HIV/AIDS and the threat of biological warfare have refueled interest in the Black Death among professional historians, biologists, and the public, not only for assessing the toxic effects of the bacillus but for understanding the psychological and longer-term cultural consequences of mass death. This article makes two arguments. Against the assumptions of historians and scientists for over a century and what continues to be inscribed in medical and history texts alike, the Black Death was not the same disease as that rat-based bubonic plague whose agent (*Yersinia pestis*) was first cultured at Hong Kong in 1894. The two diseases were radically different in their signs, symptoms, and epidemiologies. The proof of these differences forms the major thrust of this article. The second argument stems from the epidemiological differences between the two diseases. Humans have no natural immunity to modern bubonic plague, whereas populations of Western Europe adapted rapidly to the pathogen of the Black Death for at least the first hundred years. The success of their immune systems conditioned a cultural response that departs from the common wisdom about "plagues and peoples." As far back as Thucydides, historians have seen the aftershocks of pestilence as raising the levels of violence, tearing asunder secular cultures, and spawning pessimism and transcendental religiosities.  

A fresh reading of the late medieval sources across intellectual strata from merchant chronicles to the plague tracts of university-trained doctors shows another trajectory, an about-face in the reactions to the plague after its initial onslaught. This change in spirit casts new light on the Renaissance, helping to explain why a new emphasis on "fame and glory" should have arisen in the wake of the West's most monumental mortality.

One of the many memorable phrases coined in Johan Huizinga's *The Waning of the Middle Ages* is the title of its first chapter—"The Violent Tenor of Life." While this attempt to sum up the collective psychology of post-plague Burgundy and northern France hardly mentioned the plague, others following Huizinga's lead have argued that society became more violent precisely because of the plague, that the mass mortality cheapened life and thus increased warfare, crime, popular revolt, waves of flagellants, and persecutions against the Jews. But few have gone beyond recounting dramatic episodes taken almost...
exclusively from the first wave of plague to compare levels of violence before and after the Black Death, and few have hinted at differences in reactions between the Black Death of 1348 and its subsequent strikes in the fourteenth and the fifteenth centuries.  

In Florence, Genoa, Venice, and most of northern Italy, expenditures on warfare increased exponentially after the Black Death to the fifteenth century, as shown by the soaring of state indebtedness. In Siena, these fiscal pressures led in 1355 to the toppling of the most durable political regime in the history of the Italian city-states—the Nove—which had ruled since 1287. Afterward, popular unrest, factional conflict, and a rapid succession of governments filled the city's political chronicle. In one year alone, 1368, popular uprisings overthrew three regimes.

Yet the Italian post-plague political experience cannot be generalized. For England, the trend is nearly the opposite. Richard II's post-plague reign of peace (1386–1399) contrasts with the previous three Edwards' expenditures on war, their military operations in France and Scotland, and their new and horrific uses of violence, plunder, and torture to quell civilians and knights alike. Even within Tuscany, Siena's political history of stability followed by instability was not the norm. By contrast, factional strife riveted the political narrative of Florence during the first part of the fourteenth century to the extent that on two occasions its ruling elites forfeited their independence for stability by handing the government over to foreign rulers—Charles of Calabria in the 1320s and Walter of Brienne in 1342. After the plague, Florence's political history changed: the Albizzi reforms of 1393 heralded a new constitution and structure of political control that endured through most of the fifteenth century.

Further, while political conflict may have increased among the new regional states of Italy from the Black Death to the Peace of Lodi (1454), internecine war between the great families in Florence declined; "the tenor of life" became less, not more, violent. Before the Black Death, magnate rituals of violence and tower warfare regularly brought Florence's ruling families into the streets, pitching one neighborhood against another, even after the victory of the popolani grassi and their laws of 1292 to curb magnate violence. The judicial sentences of the early 1340s show Florence's inability to end this violence or prevent its noble youth from riding out of town, pillaging the countryside, and killing peasants simply for the sport of it. But after the plague, the city government began effectively to curb these acts of violence, and by 1400 such raids disappear from the judicial ledgers. Conversely, in Genoa, it was after the Black Death that the number of "general, popular, and noble revolts" increased.

While the medium and long-term consequences may continue to defy generalization, a sense of the immediate psychological consequences of the Black Death and its subsequent strikes can be scrutinized with greater clarity. The first sweep of plague, 1347 to 1351, provoked as close to a universal chorus as one hears in history. Merchant chroniclers, priests, and university-trained doctors claimed that this malady was new to world history,
that doctors and medicine were useless, and that all that could be done was to pray for God's mercy. Explanations of the plague were not sought in the human sphere but in God's wrath and the configuration of planets. A chronicler of Viterbo called it "a divine plague from which no doctor could possibly liberate the stricken." Man's only contribution had been his sins. Not only those on the margins of Europe, such as the Olivetan friar of Prussia, but also humanists such as Petrarch's close friend Louis Sanctus of Beringen (called Socrates) and chroniclers such as the friar Bartolomeo of Ferrara, who claimed to have received his evidence from eyewitness merchant accounts, reported similar tales of the plague's origins—floods of snakes and toads, snows that melted mountains, black smoke, venomous fumes, deafening thunder, lightning bolts, hailstones, and eight-legged worms that killed with their stench. While the butchering and burning of the Jews and the flagellant movements of frenzied half-naked men and women were not universal throughout Europe, they swept across wide swathes of it from the east, Germany, Spain, southwest France, the Swiss cantons, and parts of the Low Countries. 

Historians have taken these first explanations and psychological manifestations of mass hysteria as the plague's enduring characteristics. Few have sought to compare the psychological reactions to plague over time, and when they do so (as René Baehrel did for epidemics in the seventeenth and eighteenth centuries), they find an "immobile history" of "constantes psychologiques." A reading of chronicles and doctors' plague tracts over the Black Death's first hundred years charts a different history: the initial explanations and attitudes did not persist. From chroniclers, merchants, and clerics alike, the floods of snakes and black snows that melted mountains vanish altogether from the "aetiologies" of subsequent strikes of the plague, and even though God and the stars as explanations continue with some, they rapidly decline even with monastic chroniclers of later plagues. Thomas Walsingham, a monk at St. Albans, retold a story of "a silly wretch" who during the fifth plague at Cambridge in 1389 danced grotesquely in front of the Host and was struck down immediately. Skeptical of hearsay evidence, Walsingham brushed aside "all sorts of explanations" and refrained from drawing moral lessons. Instead, his exemplum was clinical: the plague "attacked healthy men, who then died raving." The verse chronicler of the Premonstratensian abbey of Floreffe in Namur explained the plague of 1437 by pointing to the war in Liège, Namur, and Hainault. He reasoned that these political circumstances "gave rise to high prices, grain shortages, and famine," which ignited the plague. God was not mentioned.

While the Black Death may have initiated a new intensity in the history of Jewish persecutions, as David Nirenberg has recently argued for late medieval Spain, I know of only one instance of an outbreak of plague for the next hundred years that sparked a massacre of the Jews: in Poland in 1360, where, at least for Krakow and its surroundings, this appears to have been the region's first plague. By the mid-fifteenth century, rather than being targets, Jews
participated alongside Christians in processions to forestall the plague.\textsuperscript{24} Similarly, subsequent plagues of the fourteenth and early fifteenth centuries failed to set off those wild and unsanctioned displays of emotion—the flagellant movements—that had frightened churchmen and secular authorities in 1349 and 1350. Instead, later movements such as the semi-nude flagellants at Liège, who attacked Simonists and fornicators in 1376, were local events and had no relation to plague,\textsuperscript{25} while other movements associated with plague were highly controlled, having been organized top down by town councils or the church.\textsuperscript{26} Some have supposed that the Bianchi movement of 1399–1400 in northern and central Italy was a revival of the 1348 religious hysteria,\textsuperscript{27} but insofar as it was associated with plague, it represented the opposite—a form of popular orthodoxy sanctioned by the church and praised for its orderliness. The Bianchi's mission was the preservation of public order.\textsuperscript{28}  

The change with the successive strikes of plague was not just one of a silence in the sources that replaces the earlier signs of desperation. From skepticism about remedies, cures, and preventive measures, doctors and chroniclers increasingly supplied solutions. One manifestation of the new confidence was the blossoming of what was effectively a new genre in late medieval writing, the plague tractatus, written mainly by doctors but also by clerics (and at least in one case by a schoolteacher).\textsuperscript{29} A census of this genre has yet to be taken, but while around fifteen are known in Western Europe for the first plague, over two hundred have been listed or edited from the 1360s to 1450, some with numerous manuscripts. The first tracts of 1348 explained the plague by planetary constellations. Later ones heeded what the famous doctor Gentile of Foligno may have suggested but failed to deliver in his own plague tracts of 1348: doctors ought to leave the stars behind and get down to the business of healing patients.\textsuperscript{30} By the second plague, the tracts rarely indulged in the long philosophical discussions of the plague's "remote causes"; instead, they began by prescribing specific cures and preventive measures—long lists of recipes, herbs and foods to eat or not eat, ointments to apply to plague swellings, instructions for lancing boils and for which veins to tap when letting blood.  

One of the most famous of these tracts is that by the doctor of three popes, Guy de Chauliac, located within his \textit{Great Surgery}, which remained a central medical text until the sixteenth century. Written in the immediate aftermath of the second plague at Avignon, it reflected first on 1348, concluding that nothing had been comparable in world history, that it was brought on by a certain configuration of Saturn and Jupiter, and that medical remedies were of no use.\textsuperscript{31} But with the second plague, his argument took a radical about-face. Instead of resignation, he offered specific procedures and prescriptions. They were, in fact, the ones Guy had used on himself while infected with "continuous fever and an ulcer in the groin" and that allowed him "to evade God's Judgment."\textsuperscript{32}
By the second plague, other doctors reported similar medical success and wished to make their remedies known. At the end of the fourteenth century, another doctor, Stephanus of Padua, also turned to personal experience in his tract, describing his own and his wife's affliction with plague—four days "of horrendous fevers and the detestable signs," himself "at the head of the bed and she at the foot." With his regime of cures, he announced that they had "triumphed over plague." He now wrote down these tested cures to benefit his fellow citizens of Padua, to whom he dedicated his tract.33

With similar confidence, other doctors, such as John of Tornamira in the third plague at Montpellier, illustrated successful surgical procedures, by recounting clinical histories of his patients who survived the plague.34 A late fourteenth-century Venetian doctor claimed to have saved one hundred patients from plague with his recipes.35 The Portuguese physician of Cardinal Philip of Alenzolo boasted that none had died under his care in "a big plague" at the beginning of the fifteenth century.36 At about the same time, a doctor from Danzig said that a concoction he invented mixed with weak wine had cured many plague victims.37 At the end of the fifteenth century, a doctor from Cologne began his tract by saying that his "little work" had proven itself a success in treating plague patients in Rome and elsewhere throughout Italy. Others such as John of Burgundy in 1365 praised not only themselves but also their generation of new plague doctors. As a doctor from Cologne declared at the end of the fifteenth century, "through their industry and medical procedures [doctors] have liberated many plague victims from the illness."38

From these alleged successes, doctors such as Johannes Jacobi of Montpellier and John of Burgundy toward the end of the fourteenth century claimed to have surpassed the ancients in the art of healing.39 From the unknowable, even the unspeakable, plague was now seen as beneficial to medical progress: it had given post–Black Death doctors a new range of practical experience. Through the fifteenth century, doctors from Lübeck and elsewhere in Germany saw the plague in much the same terms, pointing to the experience and experimentation it provided.40 Far from being slavish followers of ancient or later Arabic authorities, as historians often assert,41 doctors of the late fourteenth and early fifteenth-century plagues were now often disdainful of these authorities, Hippocrates and Galen included. The new plague doctors relied on their own "experience" in place of the "auctores" in curing plague patients. Nor did these doctors represent a Renaissance intellectual elite from central or northern Italy; indeed, in at least one text, distance from the centers of the Renaissance was seen as an advantage. A fifteenth-century country doctor from a village within the diocese of Besançon asserted that in Bologna, where he had previously practiced, the doctors had no remedies for plague because they relied on Hippocrates and other ancients, who had no knowledge of the present plague. "Without wasting words" as he put it, he then described his own many remedies, by which he claimed to have cured patients of plague.42
With the fourth plague in 1382, the Avignon doctor Raymundus Chalin de Vivario was even less respectful of the ancients. Not only did they fail to understand the causes of plagues and "plainly could not cure" plague cases, they had "left everything in confusion." In 1406, the physician of the king of Aragon added other Greek and Arabic authorities to the list of hopeless ancients who had nothing of value to say about plague, and he ended by trumpeting his own credentials—forty years of plague diagnosis in Toulouse, Montpellier, and Sicily.

By the early fifteenth century, the doctors were not alone in proclaiming their "triumph over plague." From utter despair, stargazing, and prayers to God, chroniclers began to proffer practical lessons and specific herbal remedies for facing plague. As the early fifteenth-century Florentine diarist Giovanni Morelli advised his heirs: those well armed against the plague stood a better chance of survival than the unprepared. He then defined being "well armed" as "observing diligently the remedies of valiant doctors." His view of doctors contrasts sharply with that of chroniclers of 1348 such as Matteo Villani or Agnolo di Tura del Grasso of Siena, who saw them as useless, desiring quick profits, and succeeding only in leading their patients more quickly to the grave. The sharp rise in doctors' salaries in Florence and probably elsewhere in Europe after the plague and into the fifteenth century shows that Morelli was not alone in praise and increased reliance on the medical profession.

Chroniclers of later plagues turned to causes other than the stars, snakes, toads, or even God to understand the plague's origins and transmission. While Matteo Villani still considered sin at the root of the second wave of plague that spread through Germany and the north of Europe in 1357–1358, he also understood it in terms of human immunity, observing that it struck most vigorously those areas such as Brabant and Bohemia that had not been infected the first time around. Others, such as the Gatari chroniclers of Padua, pointed to war. In addition to corrupt vapors spreading from decaying corpses, war forced peasants and their animals into cities, causing overcrowding and unhygienic conditions that quickly erupted into plague and mass mortality. Their description of the preconditions of the plague in Padua of 1405, the war-inflicted overcrowding of peasants into the city with their animals, the ensuing mounds of mud, manure, and dead carcasses, sounds more like the analysis of an early epidemiologist's description of an infectious crowd disease such as typhus than a medieval chronicler explaining the moral and cosmic conditions that presaged plague. How do we explain the change in mentality? Could it have hinged on the character of the disease?

Throughout the twentieth century, historians and scientists alike have assumed that the "third" pandemic that struck Hong Kong in 1894 and spread across the oceans was the same disease that halved Europe's population in the mid-fourteenth century. Their assumption has rested on the supposed similarity
of signs and symptoms between the late medieval and modern pandemics. According to Ann Carmichael, who combines an expertise in medieval history with one in medicine, "Boccaccio leaves no doubt that bubonic Y. pestis ravaged Florence in 1348. If the bubo predominated as a sign, we could still be reasonably comfortable after five centuries that there was not much error in the ascription of a death to plague.  

Nobel laureate and immunologist Sir Macfarlane Burnet has emphasized that diagnosis of diseases in the past must be assessed by epidemiology and not by signs or symptoms alone. But when he came to the Black Death, he forgot his lesson: "The symptoms are characteristic enough to make it easy to recognize the disease from classical or medieval descriptions, and we can be sure that the two greatest European pestilences, the plague of Justinian's reign (A.D. 542) and the Black Death of 1348, were both the result of the spread of the plague bacillus.  

As health workers in the subtropics are taught, the bubo or swelling in the lymph glands is not unique to bubonic plague. As early as the 1920s, editions of Manson's Tropical Diseases insisted that the presence of the bubo was not a sure sign that the malady was bubonic plague and advised doctors to take cultures of the infected area before treating for plague. The sign could equally well signify numerous other diseases: relapsing fever, severe cases of malaria, typhoid, typhus, glandular fever, tularaemia, lymphogranuloma inguinale, and various forms of filariasis.

For some time, scholars have been puzzled by the inconsistencies between what contemporary doctors and chroniclers reported in the fourteenth and fifteenth centuries and what scientists observed on the microscopic and macro-sociological levels in mostly subtropical zones after the discovery of the plague bacillus. One might even argue that the cultural sophistication of doctors at the turn of the century—their knowledge of the late medieval past—was a factor that delayed for a decade or more their acceptance of the complex rat-flea-human vector in the transmission of modern plague. Such a slow and inefficient transmission did not square with the medieval plague, which from contemporary descriptions and the speed it traveled must have been an airborne disease, communicable person to person, and possibly transmitted as well by infested clothing and other objects, as chroniclers reported and governments tried to curb with new plague legislation. Without the assistance of the railway or the steamship, the fourteenth-century disease spread almost as fast per day over land as modern plague does per annum.

Even after repeated observations and experiences of the plague ward as "the safest place" to be in times of plague, early twentieth-century doctors were reluctant to distinguish this disease from the rapidly infectious plague of the Middle Ages or to push aside the lessons they thought they had learned from the past. In India, even though relatives and friends crowded around plague victims, using their hands and clothing to wipe away discharges from the patients' mouths, and practicing "the common custom of receiving the sputa of the sick in their hands," plague wards remained almost completely free of further infection. Yet until around 1907, doctors continued to treat the disease
as though it were highly contagious.\textsuperscript{55}

Nor does the pneumonic form of plague help solve the riddle, as modern historians continue to assume. First, with modern plague, cases of person-to-person transmission—pneumonic plague or secondary pneumonic complications after the onset of the buboes—have been rare. Secondly, unlike measles or influenza, "droplet" transmission of \textit{Yersinia pestis} in its pulmonary form is extremely ineffective.\textsuperscript{56} The worst manifestations of modern pneumonic plague—Northern Manchuria in 1911 and 1921—were limited, the proportions killed under 0.3 percent.\textsuperscript{57} With both epidemics, the disease broke out among tarabagan fur hunters crammed in underground inns, 12 by 15 feet, where as many as forty men slept without adequate ventilation to protect themselves against the Siberian cold. Further, in packed railway cars between Harbin and Changchun, the spread and infectivity of this disease remained low. Comparing the Manchurian pneumonic plague and the late medieval pestilence that swept through Europe and Asia, the foremost authority on pneumonic plague, Wu Lien Teh, had doubts about the connection and speculated that the Black Death might have been "a virulent type of influenza such as that encountered in 1918."\textsuperscript{58} Such a speculation finds some support in the diagnosis of plague in Kashmir in 1903–1904, where the symptoms of pneumonic plague resembled influenza\textsuperscript{59} and occasionally the two accompanied one another.\textsuperscript{60} Yet no historian or medical researcher has dared to investigate further these possible connections, and few have suggested other alternatives.\textsuperscript{61}

Even if this disease had been intercurrent with other diseases or triggered them, as some have speculated to resolve the discordance between what the sources say and what the epidemiology of modern bubonic plague may demand,\textsuperscript{62} the total absence in the documents or from archaeological evidence of any prior or accompanying spread of the disease among rats must be explained.\textsuperscript{63} Not only in England and Scotland, where rats existed (even if in insufficient numbers for an epidemic of plague\textsuperscript{64}), historians have insisted that this disease was bubonic plague in areas where no evidence of rats appears for the late Middle Ages, as well as in arctic winters, where the spread of modern bubonic plague in epidemic proportions is impossible.\textsuperscript{65}

To resolve the inconsistencies past and present, scholars such as the bacteriologist J. F. D. Shrewsbury questioned contemporary accounts rather than the disease. He reasoned that England could not have possibly possessed the population densities of people or rats to sustain a bubonic plague with the massive mortality figures claimed by chroniclers or shown by the replacement rates of the clergy.\textsuperscript{66} Yet instead of challenging the bubonic plague as the root disease, he dismissed the sources of England's late medieval demographic history. From the biological "laws" of modern plague, he concluded that nowhere did more than 20 percent of the population perish, and for England as a whole, as few as 5 percent died in 1348–1349. Further, he argued, the Black Death, along with subsequent plagues, must have been a disease of towns, despite evidence to the contrary from archaeology and from bishops' and
manorial rolls. Some of the highest counts of mortality anywhere come from rural areas such as those around St.-Flour (Auvergne) and in Cambridgeshire, where as much as 76 percent of populations died in the Black Death.\(^67\)

Robert Gottfried questioned the accuracy of Gabriele de Mussis's account of the plague's spread in 1347, when soldiers of the Golden Horde lobbed infected bodies into the besieged Genoese trading port of Caffa on the Black Sea. He rightly pointed out that modern bubonic plague does not spread from dead bodies but requires a rat flea to ingest large concentrations of the bacterium from a diseased rat and afterward to bite a human, regurgitating the bacillus into the human blood stream. But from his knowledge of bubonic plague, Gottfried chose to dismiss the chronicle rather than question what the disease may have been.\(^68\)

Finally, Ole Jørgen Benedictow has argued against the general consensus that plague in Nordic countries was pneumonic, by pointing out that even in its airborne form modern plague is not highly contagious. Instead of rejecting or questioning the disease's identity as modern plague, however, he turned to a more unlikely solution, especially for the colder climates of Scandinavia, arguing that it was bubonic plague (even though none of these Nordic sources describe buboes) with secondary pneumonic complications, as though secondary pneumonic plague were more contagious than primary pneumonic plague (which it is not).\(^69\)

Let us return to the supposed "certain" signs of the two plagues—the buboes. Do the two periods of plague match so "unmistakably" as scientists and historians continue to claim? Chroniclers, storytellers, poets, and doctors of the later Middle Ages described swellings as large as onions but also pointed to smaller "carbuncles, rashes, freckles, scabs, and other similar things," which preceded, accompanied, or followed the telltale boils.\(^70\) This additional complication of the late medieval plague is found even in that passage most often cited in support of the Black Death's identity as bubonic plague, that of Giovanni Boccaccio: "From the two areas already mentioned [the groin and the armpit], the aforementioned deadly gavòcciolo would begin to spread, and within a short time would appear at random on every part of the body. Afterwards, the illness would change with the appearance of black or blue spots (macchie nere o livide) forming on their arms, thighs, and other parts of the body, sometimes large and few in number, at other times tiny and closely spaced."\(^71\)

The largest repository of clinical descriptions of plague after the discovery of the bacillus comes from the first Bombay Report in 1896–1897, conducted by Brigadier-General W. F. Gatacre. Twenty-seven hospitals in and around Bombay City submitted reports, and seven classified their clinical data according to the positions and number of plague boils that formed on their patients.\(^72\) Of 3,752 plague patients admitted to these seven hospitals, 2,883 (or 77 percent) developed plague boils. Of these, less than 6 percent had more
than a single boil, and not in a single case did spots, blisters, or rashes spread all over the body. This pattern remained much the same when plague spread to Europe at the beginning of the twentieth century. Of thirty-eight hospitalized cases in Glasgow in 1900, none showed spots spreading over the body, and only two had more than a single boil. Later editions of *Manson's Tropical Diseases* note that the spread of "carbuncles," though rare, has been known to accompany the formation of plague boils; the latest case it cites, however, comes from the London plague of 1665.

Nor should we assume that Boccaccio's description of pustules was poetic invention aimed to heighten the horror of plague. For the second plague in Wales in the 1360s, the Welsh poet Llywelyn Fychan—described a similar course: after the "swelling under the armpit, grievous sore lump" came "the shower of peas," "seaweed scales, a grim throng, berries, it is painful that they should be on fair skin." More prosaically, other fourteenth and early fifteenth-century observers—the Franciscan friar of Messina, Michele da Piazza, the Piacentine Giovanni de Mussis, Giovanni of Parma, a canon at Trent, the Saint-Denis chroniclers of Paris, Marcha di Marco Battagli of Rimini, the chroniclers of the Dominicans of Florence (Santa Maria Novella), the Florentine merchant Giovanni Morelli, the compiler of an obituary in Friuli, a chronicler of Split on the Dalmatian coast, a monastic chronicler of Neuberg in southern Austria, and the Englishman Geoffrey le Baker—described the same pustules, *antrachi*, or spots spreading over the bodies of plague victims. When plague arrived at Catania in October 1347, Michele da Piazza distinguished between *antrachi* (pustules) and the "glandule" "as big as goose eggs," both of which spread over the body. Geoffrey le Baker and Giovanni Morelli maintained that, of the two signs, the smaller carbuncles were the more deadly, giving little hope of survival.

In plague tracts, doctors went further in describing and classifying these pustules by size, color, and type. The distinctions were important for their treatments. The famous doctor Giovanni da Santa Sofia, a professor of medicine at the University of Padua, wrote a tract for the town council of Udine in 1367, advising that plague boils be treated with a plaster of pig fat, but for the smaller *antraci* and carbuncles, he recommended a plaster made from pigeon dung (*de stercore columbino*) because of the spots' more "vehement heat." Like the chroniclers, the doctors found the smaller spots the more deadly.

Further discrepancies emerge when comparing the positions of the plague boils. With modern bubonic plague, between 57 and 75 percent of the buboes form in the groin, because fleas, although they can jump a hundred times their own height, usually reach no higher than the shins and most often bite around the ankles. Thus the first glandular node met by the multiplying bacillus is in the groin. Yet not a single late medieval doctor or chronicler privileged the groin as the place where the medieval bubo most often formed, not even Boccaccio and a handful of others who pointed to the groin and the armpits. Nor were these the only sites for the swellings. Doctors, chroniclers, and plague miracle
cures often described them in non-glandular areas—on the shins, the back, the face, on arms, and under the breasts. With modern plague, such formations are extraordinarily rare: only fifteen of the plague boils from the 2,886 patients in Bombay in 1896–1897 were located outside the lymph nodes (0.05 percent).

In addition, the late medieval boils’ pride of place was in neither the groin nor the armpits, as historians now claim. For the plague of 1361, the chronicler of Parma described them as forming in only one general area—"on the neck, under the ears, that is near the throat." In counseling where to let blood from plague patients, doctors were especially attentive to the positions of the boils. Almost without exception, they saw them growing in three glands—the neck, the armpits, and the groin—and began their prescriptions by turning first to the neck, if they did not form there, then to the armpits, and lastly to the groin. From thirty-eight miracle cures between 1348 and 1500 found scattered through the *Acta Sanctorum* that indicated the place of the plague boils, more are found in the neck (fifteen cases) than anywhere else. Finally, the Lucchese doctor Iacopo di Coluccino has left us a rare, if not unique, source for the care of plague patients before 1450. Slipped in his diary (*ricordanze*) was a two-page insert (*cedole*) with his clinical notes on seven plague patients he attended twice daily during the plague of 1373. Three of the seven formed boils; all of them were in the neck or behind the ears; none were in the armpits or groin. Although small in number, the cases corroborate the impressions gained from the doctors’ tracts and the miracle cures.

Similarly, the symptoms of the two plagues do not agree as well as historians would like to think. They have seen in the Black Death’s Janus face the pneumonic and bubonic phases of the modern plague (even if in modern times the bubonic almost invariably precedes the pneumonic and not vice versa as in 1347–1349). This duality has been invoked to resolve the enigmas of the absence of a prior spread among rodents, the speed of infection, and the disease’s rapid movement across Europe and Asia, which can be explained only by person-to-person transmission. Most important for this identity has been Guy de Chauliac’s description of the plague in Avignon in 1348:

> The plague (*mortalitas*) began with us in January and lasted seven months. It had two phases (*modos*). The first was for two months with continuous fever and the spitting of blood, from which the victims died within three days. The second lasted for the remainder of the period, was also with continuous fever, and abscesses and carbuncles formed in the extremities, namely in the armpits and the groin. These victims died within five days. The disease was extremely contagious, especially with the spitting of blood, so that one caught it from another, not only through close proximity but also through receiving a glance from another. As a consequence, people died without assistance and were buried without priests.

The passage does not fit the bubonic/pneumonic paradigm, nor does it resolve the problem of the rapid spread of bubonic plague or the "second phase" described by Guy de Chauliac. First, in the twentieth century, septicemic and pneumonic plagues (which kill so fast as not to produce buboes) reached epidemic proportions only in tropical zones such as Ceylon or near Arctical
ones such as in Northern Manchuria, not in temperate zones such as Western
europe or even in the subtropics of China, India, and Latin America. Second,
those stricken with the highly virulent pneumonic form of modern plague rarely
survive for more than twenty-four hours, not three days as reported by Guy
or as with one of Iacopo's plague patients in 1373, who spat blood
continuously for four days and certainly had had the disease before coming
under Iacopo's care, or the eight days reported by doctors in Rome for a
plague with only pulmonary symptoms in 1424. Further, while a number of
medieval chroniclers and doctors can be found who described the dual
symptoms of plague—skin disorders with the spitting of blood—Guy was
unique in separating the two into two distinct seasons. The others described
them as concurrent. In Iacopo's patient log of 1373, bubonic and pneumonic
patients became ill at the same time, even within the same families.

More problematic, Guy de Chauliac's description of a winter or pneumonic
phase followed by a late spring or summer bubonic phase does not help to
explain the plague's rapid spread and high mortalities either in 1348 or for the
later epidemics. Throughout the warmer Mediterranean zones, where deathbed
testaments, necrologies, and burial records survive in large numbers—Florence,
Arezzo, Perugia, Siena, Bologna, Orvieto, Rome, Barcelona, Valencia,
Millau (southern France), Perpignan —plague spread rapidly not in winter but
at the hottest point of the year, consistently peaking in June or July (see Figures
1–11). The only exception to this Mediterranean pattern comes from Marseilles
in 1348, when testaments reached their apex in March. From his vantage
point in the second decade of the fifteenth century, the Florentine Giovanni
Morelli left advice to his future heirs on how to defend against plague, seeing
the plague's seasons as predictable: "in the winter before a plague you will hear
some whispers of plague in the surrounding countryside [contado] or on the
periphery of our territory, and it would be correct to assume that the disease
must also be somewhere in Florence. And if you know this in February, people
will begin to know of it within the city. [But] deaths from the plague will mount
in July and peak by the middle of July."
Figure 1

Orvieto, 1348
Deaths of lay brothers
Figure 2

The Plague, 1348: Siena

![Graph showing the number of testaments per month in Siena during the plague of 1348.]

Figure 3

The Plague 1348: Arezzo

![Graph showing the number of testaments per month in Arezzo during the plague of 1348.]

The Plague, 1348: Florence

Figure 4

Figure 5
The Plague, 1348: Perugia

Figure 6

The Plague, 1348: Six Cities
Arezzo, Assisi, Florence, Perugia, Pisa, Siena
Figure 7

The Plague, 1348: Bologna

Figure 8
Rome, 1348
Testaments

Figure 9

Barcelona:
Vaunt Benefices, 1348
Figure 10

Millau (Aveyron), 1348
Plague Testaments
The first burial records for entire city populations during plague time—those for Arezzo in 1390 with 1,085 deaths and those for Florence in 1400 with over 12,000—illustrate the soundness of Morelli's advice; a few cases may have sputtered in late winter or early spring, producing a slight rise in these cities' normal levels of mortality, but the explosion awaited summer. In March 1400, Florence's mortalities increased from an average of around 125 deaths to 164; in June, they soared to 2,697, then peaked in July with 5,005 and fell in August to 1,947. In 1461, Pope Pius II named the plague "that summer contagion." In contrast to the highly contagious summer plague of the later Middle Ages, the warm weather bubonic plague of the twentieth century, despite its virulence, is "one of the least infectious of all epidemics."
because of the complexity of its transmission, its reliance on rats and fleas.  

On first impression, the striking seasonal regularity of plague in late medieval Italy might suggest that it was the same as modern plague. In late nineteenth and early twentieth-century China, India, and other subtropical places, plague recurred in a particular place with remarkably seasonal regularity. Its window of opportunity must fit within the narrow limits of humidity and temperature in which the fertility cycle of rat fleas (principally *X. cheopis*) revolves. Such conditions are most favorable at warm but not hot temperatures (between 50 and 78 degrees Fahrenheit) and high humidity.

The seasonal peaks of deaths in late medieval plague years found from wills, necrologies, and burial records chart an even more consistent seasonality for Mediterranean zones than that found for India in the first decades of the twentieth century. In India, the plague pattern was bi-modal, occurring either in spring or autumn, punctuated abruptly by the summer's heat. But was the late medieval summer consistency of plague indicative of modern bubonic plague? Historians have failed to point out that the dry and hot summers of Rome, Florence, Perugia, Bologna, Valencia, Barcelona, or Millau are hardly ideal for the rat flea, *X. cheopis*, and even less so for Europe's most common rat flea, *C. fasciatus*. Nor has global warming changed these matters; indeed, average temperatures have been estimated at +1 degrees Celsius hotter in the fourteenth-century zones south of Germany than in the 1970s.

As found in India, the combination of dryness and high temperatures limits flea fertility, cuts short “the life of free-wandering fleas,” hampers the bacillus's survival, and curtails its infectivity. By high temperatures, the plague commissioners meant ones above 78 degrees Fahrenheit. Above this threshold, “plague does not maintain itself in epidemic form” even with favorable levels of humidity. Despite great differences in winter temperatures, the average daily high temperatures in July are higher in Florence (89 degrees Fahrenheit) than in Bombay City (85 degrees Fahrenheit). Even more astounding, the peak months of plague in the later Middle Ages (June and July) are the driest months of the year. Correspondingly, they are also the very months when flea life in cities such as Florence or Marseilles reaches its nadir. Reflecting these conditions, the flea month in Italy and the Mediterranean more generally is September and October, after the rains and the cooling off at the end of the summer. Thus the only bubonic plague in Italy observed by Robert Pollitzer in his survey of twentieth-century plagues, which occurred at Taranto in 1945, spread between September and November. Yet none of the fourteenth or early fifteenth-century plagues charted by the death records for Barcelona, Valencia, the cities of central Italy or southern France began or peaked in September. By then, all of them had already subsided, and, in most of these, mortality levels had even returned to normal.
A second epidemiological feature that distinguishes the late medieval from the twentieth-century plague is its cycle of recurrence. Before 1450, plague rarely hit a locality two years running, at least in epidemic proportions, and the interval separating plagues ranged between five and fifteen years (see Figures 12–16). By contrast, once modern plague flares up, it remains for the next eight to forty years (as in the case of India), with regular yearly bouts, before mysteriously disappearing.

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**Burials, 1335-1430**
Among the laity at San Domenico, Siena

![Bar chart showing burial data from 1335 to 1430.]

**Figure 13**

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**Dominican friars of Florence**
Plague-year deaths, 1348 to 1437
Figure 14

Orvieto:
Confraternity of San Francesco

Figure 15
Bologna: Plague Years
Testaments: Libri Memoriali

Figure 16

Plague in India, 1897-1907
Figure 17

Plague Mortality in India
1939-1947

Figure 18
Third, the trajectory of the fourteenth and fifteenth-century plague mortalities differs from the trends of modern plague. Death tolls from the latter (even after effective preventive rat-proofing and health measures have been implemented) do not decline progressively. Instead, annual mortalities first rise for five to ten years, then jump erratically from year to year before falling. Such were the mortality patterns in India from 1896 to 1907 and from 1939 to 1947 (see Figures 17 and 18), in Vietnam in the 1960s, in Thailand from 1944 to 1952, and in other places Pollitzer charted for the twentieth century. These trends reveal the absence of any natural or acquired immunity against *Yersinia pestis* among humans, and without it, scientists have yet to discover an effective long-term vaccination against modern plague. Unlike most infectious diseases, in terms of case or mortality levels, it does not matter whether modern plague hits a "virgin-soil" population or not. The downturn depends on rats, not humans, acquiring immunity.

By contrast, the figures given by chroniclers and doctors and drawn from late medieval wills, necrologies, and burials show plague mortalities declining sharply over the Black Death's first hundred years, characteristic of a disease in which pathogen and host are rapidly adapting to one another. Having survived four plagues, Raymundus Chalin de Vivario, papal doctor at Avignon, looked back over his plague experience: in 1348, two-thirds were afflicted and almost all died; in 1361, half the population caught it and few survived; in 1371, only one tenth were sick and many survived; in 1382, only one twentieth of the population became sick and almost all survived. Although Raymundus's retrospective appears overly optimistic, the trends from testaments and burials trace a similarly progressive, long-term decline in the plague's mortality, at least until around 1450. Surviving testaments taken from six cities in Tuscany and Umbria (Arezzo, Assisi, Florence, Perugia, Pisa, and Siena) declined from 340 in 1348 to less than three-quarters that figure in 1363 (241), to less than a third in 1374 (102), to a fifth in 1383 (71). And for no plague of the first quarter of the fifteenth century did the number of deathbed testaments exceed the 1383 number. For Dominicans born in the province of Florence, the decline in mortality over the first three plagues was even steeper. While the plague of 1363 claimed a third of those friars killed in 1348, the third plague of 1374 claimed little more than a twentieth (5), and after 1400, no plague killed more than that fraction.

The records of the laity buried at the Dominican cemetery, Camporegio, in Siena, on first observation appear to deviate from the patterns traced above. Here, the peak death rate came in 1363, not 1348. But the reason for this discrepancy stems from the cessation of records in 1348 caused by the pervasive fear and overwhelming magnitude of the task faced by the friars as well as by the civil authorities. As Boccaccio and numerous chroniclers
lamented, fathers abandoned sons, wives husbands, and sons fathers, resulting in mass burials without proper funerals. By the end of June, at the peak of the plague, the Sienese burial records cease altogether and do not resume until the plague had abated in August. Yet, according to Siena's principal chronicler, Agnolo di Tura, the plague raged during the three summer months, when he claimed three of every four in Siena died. In the summer, the chronicler was forced to bury his five children with his own hands because no one would assist him.118

With later plagues, civil and religious authorities adjusted to problems of the deadly contagion and the sudden increases in burials. Institutions such as the Florentine Grascia recorded and regulated burials across all the city's parishes. In Siena, with the plagues after 1348, the Dominicans even added new information to their burial ledgers, such as the addresses of the dead, perhaps in an attempt to understand the plague's spread. Yet, despite this greater care in record keeping, after 1363 burials and other death documents show a steep decline in the plague's triumph over life.

Did these declines in mortality simply result from a general decline in population? Quick rises in fertility compensated to some extent for the population losses,119 and, more important, immigrants from the countryside rushed to cities (where these death records are found) to realize new social and economic opportunities. In one place—Florence—where sufficient figures on population were taken and survive, the urban population showed a remarkable capacity to rebound after successive strikes of plague, at least through the fourteenth century. First, its numbers may have dropped from as high as 120,000 before the Black Death to around 40,000 immediately afterward. (The tax surveys [estimi] of 1352 and 1355 numbered around 10,000 households.) Yet, on the eve of the third plague of 1374, the chronicler Stefani put the population of Florence at 60,000 or more. The city responded again with remarkable speed to the losses incurred from this third plague. By the tax records of 1379, its population tallied 13,779 households. Given a household multiplier of around four (slightly less than in 1427), Florence had recouped most of its losses within five years. After the fourth plague of 1383 and on the eve of the fifth of 1400, Florence's population once again stood at 60,000.120

In addition, the plague stimulated will writing in Tuscany and Umbria, from the rich down the social hierarchy. In Florence, wills per annum increased threefold after the Black Death and in Tournai fourfold, despite shrinking populations in both places. Similarly, the demand to be buried in Siena's Dominican cemetery rose in non-plague years in tandem with the rising prestige of the Dominicans in post-plague Siena, as illustrated in the pious choices of the laity in their last wills and testaments.121 To control for these demographic shifts and counterbalancing tendencies, I have charted the plague figures as ratios of the preceding intervals of non-plague years. By these ratios, the steady downward thrust of plague mortality is even more striking than that shown by the raw figures (see Figures 19–20). From the testamentary evidence of the six Italian cities, plague mortality relative to non-plague years was less than a quarter of 1348's onslaught by the third plague (1374) and one-sixth the ratio.
by 1400. From the Sienese burials, 1374’s toll amounted to half the relative mortality of the preceding plague of 1363, and the last plague the friars recorded, that of 1430, killed only a tenth the numbers taken in 1363 relative to previous years of non-plague deaths.

Testaments: Six Cities

Plague years as a ratio of non-plague years

Figure 19

Sienese Plague Burials

Plague mortality as a ratio of non-plague mortality
Our best example comes from the citywide lay confraternity of San Francesco in Orvieto. In addition to an obituary of all its members from 1337 to 1398, it kept a matriculation list over the same time span. In 1348, 109 members or half the brotherhood died, amounting to thirty-six times the average per annum mortality since the confraternity’s foundation. With the second plague of 1363, deaths rose above any previous non-plague year (22) but were only a fifth the 1348 toll. By the third and fourth plagues, 1374 and 1383, the numbers of deaths (8 and 9) tumbled to just over one-twentieth the plague’s first strike (see Figure 15). For this community, we can be certain that the decline did not simply arise from a progressively shrinking population exposed to death. In addition to being an extraordinary year for deaths, 1348 was equally unusual for attracting new entrants: while 109 died, 110 joined. No doubt the confraternity’s attraction hinged on its role in providing for the spiritual and corporeal needs of the dead, but it was not a matter of the dying signing up on the spot to ensure themselves the proper sacraments and burial. The new entrants did not boost the confraternity’s mortality rates. Forty-four percent of them as opposed to 54.8 percent of the previously enrolled members died in that year. Moreover, the confraternity’s popularity continued through the century, with more members joining after 1349 than before; thus the decline in mortalities relative to the community’s population was even steeper than the raw death figures chart.
Another characteristic of the adaptation and immunity of late medieval population was the radical change in the age structure of the victims. The records of Siena are the only ones I know to cover the burials of the laity across the plague experience from the Black Death of 1348 to the fifteenth century. Here, we witness a remarkable transformation. Of 136 buried in the Dominican cemetery in 1348, only 12 were identified as children. With the second plague in 1363, their proportion soared to 116 of 331, or over a third of the burials; with the third plague of 1374, the children's numbers climbed still higher, from a third to over half (136 of 233 burials), and with the fourth plague (1383), children accounted for a staggering 88 percent of that year's victims (230 of 260). Afterward, in the lesser plagues of 1390 and 1400, their proportion fell to 67 of 151 and 62 of 182, lower than in 1383 but still much above the proportions of the 1360s—the supposed "plague of children." 

Nor does Siena appear to have been exceptional. Already by the third plague of 1374, the chronicler Ranieri of Pisa reported that 80 percent of the plague victims in his city were children twelve years old or younger. With the
first burial records for a plague year in Florence—1400—the consequence for children is again telling: over two-thirds of the dead were identified as infants or children.\textsuperscript{127} By the plague of 1423–1424, when the Florentine gravediggers began to distinguish those dying from plague with a "P," child victims were just under 70 percent. By contrast, modern plague has never been a disease of children; nor have the ages of its victims—the highest proportion being between twenty and forty—shown notable differences over place or time.\textsuperscript{128} In 1918, looking back on twenty years of plague in India, the plague commissioner Norman White observed the very opposite of what the burial trends of the late medieval plagues have traced: instead of being the plague's principal victims, infants and young children [more than any other portion of the population] enjoyed a certain degree of immunity.\textsuperscript{129} In 1911 and 1922, a plague fighter of Manchuria, Wu Lien-Teh, saw the same with pneumonic plague.\textsuperscript{130}

A team of archaeologists and microbiologists has recently claimed to have discovered DNA traces of \textit{Yersinia pestis} in the pulp of teeth from those buried in fourteenth-century graves at Montpellier. They have concluded: "we can end the controversy: Medieval Black Death was plague."\textsuperscript{131} The ossio-archaeologists Alan Cooper and Hendrik Polnar have pointed out that the extraction of DNA from ancient bones is fraught with technical difficulties and have expressed grave doubts about the Marseilles group's proclamations.\textsuperscript{132} Certainly, the historian will want to see if other studies from different plague sites around Europe corroborate these claims. So far, they do not. After years of such testing from well-preserved plague hospital graves of the late Middle Ages as well as of the seventeenth century in other places in France, Britain, and Denmark, no such positive results have turned up.\textsuperscript{133} But, regardless of what the agent may have been, the signs and symptoms of the two diseases, their epidemiologies, and the interactions between human hosts and the pathogens were entirely different.

Despite medical nomenclature that labels diseases after the names given to their pathogens, a disease is not a macrobiotic agent; rather, it is a relationship between a pathogen and its human hosts; both sides can develop and change radically over time, as with tuberculosis. If the microbe of the late medieval plagues was \textit{Yersinia pestis}, medical scientists will then have to explain at least two new enigmas for biological evolution. Why did a disease that once passed rapidly person-to-person become a rat disease dependent on a flea vector? Why did the human species once possess an ability to acquire immunity to this microbe and then lose it? With other diseases, natural selection has moved in precisely the opposite directions, benefiting the means and efficiency of transmission, while also (to the mutual benefit of both parasite and host) enhancing their mutual adaptation.\textsuperscript{134} Thus rat diseases such as typhus have evolved with the pathogen's natural selection into diseases that short-circuit the
rat to spread faster and more efficiently person-to-person via lice. I know of no disease of rats that has evolved in the reverse direction. Second, to defend against the ever-increasing barrage of new pathogens, the human species has diversified, and its immune system has developed over time because of the bombardment of new pathogens and subsequent genetic mutations. Although a human population unexposed to a disease for generations may temporarily lose its immunity to a pathogen, with disastrous consequences (as happened with plague in seventeenth-century Venice, Genoa, Naples, and other places), I know of no case (before the massive influx of antibiotics of the past decade) in which humans have lost all capacity to acquire immunity to a microbiotic agent to which they were once able to adapt.

Unlike modern populations and their early encounters with *Yersinia pestis* in the Orient and the subtropics, those of the later Middle Ages adapted to their new plague with remarkable success, as reflected by sharply falling levels of mortality and the rapid domestication of the disease as one largely of children over the first hundred years of the Black Death. The steepness of this adaptation compares favorably even with the late nineteenth and twentieth-century conquest of infectious diseases in England and Wales, which was then aided by vaccination, modern medicine, and new measures of public health. Of the four principal childhood killers—measles, whooping cough, scarlet fever, and diphtheria—the fall in mortality from scarlet fever from the mid-nineteenth century to the 1920s was the only one that was as steep and steady as the late fourteenth-century's "triumph over plague" (see Figure 21).

In conclusion, the character of the Black Death—its speed, mode of transmission, seasonality, cycles of recurrence, and the swiftness by which Western Europeans adapted to its pathogen over time—was wholly different from that of the rat-based bubonic plague of the late nineteenth century. In addition, the psychological and cultural consequences of the late fourteenth and fifteenth-century plagues do not conform to the picture of pessimism and the breakdown of secular forms of mentality heretofore proposed by historians. Pinning long-term effects on single events is hazardous in any case and even more so with such factors as levels of violence, difficult to quantify or to judge qualitatively over a landscape as vast and variegated as Western Europe. Nonetheless, the Black Death and its recurrences cannot be shown to have ushered in unequivocally a more "violent tenor of life" that supposedly ensued over the late fourteenth and fifteenth centuries. Instead, stability, not violence, followed in some places, such as appears with the growth of centralized authority in Florence and a corresponding decline in factional strife within its city walls, or with the growth of diplomacy and the balance of power between city-states in northern and central Italy during most of the fifteenth century, or again with the conclusion of the Hundred Years' War in France by the mid-fifteenth century.

The more immediate consequences of the Black Death and its successive bouts are easier to isolate. After the first assault, contemporaries' explanations and attitudes across a wide social and intellectual spectrum show a sharp turnabout. While chroniclers in 1348 relied on the supernatural and based their
explanations on the constellation of planets and bizarre happenings in distant lands, those commenting on the plague's successive bouts increasingly turned to political, social, and hygienic conditions within their own territories to understand its origins and transmission. From distrust, even hatred, of doctors during the first outbreak, Europeans looked to the medical profession for advice and cures, as evinced by the plague tract becoming by the beginning of the fifteenth century one of the earliest forms of popular literature in the West. Similarly, frenzied expiation of plague guilt seen in the pan-European movement of the flagellants and the burning of Jews from 1348 to 1350 were not repeated during successive plagues, at least for the next hundred years or more. Instead, later movements such as the Bianchi in Italy were organized top-down and were known for their orderliness, and Jews could accompany gentiles in civic processions to hasten the end of plagues.

This change in mentality and behavior, I argue, hinged on the steady and rapid adaptation between Europeans and their new bubonic pathogen. It helps to explain a fundamental enigma of the early Renaissance mentality: why a new culture of secularism, state-building, and "fame and glory"—the latter seen even in the testaments of peasants, artisans, and shopkeepers in Tuscany as well as in the north of Europe—should have sprung forth in the midst of mass mortality, and why those who dealt most intimately with death, plague doctors, should have been the first to claim to have surpassed the ancients in any branch of secular learning. Had the plague behaved like modern plague or even other infectious diseases such as smallpox with complex mechanisms of human immunity, which often fail to show steady and progressive declines in mortality, these "Renaissance" men and women might not have been so confident. As revealed in the early plague reports at the turn of the twentieth century, the British medical corps, in the full bloom of colonial glory and industrial and scientific progress, faced India's mounting annual death tolls from plague with fatalistic resignation (even though the numbers killed were considerably lower than those of the late medieval plagues, both absolutely and especially relative to their populations).

The history of the Black Death in its first hundred years reveals that violent epidemics in past time do not always have the same cultural consequences. They need not always provoke distrust of authority or hatred of doctors, as René Baehrel argued for plague, cholera, and other epidemics in Europe from the seventeenth to the nineteenth centuries, or undermine secular mentalities, leading inexorably to pessimism and transcendental religions, as William H. McNeill generalized more broadly across time and space. As different pathogens provoke different consequences for our bodies and populations, they also spark differences for our minds.

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Notes

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10 Samuel Kline Cohn, Jr., *The Laboring Classes in Renaissance Florence* (New York, 1980), chap. 8. Also, the violence among other social classes as measured by numbers of assaults and batteries declined steeply from the 1340s to the fifteenth century.


13 See, for instance, *Chronica Olivensis auctore Stanislao, abbate Olivensi*, in *Monumenta Poloniae historica* 1, ser. 6 (Lvov, 1893): 345.


16 Among others, see *Annales Pistorienses sive Commentarii Rerum Gestarum in Thuscia . . . Ab anno MCCC usque ad An MCCCXLVIII auctore Anonymo Sychrono*, in *RIS*, vol. 11 (Milan, 1727), col. 526. Similar tales are well known to historians of the later Middle Ages and are often repeated in general texts.


18 Implicitly, this is the sense of Biraben's survey and Philip Zeigler's *Black Death*; more recently, historians have become more explicit, not only for the later Middle Ages but for the early modern period as well; see Jean Delumeau, *La peur en Occident, XIVe–XVIIIe siècles: Une cité assiégée* (Paris, 1978), 357–64; and Ginzburg, *Ecstasies*, 70–73. C. M. Cluse, "De Jodenvervolgingen ten Tijde van de Pest (1348–9) in de Zuidelijke Nederlanden," *Koninklijke Academie voor Geneeskunde van België* 61, no. 2 (1999): 135–73, has argued that the flagellants in the Low Countries did not provoke the Jewish pogroms of 1349. But neither nor R. Jansen-Sieben, "Ooggetuigen en Flagellanten anno 1349," *Koninklijke Academie*, 175–98, has denied their unsanctioned and disruptive marches across Europe; Jansen-Sieben has seen them as indicative of "the chaos, general panic, the flight of countless people" in 1349.


21 *Chronique de l'Abbaye de Floreffe, de l'Ordre des Prémontrés dans l'ancien comté de Namur*, in *Monuments pour servir à l'histoire des Provinces de Namur, de Hainaut et de Luxembourg*, Le Baron De Reiffenberg, ed., vol. 8 (Brussels, 1848), 147–49.

22 David Nirenberg, *Communities of Violence: Persecution of Minorities in the Middle Ages* (Princeton, N.J., 1996), 231–49. Anna Foa, *The Jews of Europe after the Black Death*, Andrea Grover, trans. (Berkeley, Calif., 2000), 13–16, has seen 1348 in a similar vein: "for the medieval Ashkenazic world, the material, cultural, and psychological consequences of the dramatic events of 1348 were truly a point of no return" (p. 16). However, an older historiography sees this post-plague history as more variegated and complex at least for the Jews in Spain. See, for instance, Angus MacKay, "Popular Movements and Pogroms in Fifteenth-Century Castile," *Past and Present*, no. 55 (1972): 33–67, who shows that after the persecutions of 1391, the Jewish communities and especially those of the *conversos* were protected by church and monarchy and prospered until a sharp reversal in their fate in 1449.

23 For 1349, *Rocznik Miechowski*, in A. Bielowski, ed., *Monumenta Poloniae historica*, series 1 (1872), 2: 885–86, describes the plague in Hungary but does not mention it afflicting Poland. Also Biraben, *Les hommes et la peste*, 1: 104, maintains that no source mentions the plague in southern Poland during its first wave, 1347 to 1351.

24 Nirenberg, *Communities of Violence*, 249.


26 Chroniclers and other sources, literary as well as artistic, point to numerous examples of such processions organized by a local bishop or town council at the time of plague from the late fourteenth to the seventeenth century. For examples in late fourteenth and fifteenth-century Italy, see Daniel E. Bornstein, *The Bianchi of 1399: Popular Devotion in Late Medieval Italy* (Ithaca, N.Y., 1993), 22, 61.


For this claim, see Campbell, *Black Death and Men of Learning*, 11; however, I do not find any evidence in Gentile's tracts that he made any such suggestions. For his various tracts, see Sudhoff, 5 (1911), 83–87, 332–40.


Chauliac, *Chiurgia*, 176.

"Ein Paduaner Pestkonsilium von Dr. Stephanus de Doctoribus," in Sudhoff, 6 (1913), 356.


Gian Maria Varanini, "La peste del 1347–50 e i governi dell'Italia centro-settentrionale: Un bilancio," in *La peste nera*, 305. Unfortunately, Varanini neither names the doctor nor cites a source.


"Kölner Pestinkunabel kurz vor 1500," in Sudhoff, 16 (1925), 152.

"Die Pestschriften des Johann von Burgund und Johann von Bordeaux," in Sudhoff, 5 (1911), 58–75; and Johannes Jacobi, "Tractatus de peste ad honorem sancte et individue Trinitatis," in Sudhoff, 17 (1925), 16–32.

Sudhoff, 17 (1925), 20.


"Der Tractatus pestilentialis eines Theobaldus Loneti aus Aurigny in der Diözese Besançon," in Sudhoff, 17 (1925), 54. Later in his plague tract, he claimed much the same as Johannes Jacobi and others that since this plague had not struck in their times, they had nothing to say (p. 55).


"Die Pestschrift des Blasius Brascinensis (Barcelonensis)," in Sudhoff, 17 (1925), 104.


Katherine Park, *Doctors and Medicine in Early Renaissance Florence* (Princeton, N.J.,
Ann G. Carmichael, *Plague and the Poor in Renaissance Florence* (Cambridge, 1986), 26, 79. A decade later, Carmichael, "Bubonic Plague: The Black Death," in *Plague, Pox, and Pestilence*, Kenneth F. Kiple, ed. (London, 1997), was more emphatic: "Because of these sudden and abnormal swellings on different places of victim's bodies, we can now confidently identify the epidemic's cause as *Yersinia pestis*" (p. 60). Elizabeth Carpenter, *Une ville devant la peste: Orvieto et la Peste Noire de 1348* (Paris, 1962), 113, uses the Florentine chronicler Marchionne di Coppo Stefani to draw the same conclusion: "the bubonic plague is here briefly but exactly described." Many others have said the same, even doctors who are plague specialists; see Jacqueline Brossollet and Henri H. Mollaret, *Pourquoi la peste? Le rat, la puce et le bubon* (Paris, 1994), 19: "Cevical, axilliar or inguinal bubo, fever, delirium, rapid death, these are the precise symptoms of bubonic plague and which cannot be confused with any other diseases."


According to Graham Twigg, *The Black Death: A Biological Reappraisal* (London, 1982), 133–35, the Black Death spread at five miles per day, while in South Africa, 1899–1925, plague spread at eight to twelve miles a year; on the slowness of modern plague and its gradual movement in China from 1866 to 1894, see Pollitzer, *Plague*, 15; and for the plague in New Orleans in 1915, Hirst, *Conquest of Plague*, 304–05. In certain Indian villages in the early twentieth century, the infection took six weeks to spread 300 feet, *Journal of Hygiene* 7, no. 3: Extra "Plague Number" (1907): 839.

The first observation of this fact that I have spotted comes from W. F. Gatacre, *Report on the Bubonic Plague in Bombay*, 1896–97 (Bombay, 1897), 51–52, even though the plague commissioners continued until the first decade of the twentieth century to believe that the disease was communicable. See Thompson, "Contribution to the Aetiology of Plague," 153–67; Thompson, "On the Epidemiology of Plague," 537; Hankin, "On the Epidemiology of Plague," 77; Hirst, *Conquest of Plague*, 118; Bannerman, "Spread of Plague in India," 180–81; and "General Considerations regarding the Spread of Infection, Infectivity of Houses, etc. in Bombay City and Island," *Journal of Hygiene* 7 (1907): 875–76: "that one of the safest places during the epidemic is the ward—the 'acute ward' we might add—of a plague hospital."
Similarly, the bacillus is not particularly dangerous in the laboratory; see Simond, "La propagation de la peste," 665.


55 See the contradictory conclusions from Gatacre, *Report on the Bubonic Plague in Bombay*. After reports from the hospital at Parel and many others of the remarkable absence of contagion in hospitals, the report nevertheless concluded: "The disease appears to be both infectious and contagious" (p. 231).

56 Wu Lien Teh, "Plague in the Orient with Special Reference to the Manchurian Outbreaks," *Journal of Hygiene* 21 (1922–23): 62–76: "Rooms where patients have died of Pneumonic Plague are not particularly dangerous," and "sick patients travelling in railway carriages have not infected their fellow passengers."


61 The most prominent exception is Twigg, *Black Death*, who in the last section of his book speculated that the disease might have been anthrax. See most recently Susan Scott and Christopher J. Duncan, *Biology of Plagues: Evidence from Historical Populations* (Cambridge, 2001), 5, 385, who suggest that it may have been a filovirus like Ebola. Following Twigg, they explain convincingly the improbability of the late medieval and early modern plague as having *Yersinia pestis* as its agent. They produce little, however, to support any filovirus as the substitute.

62 This is the central thesis of Carmichael, *Plague and the Poor*, also J. F. D. Shrewsbury, *A History of Bubonic Plague in the British Isles* (Cambridge, 1970), reasoned that, since the bubonic plague could not have possibly killed so many in Britain, a cluster of other diseases must have accompanied the plague.

63 Some such as S. R. Ell, "Interhuman Transmission of Medieval Plague," *Bulletin of the History of Medicine* 54 (1980): 497–510, have speculated that the human flea was the vector of a person-to-person transmission of the plague, but despite claims of such transmission in Morocco in the 1940s and Egypt in the nineteenth and twentieth centuries, scientists remain doubtful that plague could be spread in epidemic proportions by such a weak conveyer. Even in laboratory cases, the human flea is very unlikely to spread the disease; see "Further Observations on the Transmission of Plague by Fleas," *Journal of Hygiene* 7 (1907): 415, 881; Thomas Butler, "A Clinical Study of Bubonic Plague: Observations of the 1970 Vietnam Epidemic," *American Journal of Medicine* 53 (1972): 51: "The human fleas Pulex irritans is not an efficient plague vector and rarely, if ever, has transmitted plague from man to man."
See Shrewsbury, *History of Bubonic Plague*.


Benedictow, *Plague in the Late Medieval Nordic Countries*. In India and elsewhere in the subtropics, around 3 percent of cases have secondary pneumonic complications, yet person-to-person spread of the plague even in these cases remains rare.

See, for instance, the chronicler of Santa Maria Novella's description of plague in 1348: "seva peste videlicet inguinarie vel subascelle, carbunculi, seu antracis aut alicuius similis, ex quibus bidaunis aut triduanis ergitudinibus fere due partes hominium decesserunt"; Stefano Orlandi, O.P., "Necrologio" di S. Maria Novella (Florence, 1955), 1: 65.


sacri, vol. 3 (Venice, 1765), 324; Codex Novimontibus in Continuatio Novimontensis, in Monumenta Germaniae historica, vol. 9, G. H. Pertz, ed. (Hanover, 1851), 675; Chronicon Galfridi le Baker de Swynebrooke, Edward Maude Thompson, ed. (Oxford, 1889), 100.

72 Michele da Piazza, Cronica, 82, 86.

73 Morelli, Ricordi, 207; Chronicon Galfridi le Baker, 100.

74 “Ein Pestkonsilium des Giovanni Santa Sofia an den Rat der Stadt Udine,” in Sudhoff, 6 (1913), 348.

75 “Ein 'Regimen contra febrem pestilenciae simplicem,'” in Sudhoff, 8 (1915), 269; "Mag. Hermann Schedels aus Nürnberg für seinem Dienstherrn Bischof Johann von Aich zu Eichstäd, 1453,” in Sudhoff, 14 (1923), 95; Practica Antonii Guainerii papiensis doctoris clarissimi et omnia opera (Florence, 1517), 107r.

76 The former comes from my calculations derived from the Bombay Report of 1896–97, the latter from Alexandre Yersin’s estimates from the plague in Hong Kong in 1894, "La peste bubonique á Hong-Kong,” Annales de Institut Pasteur 8 (1894): 663.


78 I have found fifty-five such examples in the plague tracts edited by Sudhoff.


80 Many chroniclers and doctors described much the same signs. In addition to Guy de Chauliac, see Gabriele de Mussis in Haeser, Lehrbuch, 2: 157–62.

81 Guy de Chauliac, in Haeser, Lehrbuch, 2: 175.


83 Manson’s Tropical Diseases, 20th edn. (London, 1996), 921.

84 Il memoriale di Iacopo di Coluccino, 397.

85 “Tractatus de epidemia anni 1424 (cuiusdam Papiensis scriptus anno 1431),” in Sudhoff, 16 (1925), 155.


89 Morelli, Ricordi, 210–11.

90 Archivio di Stato, Firenze, Ufficiali della Grascia, I Libri dei morti, n. 187: 1398–1412; for
Arezzo in 1390, mortality also edged upward in March (24 deaths over the monthly normal 10 to 15 deaths) and reached its peak of 437 deaths in June. By September, mortality had returned to normal; Archivio di Fraternità dei Laici, Libri di morti, no. 882.


104 *Journal of Hygiene* 8 (1908): 275.


106 *Washington Post*, Historical Weather Data (last ten years).


108 Hans Zinsser, *Rats, Lice, and History* (London, 1935), 93; for Marseilles, the rat flea (*X. cheopis*) comes to the fore only in August and reaches its peak in September followed by October; its lowest numbers are in May and June; Gauthier and Raybaud, "Des variétés du pulicidés."


*Manson's Tropical Diseases*, 19th edn., 591.


*De peste libri tres, opera Jacobi Dalechampii* (Leiden, 1552); Zinsser, *Rats, Lice, and History*, 89.

I have compiled these figures from Orlandi, "Necrologio" di S. Maria Novella, vol. 1.


Many preachers and chroniclers such as Jean de Venette and John of Reading decried the promiscuous sex and multiple births that followed the Black Death. Such rebounds in fertility continued to follow in the wake of later plagues; see David Herlihy and Christiane Klapisch-Zuber, *Les Toscan et leurs familles: Une étude du catasto florentin de 1427* (Paris, 1978), 426–27.


Samuel K. Cohn, Jr., *The Cult of Remembrance and the Black Death: Six Renaissance
Cities in Central Italy (Baltimore, 1992), 37.


123 My calculations differ slightly from those of Henderson, "La confraternita e la catastrofe," 103, because I have used the deaths and entry of new members for the entire year, 1348, and not for what she has considered to be the plague months.

124 Similarly, Charles Creighton, History of Epidemics in Britain, 2d edn., D. E. C. Eversely, E. A. Underwood, and L. Ovenall, eds. (1894; London, 1965), 1: 122, finds that the plague of 1348–1349 in England carried off able-bodied young adults and not the young, weak, or elderly.

125 I necrologi di Siena di San Domenico in Camporegio (Epoca Cateriniana), M.-H. Laurent, ed. (Siena, 1937). The English medievalist V. H. Galbraith discredited the observation of the Anonimale Chronicle that the third plague of 1375 was particularly fatal to children, alleging that the York chronicler had mistakenly copied what he had said for 1361: The Anonimale Chronicle 1333 to 1381, Galbraith, ed. (Manchester, 1927), 191. But across England and Europe, later chroniclers continued to remark that plague killed children first and foremost. The slight upturn in the proportion of adults killed by plague in the fifteenth century follows a cycle seen with other childhood diseases such as smallpox. When mortalities decline to a certain level, more adults survive who have had no exposure to the disease and thus with the next outbreak begin to die in increasing numbers; see Burnet, Natural History of Infectious Disease, 228–29.

126 Cronaca di Pisa di Ranieri Sardo, Ottavio Banti, ed. (Rome, 1963), 186.

127 Occasionally, the notary supplied the ages of those they called children (pueri or puellae); they ranged from those who died stillborn to a maximum of nine years old, generally less than the time since a previous strike of plague.


129 Norman F. White, "Twenty Years of Plague in India with Special Reference to the Outbreak of 1917–18," Indian Journal of Medical Research 6, no. 2 (1918): 211.

130 Pollitzer, Plague, 516. In the Manchurian plague of 1920–1921, 78.1 percent of the cases were among those aged twenty-one to forty.

131 Didier Raoult, Gérard Aboujoharam, Eric Crubézy, Georges Larrouy, Bertrand Ludes, and Michel Drancourt, "Molecular Identification of 'Suicide PCR' of Yersinia pestis as the Agent of Medieval Black Death," Proceedings of the National Academy of Science 97, no. 23 (November 7, 2000): 12800–03.

132 Such headline pronouncements fail to show the "criteria of authenticity" as set out by Alan Cooper and Hendrik Polnar, "Ancient DNA: Do It Right or Not at All," Science 289 (August 18, 2000): 1139. I am grateful to Alan Cooper for personal correspondence.

133 Their first results, "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 Science* 95 (October 1998): 12637–40, reported finding DNA traces of *Yersinia pestis* in dental pulp from two grave sites in Provence, one at Lambesc for 1590, the other at Marseilles for 1722. These findings were criticized because of suspicions of *Yersinia pestis* contamination in their laboratory. By contrast, Alan Cooper of the departments of Zoology and Biological Anthropology at the University of Oxford has been working at Black Death and early modern plague sites in London, Copenhagen, and two places in France with no such findings of *Yersinia pestis*. Scott and Duncan, *Biology of Plagues*, 8, 49, 340, 350, concede that plague in Marseilles both in 1348 and in 1720 was *Yersinia pestis*, even though the concession cuts against the evidence and arguments about the plague's biology and epidemiology marshalled throughout the remainder of the 400-page book. The levels of mortality and speed of transmission of both plagues at Marseilles are commensurate with the Black Death and its recurrences at other places but not with modern bubonic plague.


135 Zinsser, *Rats, Lice, and History*, 270; and *Manson's Tropical Diseases*, 19th edn., 213.

136 On the development of human genetic diversity and the historic build-up of human immunity, see Christopher Wills, *Plagues: Their Origin, History and Future* (London, 1997), chap. 11.


138 In addition to *Death and Property in Siena* and *The Cult of Remembrance*, see most recently, Samuel K. Cohn, Jr., "The Place of the Dead in Flanders and Tuscany: Towards a Comparative History of the Black Death," in *The Place of the Dead: Death and Remembrance in Late Medieval and Early Modern Europe*, Bruce Gordon and Peter Marshall, eds. (Cambridge, 2000), 17–43. It shows men and women in the heartland of Huizinga's "Waning of the Middle Ages" to have been as impassioned with proclaiming and preserving their earthly memories in the early fifteenth century as were those in Florence, Arezzo, or Perugia.


140 Baehrel, "La haine de classe en temps d'épidémie," esp. 358–60. His evidence derives mostly from the first massive cholera epidemic in Europe of 1831–1832 but is generalized as a common reaction to epidemics across time. McNeill, *Plagues and People*. 