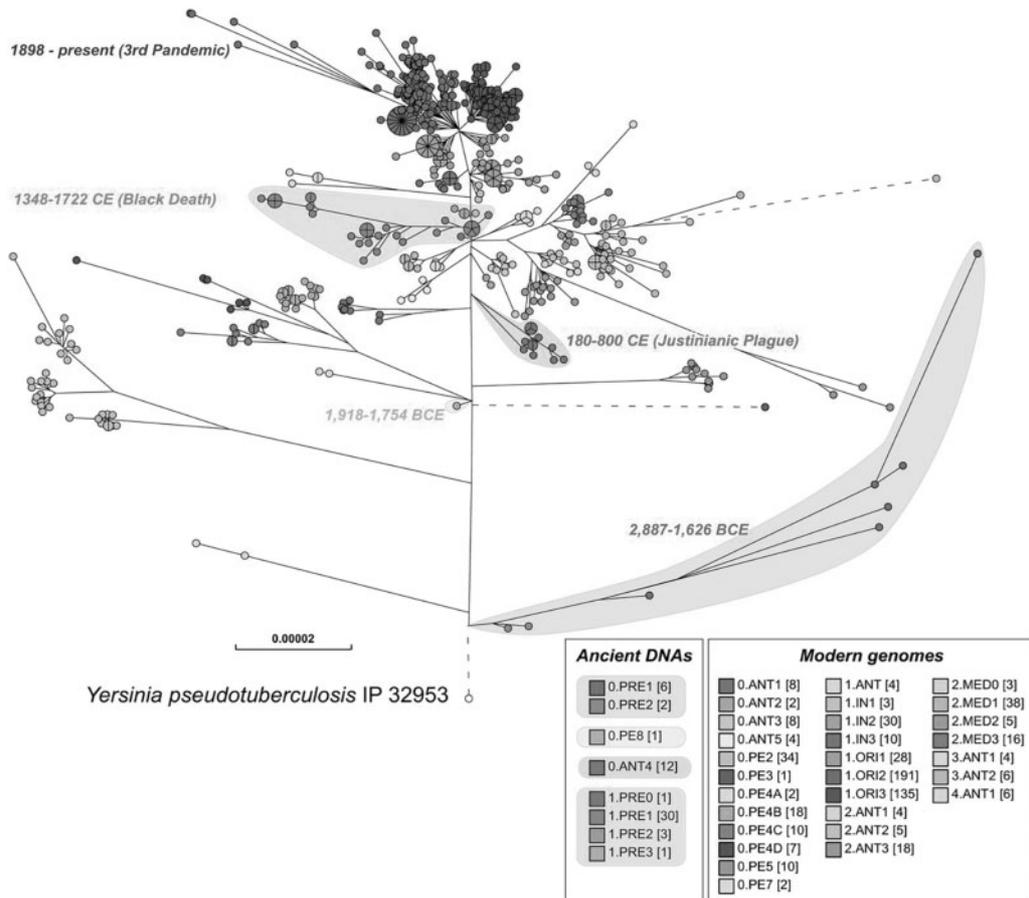


FIGURE 3: The phylogenetic tree of *Yersinia pestis* from Zhou et al., “The EnterBase User’s Guide.”

than fifty individuals in such burials from late antiquity across Western Eurasia.¹⁵⁰ The alternative—testing a substantial number of (ideally all) human remains from late antiquity—is impractical for the foreseeable future for logistical (e.g., many remains are still buried), technical (e.g., DNA decomposes, so failing to identify plague does not mean the person did not die of plague), financial (e.g., the high costs of running paleogenetic labs), and other reasons (e.g., DNA extraction is destructive). Legal and historical issues pose additional challenges. Every positive case of late antique plague comes from Western and Central Europe rather than the source of most late antique written evidence, the Eastern Mediterranean. The reasons are not discussed openly, but are likely related to academic networks, the ease of working and excavating within particular countries, and constraints on the exportation of human remains for analysis; therefore,

¹⁵⁰ Mass burials are defined in this case as containing five or more human remains that were interred at the same time. For a list of such mass burials during late antiquity: Michael McCormick, “Tracking Mass Death during the Fall of Rome’s Empire (I);” and Michael McCormick, “Tracking Mass Death during the Fall of Rome’s Empire (II): A First Inventory of Mass Graves,” *Journal of Roman Archaeology*, no. 29 (2016): 1004–1007; Michael McCormick, “Tracking Mass Death during the Fall of Rome’s Empire (II): A First Inventory,” *Journal of Roman Archaeology*, no. 29 (2016): 1008–1046. Whether multiple burials are indicative of plague has been questioned; see Mordechai et al., “The Justinianic Plague: An Inconsequential Pandemic?”

most labs engaged in this research are in Europe and North America. Ethical issues have arisen as well, as paleogeneticists' competition to gather human remains and publish results have been compared to colonial and exploitative practices.¹⁵¹

Precision and resolution remain issues. The fragmentary state of *Y. pestis* DNA often prevents scientists from reconstructing its full genome. Archaeological and radiocarbon dating lacks the decade-level (let alone annual) precision necessary to answer causal historical questions. Substantially more precise data would be required to draw even generalized transmission routes. Although the discovery of more late antique plague cases is all but certain, these issues may remain intractable.

Furthermore, even if one could uncover the exact transmission route and predominant means of transmission of late antique plague, the kind of *historical* questions that can be answered with such information remains debatable. Although earlier scholarship suggested that plague evidence would illuminate communication and commerce routes, it remains easier and cheaper to uncover connections between places through less "cutting-edge" methodologies, such as pottery or coins.¹⁵² That plague moved along a particular route does not mean that it brought catastrophe, or was even noticed by local populations.¹⁵³ After all, plague has existed in the United States for over a century, with little effect on the country or its social structures (even its presence remains largely unknown).¹⁵⁴

While paleogenetics provides new and exciting evidence for plague studies, historians must evaluate it as they do all other types of evidence: critically and without assuming the plague concept. Paleogenetics has offered important answers: identifying the bacterium, for instance, or establishing that plague existed in sixth-century Britain. Future discoveries might include genetic proof that plague killed people in the Roman world even before the mid-sixth century, as suggested by Rufus of Ephesus.¹⁵⁵ They may even help illuminate the vexed question of comorbidity.¹⁵⁶ However, paleogenetics will likely not be able to answer questions about the social, cultural, or demographic effects of plague for the foreseeable future.

Historians remain divided about how to integrate paleogenetics into the historical understanding of plague.¹⁵⁷ Instead of adopting a techno-utopian stance that pins all

¹⁵¹ For this discussion again, see Lewis-Kraus, "Is Ancient DNA Research Revealing New Truths—or Falling into Old Traps?"

¹⁵² This is what McCormick aimed to accomplish in his first plague article: McCormick, "Toward a Molecular History"; and on this point see Horden, "Mediterranean Plague in the Age of Justinian," esp. 157.

¹⁵³ For this point see Mordechai and Eisenberg, "Rejecting Catastrophe"; and Mordechai et al., "The Justinianic Plague: An Inconsequential Pandemic?" For a comparative example from Egypt, see Alan Mikhail, "The Nature of Plague in Late Eighteenth-Century Egypt," *Bulletin of the History of Medicine* 82, no. 2 (2008): 249–275.

¹⁵⁴ A trade book was recently published as a way to bring the story back into public awareness in the U.S.: David K. Randall, *Black Death at the Golden Gate: The Race to Save America from the Bubonic Plague* (New York, 2019).

¹⁵⁵ Oribasius, *Oribasii Collectionum Medicarum Reliquiae*, vol. 3: *Libri XXIV–XXV, XLIII–XLVIII*, ed. Joannes Raeder (Leipzig, 1931), 44.14; *The Chronicle of Pseudo-Joshua the Stylite*, trans. Frank R. Trombley and John W. Watt (Liverpool University Press, 2000), year 806, p. 26; and Mulhall, "Plague before the Pandemics."

¹⁵⁶ For a first step see Newfield, "Mysterious and Mortiferous Clouds."

¹⁵⁷ For this point in more detail, see Lee Mordechai and Merle Eisenberg, "Plague, Paleogenetics, and the Boundaries of the Discipline of History," *Environment and Society Portal* (Rachel Carson Center for Environment and Society), *Arcadia*, no. 30 (Summer 2020): <http://www.environmentandsociety.org/node/9088>. For further discussion, see J. R. McNeill, "Peak Document and the Future of History," *American Historical Review* 125, no. 1 (2020): 1–18.

hopes on paleogenetics as the most recent manifestation of “science” and “technology,” historians might use their considerable skills to analyze the problematic mindsets that perpetuate the dominant plague concept through its most recent truism.

OVER A CENTURY OF RESEARCH UNDERTAKEN by scholars in a variety of disciplines has not challenged the plague concept. Despite significant academic and public attention, few scholars have made critical progress on key historical questions such as the pandemic’s mortality. Many of the current debates in the field—such as the role of rats and the geographical scope of plague—rehash discussions from the turn of the twentieth century or earlier. Despite the evidentiary gaps, no new evidence or argument seems able to conclusively refute or falsify the use of the plague concept for late antique plague, despite it being neither scientific nor robust.¹⁵⁸ Moreover, the tremendous amount of scholarly energy and resources invested in late antique plague research has barely advanced our understanding of its effects on late antique society.

Instead of illuminating the past, Justinianic Plague scholarship reveals how the plague concept fused together a series of discrete outbreaks into a major historical event that has since gained its own explanatory power. As plague grew in importance, scholars increasingly used “the first pandemic” to answer larger questions of historical change. Although the chronological extent of late antique plague remains uncertain, a consensus timeframe (541–750 C.E.) defines how scholars investigate and use it to explain other large-scale historical events. Potential plague outbreaks that fall outside this timeframe are overlooked and only rarely considered part of the same disease ecology. Similarly, after the mid-eighth century, scholars no longer look to plague as an explanation for large-scale transformative processes.¹⁵⁹

Our earlier work deconstructed the empirical evidence that had long portrayed the Justinianic Plague as a devastating, catastrophic pandemic. But is this enough? Although we demonstrated major faults in the maximalist interpretation of plague elsewhere, we cannot deny that the maximalist narrative of apocalyptic death and catastrophic destruction is an appealing story.¹⁶⁰ We believe this article suggests another way to think about problems with this narrative by showing how a variety of actors constructed the composite Justinianic Plague narrative over time by synthesizing the plague concept with their contemporary cultural ideologies and values. This casts a conceptual layer of doubt over plague’s perceived power to reshape the world and transform societies across Eurasia. Yet these two acts of deconstruction are insufficient. As Hayden White suggested, “the best counter to a narrative that is supposed to have misused historical memory is a better narrative,” namely “a narrative with greater artistic integrity and poetic force of meaning” rather than simply more historical

¹⁵⁸ Karl Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge*, 2nd ed. (London, 2002), 47–48.

¹⁵⁹ Conrad, “The Plague in the Early Medieval Near East,” 304–311, attributes the plague as one of the causes of the Abbasid Revolution, although since this is on the margins of the plague pandemic, his argument is almost never cited. No one (as far as we are aware) has ever argued that Merovingian rule collapsed due to repeated plague outbreaks or that the Carolingians’ regaining direct control over peripheral regions of the Frankish state was due to the end of plague outbreaks.

¹⁶⁰ On this power Charles E. Rosenberg, “What Is an Epidemic? AIDS in Historical Perspective,” *Daedalus* 118, no. 2 (1989): 1–17.

facts.¹⁶¹ As the next step forward, we must tell a story about the past that holds as much charm as the inevitable doom of the transhistorical plague.¹⁶²

We are keenly aware of the changes to pandemic and disease scholarship likely to occur due to the COVID-19 pandemic as well. While we researched and wrote this article before the globalization of SARS-CoV-2, and cannot reflect on it in detail here, the novel coronavirus could replace plague (i.e., the Black Death) as the quintessential pandemic concept in historical thinking. Not only are historians today living through it in ways that will shape our historical analyses, but (as of October 2020) it has led to social, economic, and cultural change, from historic unemployment to Black Lives Matter protests following the murder of George Floyd. COVID-19 already appears to have refuted some assumptions, such as the belief that high mortality is required for a pandemic to cause or catalyze significant change.¹⁶³ It has also cast doubt on existing theories, such as the view of pandemics as “Great Levelers” that reduce inequality within societies.¹⁶⁴ Alongside the misery and grief that COVID-19 has already caused, perhaps it will force us to further challenge the plague concept.

Future research—keeping White’s comments in mind along with the knowledge that pandemics have differing effects across time and place—should focus on the effects of late antique plague *on humans* by investigating the outbreaks circa 541–750 C.E. in their local contexts. The layers of assumptions we have revealed need to be discarded in favor of less familiar forms of evidence, such as changes in local material culture, cultural production, or land use. In other words, we propose scholars replace a “global” level of analysis with the “micro.”¹⁶⁵ Such an examination would facilitate our understanding of whether and how plague affected individuals, local communities, and regional forms of governance. These should be stories that focus on individuals and communities, and how they attempted to mitigate, explain, or resolve plague outbreaks within their own systems of beliefs and cultural norms.¹⁶⁶ In parallel, scholarship must at least consider the possibility—supported by recent aDNA discoveries of *Y. pestis* in human remains far beyond the chronological range of the Justinianic Plague—that plague was enzootic to a degree across Eurasia before and during late antiquity, even if it was not a direct descendant of the Bronze and Stone Age plague found so far. In such a scenario, plague would have increased the disease burden on the local population and been responsible for a low but constant background death toll.¹⁶⁷

¹⁶¹ Hayden White, “The Public Relevance of Historical Studies: A Reply to Dirk Moses,” *History and Theory* 44, no. 3 (2005): 336.

¹⁶² On this challenge, see the *AHR* Reappraisal: *Metahistory and the Resistance to Theory*, by Carolyn J. Dean, “*Metahistory: The Historical Imagination in Nineteenth-Century Europe*, by Hayden White,” *American Historical Review* 124, no. 4 (2019): 1337–1350, here 1339.

¹⁶³ As of October 18, 2020, there have been 219,311 deaths in the United States. See Johns Hopkins Coronavirus Resource Center, “COVID-19 United States Cases by County,” accessed October 18, 2020, <https://coronavirus.jhu.edu/us-map>.

¹⁶⁴ Walter Scheidel, *The Great Leveler: Violence and the History of Inequality from the Stone Age to the Twenty-First Century* (Princeton, N.J., 2017).

¹⁶⁵ This is precisely the point in John-Paul A. Ghobrial, “Introduction: Seeing the World like a Microhistorian,” *Past and Present*, no. 242, suppl. 14 (2019): 1–22.

¹⁶⁶ On bringing people back into the story, see Walter Johnson, “On Agency,” *Journal of Social History* 37, no. 1 (2003): 113–124; and Alan Mikhail, “Enlightenment Anthropocene,” *Eighteenth-Century Studies* 49, no. 2 (2016): 211–231, here 223. This is precisely what Risse’s book does: Risse, *Plague, Fear, and Politics in San Francisco’s Chinatown*.

¹⁶⁷ Recent aDNA evidence seems to be moving in that direction: Simon Rasmussen et al., “Early Divergent Strains of *Yersinia pestis* in Eurasia 5,000 Years Ago”; Maria A. Spyrou et al., “Analysis of

Very often—indeed, in our own previous work on this subject—scholars have called for greater interdisciplinary effort to move the field forward, seeking in part to resolve the problems we have outlined. Yet we have come to regard this advice as rhetorical window dressing: intended to signal greater engagement with more disciplines, it tends toward an approach that uses new data (most recently, scientific data) without questioning its, or our own, assumptions about the plague concept. Our previous work is not exempt from this critique.¹⁶⁸ Interdisciplinary plague studies—whether researching the “Justinianic Plague,” the “Black Death,” the “Third Pandemic,” or any other outbreak—must explore and understand the underlying paradigms and assumptions of all the disciplines involved, rather than simply importing assumptions across fields or using their research products.¹⁶⁹ Close collaboration is essential for the continued development of plague studies: there is simply too much for a single scholar in one discipline to know. However, the collaboration must be on the terms of every discipline involved, with history—including its critical approach and ability to contextualize past work—centrally represented.¹⁷⁰ As we hope to have demonstrated, following the lead of other disciplines while trying to answer historical questions simply reifies our existing assumptions and allows the plague concept to define not just the answers we find, but even the questions we ask.

3800-Year-Old *Yersinia pestis* Genomes Suggests Bronze Age Origin for Bubonic Plague,” and the evidence from Peter de Barros Damgaard et al., “137 Ancient Human Genomes from across the Eurasian Steppes,” together with the team’s response to a later paper, Simon Rasmussen et al., “Response to Keller et al. on Justinianic Plague.” This might explain the potential existence of plague recorded by Rufus of Ephesus in circa 100 C.E.: Oribasius, *Oribasii Collectionum Medicarum Reliquiae*, 44.14.

¹⁶⁸ For our previous discourse on this topic, see Mordechai and Eisenberg, “Rejecting Catastrophe,” 49–50; Eisenberg and Mordechai, “The Justinianic Plague: An Interdisciplinary Review,” 179–180. For other examples of this discourse in the *AHR* Roundtable: History Meets Biology, see Brooke and Larsen, “The Nurture of Nature,” 1513; Harper, “The Sentimental Family,” 1561; Lynn Hunt, “The Self and Its History,” *ibid.*: 1576–1586, here 1586; Walter Scheidel, “Evolutionary Psychology and the Historian,” *ibid.*: 1563–1575, here 1575; Norman Macleod, “Historical Inquiry as a Distributed, Nomothetic, Evolutionary Discipline,” *ibid.*: 1608–1620, here 1619–1620.

¹⁶⁹ For a suggestion to center history, see Thomas, “History and Biology in the Anthropocene,” 1605; and for discussion of why history is not central, see Ethan Kleinberg, “Just the Facts: The Fantasy of a Historical Science,” *History of the Present* 6, no. 1 (2016): 87–103.

¹⁷⁰ John Haldon et al., “History Meets Palaeoscience: Consilience and Collaboration in Studying Past Societal Responses to Environmental Change,” *Proceedings of the National Academy of Sciences* 115, no. 13 (March 9, 2018): 3210–3218.

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