

Philip Slavin

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## Death by the Lake: Mortality Crisis in Early

**Fourteenth-Century Central Asia** The geographical origins of the Black Death is one of the most pressing and hotly debated questions concerning the historiography of the Second Plague Pandemic, involving not only historians but also (in recent years) palaeogeneticists. Roughly speaking, the history of the debate begins in 1893 with Gasquet's *The Black Death of 1348 and 1349* (1893), which situated the origins of the plague in China, whence Italian merchants spread it to Europe in trading caravans, through Crimea. In 1951, Pollitzer brought attention to the existence of two East Syriac Christian (Nestorian) cemeteries in Chu Valley (in the Issyk-Kul' region of northern Kyrgyzstan), excavated in 1885/6, containing ten inscriptions from 1338/9 indicating "death through pestilence." Although Pollitzer himself never studied the epigraphical evidence from the Issyk-Kul' cemeteries, he "relocated" the initial outbreak of the plague to Central Asia, whence, according to him, it spread to Crimea and later to Europe. Dols adopted the "Central Asian origin" hypothesis in his 1977 monograph about the plague in the Middle East. Conversely, the "Chinese origin" hypotheses found advocates in Ziegler (1969), who was not aware of the Issyk-Kul' evidence, as well as in McNeill (1979) and Campbell (2016), who both saw Issyk-Kul' as an intermittent station in the pathogen's journey from China to Europe.<sup>1</sup>

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1 Francis A. Gasquet, *The Black Death of 1348 and 1349* (London, 1908; orig. pub. 1893), 2–3; Robert Pollitzer, *Plague* (Geneva, 1954), 14; Michael W. Dols, *The Black Death in the Middle East* (Princeton, 1977), 35–38; William H. McNeill, *Plagues and Peoples* (New York, 1976), 43; Bruce M. S. Campbell, *The Great Transition: Climate, Disease and Society in the Late-Medieval World* (New York, 2016), 246–247.

In 2014, Hymes suggested that the Mongols may have carried plague into China through Gansu Corridor during their conquest of Jin (northern China) as early as the first half of the thirteenth century. In 1977, Norris proposed an altogether different explanation, postulating that the Issyk-Kul' outbreak was unrelated to the European outbreak a few years later and that the disease originated in the Caspian basin (not China) before spreading to the west into the Golden Horde, to the east into Central Asia, and to the south into the Middle East. Norris' arguments were rejected in 1978 by Dols, who criticized Norris' thesis as unsubstantiated by any historical evidence; Norris' rejoinder reaffirmed his original position about the Caspian origin of the plague.<sup>2</sup>

The Chinese-origin hypothesis deserves attention. On the one hand, there is no reference to plague mortality on a *pandemic* scale in any Chinese source from the Yuan period, be it the *Yuanshi* chronicle or the local history gazetteers. On the other hand, as Hymes has recently shown, the sources make reference to sporadic outbreaks of epidemic mortality among Mongol soldiers campaigning in the Jin state during the early thirteenth century, as well as to two outbreaks of mass mortality in the south—in 1333 (the prefectures of Songjiang, Jiaxing, and Hangzhou) and 1344/5 (the prefectures of Fujian, Fuzhou, Yanping, Shaowu, and Tingzhou). We may also add a 1353 outbreak in Datong (in Shanxi province, northwestern China), which was designated as a “pestilence” (“*Yi*”) that killed more than half of the local inhabitants.

The evidence does not suggest, at least at present, that these mortality crises were caused by plague. Although some scholars, including McNeill and Cao, see the 1333 outbreak as a prelude to the outbreaks in Europe from the late 1340s to the early 1350s, scholars of the Yuan and Ming periods remain skeptical about such an interpretation. Nonetheless, the remarkably high mortality rates during the Datong mortality should discourage us from rejecting the possibility of localized/regional outbreaks of plague in different parts of China, albeit differing in scale from, and unrelated to, the pandemic mortality of the Black Death. What we lack is any indication of a plague

2 Robert Hymes, “A Hypothesis on the East Asian Beginnings of the *Yersinia Pestis* Polytoxy,” *Medieval Globe*, I (2014), 285–308; John Norris, “East or West? The Geographic Origin of the Black Death,” *Bulletin of the History of Medicine*, LI (1977), 1–24; Dols, “Geographical Origin of the Black Death: Comment,” *ibid.*, LII (1978), 112–113; John Norris, “Response,” *ibid.*, 114–120.

pandemic that engulfed vast territories of the Yuan Empire and later moved into western Eurasia through Central Asia.<sup>3</sup>

Recent advances in palaeogenetics shed important light on the controversy regarding the geographical origins of the plague. In a 2010 study, Morelli et al. established a global phylogeny of *Yersinia pestis* that suggested an origin and evolution of the bacillus in or near China. In 2013, Cui et al. identified the four-lineage “big bang” polytomy of *Yersinia pestis*, which they dated between 1142 and 1339 (a median date of 1268 was re-calibrated by Spyrou et al. in 2018 to 1238). They found the Qinghai-Tibet Plateau to have had the largest diversity of strains, meaning that this region could have been the original *focus* of the pathogen polytomy. In 2017, Eroshenko et al. sequenced fifty-six modern samples of *Yersinia pestis* collected from the three plague foci of Kyrgyzstan (Tien-Shan’ [itself consisting of three autonomous sub-foci—Sarydzhas, Upper-Naryn, and Aksai], Alai and Talas) during the past fifty years. Fifteen of these samples came from the vicinity of the Issyk-Kul’ region (the Tien-Shan’ focus in eastern Kyrgyzstan).<sup>4</sup>

Of particular importance is the identification of an additional and previously unknown strain of Branch o (o.ANT<sub>5</sub>), which is unique to the Tien-Shan’ focus of eastern Kyrgyzstan and south-eastern Kazakhstan. It is older than most other known pre-Black Death strains of the same clade (except o.ANT<sub>4</sub>, responsible for the sixth-century Justinianic plague, which just preceded o.ANT<sub>5</sub>). In addition to o.ANT<sub>5</sub>, the Issyk-Kul’ region is also dominated by three additional strains of *Y. Pestis*—o.ANT<sub>2</sub>, o.ANT<sub>3</sub>, and 2.MED1. This remarkable diversity of strains points to the possibility that the Tien-Shan’ focus in eastern Kyrgyzstan (which covers Issyk-Kul’) was the original location of the great big bang of the plague lineages (contrary to Cui et al.’s placement of the

3 Hymes, “Hypothesis,” 288–294, 299–300; McNeill, *Plagues and Peoples*, 43; Cao Shuji, “Dili huanjing yu Song-Yuan shidai de chuanranbing,” *Lishi yu dili*, XII (1995), 183–192. For Cao’s arguments, see Hymes, “Hypothesis,” 287; Paul D. Buell, “Qubilai and the Rats,” *Sudhoffs Archiv*, XCVI (2012), 127–144; *Yuanshi* (Beijing, 1976), Chapter 43, 912 (I am grateful to Ilya Mozias, who translated the relevant entry).

4 Giovanna Morelli et al., “Yersinia Pestis Genome Sequencing Identifies Patterns of Global Phylogenetic Diversity,” *Nature Genetics*, XLII (2010), 1140–1145; Yujun Cui et al., “Historical Variations in Mutation Rate in an Epidemic Pathogen, *Yersinia Pestis*,” *Proceedings of the National Academy of Sciences* (hereinafter *PNAS*), CX (2013), 577–582; Galina Eroshenko et al., “Yersinia Pestis Strains of Ancient Phylogenetic Branch o.ANT Are Widely Spread in the High-Mountain Plague Foci of Kyrgyzstan,” *PLoS ONE*, XII (e0187230).

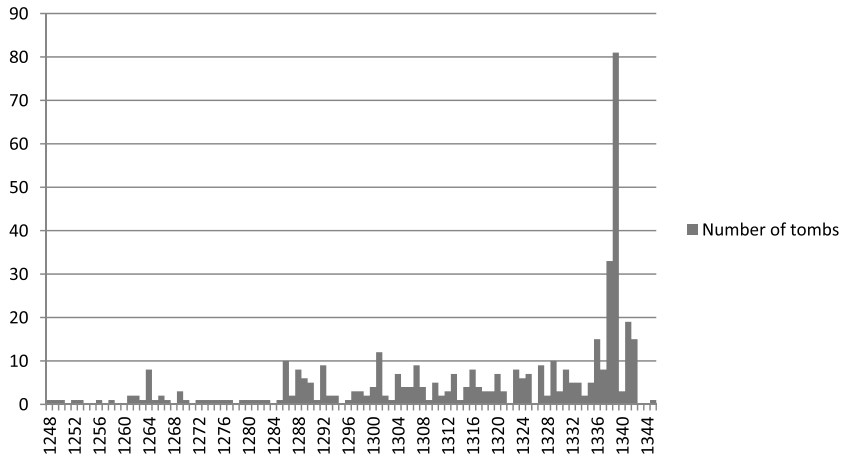
polytomy on the Qinghai-Tibet Plateau). Such reasoning replicates and expands upon Green's 2014 analysis and the historical application of the Cui team's work.<sup>5</sup>

The present article does not (and cannot) pretend to solve the mystery of the geographical origins of the Black Death. Instead, it focuses on an intriguing, yet unstudied, instance of a mortality crisis that preceded the Black Death outbreak in the Caspian/Crimea of late 1346 by seven to eight years but exhibited clear signs of plague. The outbreak in question occurred among the East Syriac (Nestorian) communities of the Chu Valley, not far from Issyk-Kul' Lake in northern Kyrgyzstan. Our information about the outbreak derives from a rich epigraphical corpus consisting of about 620 tombstone inscriptions from three East Syriac cemeteries in the Chu Valley. Scholars have been aware of the corpus of the Issyk-Kul' inscriptions for some time, but philologists, not historians, were the ones to explore it intensively. Historians of the East Syriac church used it to reconstruct the socioreligious aspects of local Christian communities, but no historians of health and disease attempted an analysis of the corpus to reconstruct the demographic and mortality patterns of the local population with regard to an outbreak of severe mortality that occurred in 1338/9. This article fills the gap, performing both linguistic and quantitative analysis on the epigraphical corpus to examine mortality trends.

The Issyk-Kul' mortality seems to be the earliest instance of a quantifiable mortality crisis during the so-called Second Plague Pandemic. In fact, it is the only quantifiable plague crisis in Central Asia during the Second Plague Pandemic. In the absence of palaeogenetic data from the same cemeteries, this study does not purport to establish any direct causal (let alone genetic) connection between the Issyk-Kul' mortality and the ensuing Black Death that hit Eurasia and North Africa from 1346 to 1353. Nor does it deny such possible connection. Instead, it treats the Issyk-Kul' crisis as a local instance of plague *preceding* the Black Death. To appreciate the timing and contours of its outbreak, it scrutinizes the environmental, climatic, and socioeconomic context of the Issyk-Kul' region in particular and Central Asia in general, wrapping the outbreak in this wider context.

5 For Monica Green's historical application of Cui et al.'s work, see Green, "Taking 'Pandemic' Seriously: Making the Black Death Global," *Medieval Globe*, 1 (2014), 35-41.

Fig. 1 Chronology of Christian Burials on the Issyk-Kul', 1248–1345



THE MORTALITY CRISIS AROUND ISSYK-KUL', 1338/9 The epigraphical corpus consists of about 620 tombstone inscriptions from three East Syriac (Nestorian) cemeteries in the Chu Valley. The sites in question are Karadzhigach, on the outskirts of Bishkek ( $42^{\circ}48'28''$ ,  $74^{\circ}42'30''$ ), Tokmak/Burana ( $42^{\circ}49'07''$ ,  $75^{\circ}18'28''$ ), and Krasnaya Rechka ( $42^{\circ}54'00''$ ,  $74^{\circ}57'36''$ ). Almost three-quarters of the inscriptions (439) are dated; the chronology spans from 1248 to 1345 (Figure 1). Pantusov (1849–1909), who excavated the first two cemeteries in 1885/6, reckoned that the total number of East Syriac tombstones in the area was around 3,000. Chwolson meticulously edited and published 548 inscriptions, almost all of them in Syriac. Kokovtsev (1905–1909), Dzhumagulov (1968, 1971, 1982, and 1987), and Klein (2000 and 2009) discovered and published, in stages, an additional seventy-two inscriptions.<sup>6</sup>

6 Daniel A. Chwolson, "Syrisch-Nestorianische Grabinschriften aus Semirjetschie," *Memoires de l'Academie Imperiale des Sciences de St. Petersburg*, XXXVII (1890), 10–168; *idem*, *Syrismnestorianische Grabinschriften aus Semirjetschie: Neu Folge*. (St. Petersburg, 1897); P. K. Kokovtsev, "Khristiyansko-siriyskiya nadgrobnyya nadpisi iz Almalyka, Zapiski Vostochnogo Otdeleniya Imperatorskogo Russkogo Arkheologicheskogo," *Obshchestva*, 16 (1904/5), 190–200; *idem*, "Neskol'ko novykh nadgrobnnykh kamney s khristiyansko-siriyskimi nadpisyami iz Sredney Azii," *Izvestiya Imperatorskoy Akademii Nauk*, 12 (1907), 427–458; *idem*, "K siro-turetskoy epigrafike Semirech'ya," *ibid.*, 11 (1909), 773–796; C. Dzhumagulov, "Die syrisch-türkischen (nestorianischen) Denkmäler in Kirgisien," *Mitteilungen des Instituts für Orientforschung*, 14 (1968), 470–480; *idem*, *Yazyk*

Of the 439 dated inscriptions, 114 (26 percent) are from 1337/8 and 1338/9—years 1649 and 1650, according to East Syriac dating, which began, by the Seleucid calendar, at 312 B.C.E. (each year ran from October 1 of the previous year to October 1 of the next year) (Figure 1). That this remarkable spike was connected to an acute mortality crisis is corroborated by ten inscriptions providing the additional detail that people “died of pestilence” (*mūt[ā] bi-mawtānā*, in Syriac). According to one tombstone inscription, “In the Year 1649 / this is the tomb / of the maiden Qiz Terim / who died of pestilence.” The Syriac term *mawtānā* has an unambiguous meaning of “pestilence” or “great mortality.” Yet, the presence of this term alone is by no means sufficient to suggest that *Yersinia pestis* caused the mortality crisis of 1338/9. In theory, palaeogenetic analysis involving sequencing genomes—in this case, from one of the *mawtānā* graves—could provide a definitive answer, as it recently did in several Black Death cemeteries in England, Germany, France, Italy, the Netherlands, Spain, Norway, and Tatarstan (and subsequent late fourteenth-century outbreaks). Such an undertaking is not, however, currently in the works at the Issyk-Kul’ cemeteries because the tombstones there were removed from the graves during the 1885/6 excavations, leaving no way to identify the original locations of the *mawtānā* graves or, indeed, any of the graves from the mortality years. To make matters worse, many of the skulls were also removed from the graves during the excavations rendering the whereabouts of most of them unknown. Hence, no identification of *mawtānā* with the Black Death of a few years later can be established without a palaeogenetic analysis.<sup>7</sup>

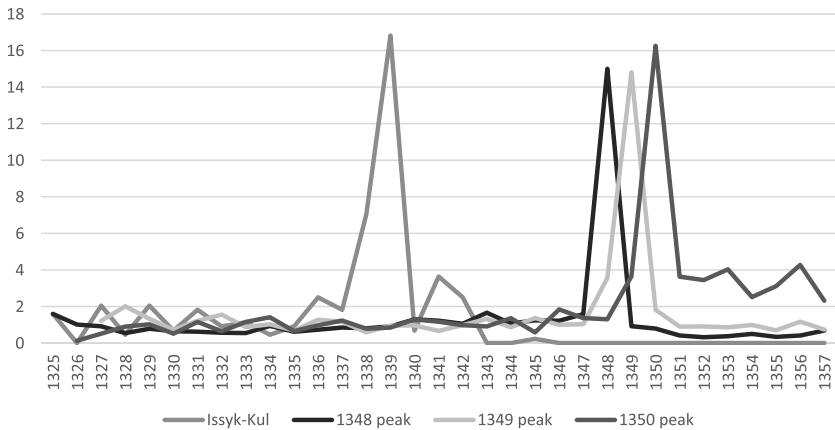
These difficulties notwithstanding, we can still present a good case that the 1338/9 outbreak was the earliest documented and quantifiable instance of fourteenth-century plague in Central

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*siro-tyurkskikh (nestorianskikh) pamyatnikov Kirgizii* (Frunze, 1971); *idem, Epigrafika Kirgizii, Vypusk 2* (Frunze, 1982); *idem, Epigrafika Kirgizii, Vypusk 3* (Frunze, 1987); Wassilios Klein, *Das nestorianische Christentum an den Handelswegen durch Kyrgyzstan bis zum 14. Jh.* (Turnhout, 2000); Klein and Kuvatbek Tabaldiev, “Zwei neu gefundene syrische Grabsteine aus Kyrgyzstan,” in Dietmar W. Winkler and Li Tang (eds.), *Hidden Treasures and Intercultural Encounters: Studies on East Syriac Christianity in China and Central Asia* (Münster, 2009), 87–90; John Stewart, *Nestorian Missionary Enterprise* (Edinburgh, 1928), 198–213.

<sup>7</sup> Chwolson, *Syrishnestorianische Grabinschriften aus Semirjetschie: Neu Folge*. (St. Petersburg, 1897), 32 (no. 142). The removal of the stones and skulls is surveyed in T. W. Thacker, “A Nestorian Gravestone from Central Asia in the Gulbenkian Museum, Durham University,” *Durham University Journal*, LIX (1967), 94–107.

Fig. 2 Annual Mortality Levels in Issyk-Kul' and Europe (Indexed on Pre-Plague Levels), 1325–1357



NOTES The “1348 peak” sample includes Baghdad, Barcelona, Lyon, Givry, Arezzo, Assisi, Florence, Perugia, Pisa, Siena, Bologna, and Dubrovnik (Ragusa). The “1349 peak” sample includes Besançon, Lausanne, Toumai, and London. The “1350 peak” sample includes Lübeck and Stralsund. All figures are indexed on averages for pre-plague years. Hence, for the “1348 peak” sample, 1 = average mortality rates for pre-1348 years.

Asia by closely scrutinizing the epigraphical evidence in its bio-environmental and socioeconomic contexts. The first step is to consider the ratio between mortality in “normal” years and that in 1338/9. Throughout the entire period from 1295 to 1345, the average number of Issyk-Kul’ tombstones in a single year was 4.4. The figure rose to 31 in 1337/8 and to 74 in 1338/9. This increase indicates that the mortality crisis seems to have started sometime in the spring/summer of 1338. The ratios between the crisis years (and, in particular, the second crisis year) and “normal” (that is, non-plague) years are strongly comparable with figures from different parts of Europe and the Middle East during the Black Death, deriving largely from probated wills (in the case of Givry in Bourgogne, from a local parish register, and in the case of Baghdad, annual counts of mortality of scholars). As Figure 2 indicates, the ratio for Issyk-Kul’ was nearly 17 to 1. The comparable ratios for locations where the plague peaked in 1348, 1349, and 1350 were, respectively, around 15 to 1, 15 to 1, and 16 to 1—a striking similarity.<sup>8</sup>

8 Stuart Borsch and Tarek Sabraa, “Refugees of the Black Death: Quantifying Rural Migration for Plague and Other Environmental Disasters,” *Annales de démographie historique*,

Another comparison between the Issyk-Kul' mortality and the Black Death in Europe concerns the distribution of deaths across genders. As Table 1 indicates, during the 1338/9 crisis, the ratio of male-to-female deaths went down to 0.9 from about 1.27 in normal years. One theory holds that in nonepidemic years, testosterone reduces the resistance to pathogens, whereas estrogen increases it, thus explaining why men are normally frailer than women. Whether this rule works in the case of plague outbreaks remains an unsolved question; the available evidence is contradictory. Sex ratios from different skeletal assemblages vary from place to place. At the Black Death burial site of East Smithfield (London), adult female skeletons accounted for 40 percent of the total adult skeletons identified by sex; at Hereford Cathedral and Dreux (northwestern France), the figures stood at 56 and 58 percent, respectively. The preponderance of one sex at a particular burial site does not, however, mean that one sex was at a higher risk of mortality than the other. As DeWitte has established, applying the biostatistical Gompertz Model of mortality, the East Smithfield evidence does not necessarily indicate that the Black Death in London was sex-selective. Likewise, Castex and Kacki concluded that the sheer number of sexed skeletons at both Hereford and Dreux was too small to establish Black Death sex selectivity.<sup>9</sup>

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CXXXIV (2017), 85; Jordi Gunzberg Moll, "Epidemias y mortalidad en la Cataluña medieval: 1300–1500," in Simonetta Cavaciocchi (ed.), *Le interazioni fra economia e ambiente biologico nell'Europa preindustriale sec. XIII–XVIII* (Florence, 2010), 57–80; Marie-Thérèse Lorcin, *Vivre et mourir en Lyonnais à la fin du Moyen Age* (Paris, 1981), 192; P. Gras, "Le registre paroissial de Givry (1334–1357) et la peste noire en Bourgogne," *Bibliothèque de l'école des chartes*, C (1939), 295–308; Samuel K. Cohn, Jr., "The Black Death: End of a Paradigm," *American Historical Review*, CVII (2002), 728–733; Martin Bertram, "Bologneser Testamente: Erster Teil: Die urkundliche Überlieferung," *Quellen und Forschungen aus italienischen Archiven und Bibliotheken*, LXX (1990), 208–212; Testamenta notariae, Vols. 1–5, Državni arhiv Dubrovnik (The State Archive of Dubrovnik) (I am grateful to Gordan Ravančić for making a digital copy of the Dubrovnik registers available to me); Ulysse Robert, *Testaments de l'officialité de Besançon, 1265–1500* (Paris, 1902), 24–52; Bernard Andenmatten and Jean-Daniel Morerod, "La Peste à Lausanne au XIV<sup>e</sup> siècle (1348/9, 1360): étude du Chapitre cathédral et des testaments vaudois," *Études de lettres*, II–III (1987), 19–49; A. de la Grange, "Choix de testaments Tournaisiens antérieurs au XVII<sup>e</sup> siècle," *Annales de la Société historique de Tournai*, II (1897), 47–80; R. R. Sharpe (ed.), *Calendar of Wills Proved and Enrolled in the Court of Husting, London: Part 1, 1258–1358* (London, 1889); A. Von Brandt (ed.), *Regesten der Lübecker Bürgertestamente Band I: 1278–1350* (Lübeck, 1964); *Band II: 1351–1363* (Lübeck, 1973); Testamente 1–331, Stadtarchiv Stralsund, Germany.

9 Sharon N. DeWitte, "The Effect of Sex on Risk of Mortality during the Black Death in London, A.D. 1349–1350," *American Journal of Physical Anthropology*, CXXXIX (2009), 222–234; Dominique Castex and Sasha Kacki, "Demographic Patterns Distinctive of Epidemic Cemeteries in Archaeological Samples," *Microbiology Spectrum*, IV (2016), 7–8.



*Table 1* Mortality Distribution across Genders, Issyk-Kul' (1248–1345) and Hainaut (1349–1450)

		Male	Female	Ratio
Issyk-Kul'	All years (1248–1345)	232	200	1.16
Issyk-Kul'	Non-plague years	178	140	1.27
Issyk-Kul'	Plague years (1337/8–1338/9)	54	60	0.90
Hainaut	All years (1349–1450)	11,292	10,559	1.07
Hainaut	Non-plague years	6,960	5,925	1.17
Hainaut	Plague years (1349–1351)	342	383	0.89

SOURCE Daniel Curtis and Joris Roosen, "The Sex-Selective Impact of the Black Death and Recurring Plagues in the Southern Netherlands, 1349–1450," *American Journal of Physical Anthropology*, CLXIV (2017), 246–259.

Yet, Curtis and Roosen's work on the sex distribution of mortality in Hainaut (Belgium) between 1349 and 1450, based on an analysis of almost 22,000 death duties ("mortmains"), found that greater proportions of women died during the Black Death and its recurrent outbreaks than during non-crisis years. The sex ratio in mortality was 0.89 to 1.00 during the 1349/50 outbreak as opposed to 1.07 to 1.00 for non-plague years (Table 1). Although the contradiction between these sets of data may have something to do with regional differences, much new work, based on fresh archival and skeletal data, remains to be done, to resolve it. In other words, although the Issyk-Kul' data could rule in favor of Curtis and Roosen's recent findings without the benefit of any robust biostatistical analysis of skeletal data based on the Gompertz Model of mortality, the conclusion that the 1338/9 mortality was sex-selective remains purely hypothetical.<sup>10</sup>

ISSYK-KUL' AS A PLAGUE FOCUS The three cemeteries are located between two sub-foci of the Tien-Shan' plague—"Talas High Mountain" to the west, dominated by the 0.PE4t strain (which does not cause mortality in humans) and the 2.MED1 strain, and "Sarydzhas High Mountain" to the east, dominated by 0.ANT5 (by far, the most widespread strain in that sub-focus), as well as 0.ANT2, 0.ANT3, and 2.MED1. The Branch 0 strains all predate both the Branch 1 (which was responsible for the

10 Daniel Curtis and Joris Roosen, "The Sex-Selective Impact of the Black Death and Recurring Plagues in the Southern Netherlands, 1349–1450," *American Journal of Physical Anthropology*, CLXIV (2017), 246–259.

outbreak of the Black Death) and the great big bang (the polytomy). Such a long perseverance of the ancient strains can at least partly be explained by the environmental conditions of the Issyk-Kul' area, which along with other parts of the Chu Valley, is characterized by the predominance of salty soils of different kinds. As some recent research has shown, *Yersinia pestis* boasts a strong halotolerance (adaptation to salinity conditions), which permits it to persevere in salty soil areas.

In theory, even though the bacterium can survive in soil for weeks and even months, the pathogen cannot survive longer periods without vectors and hosts. The Tien-Shan' focus boasts a rich faunal bio-diversity consisting of several species of sylvatic rodents, hosts of the plague bacillus. The main host is the grey marmot (*Marmota baibacina*), but susliks, gerbils, and pikas, as well as some rodents of the *Mustelidae* family (including steppe polecats, ferrets, and stoats) take part. Bactrian camels, too, can carry the pathogen, as they did in a number of plague outbreaks in late imperial and Soviet Central Asia and Siberia, particularly local outbreaks in Kyrgyzstan (1917/8) and Kazakhstan (1926, 1945, and 1947). As far as vectors are concerned, the Tien-Shan' focus is a natural habitat for more than thirty-five types of rodent fleas that are known to have been the carriers of the pathogen, and at least as many types of rodent lice and *acari*, whose role in the transmission of the plague is less apparent.<sup>11</sup>

ISSYK-KUL'S CHANGING ENVIRONMENT UNDER THE MONGOL RULE  
In 1218, the Issyk-Kul' region, then part of the Qara Khitai Empire, fell to Mongol forces. After the death of Chinggis Qan

11 Yu. Z. Rivkus and Alexander G. Blyummer, *Endemiya chumy v pustynnyakh Sredney Azii i Kazakhstana* (Voronezh, 2016), 27–28; Eroshenko et al., “Yersinia Pestis Strains.” For the soil of the Chujskaya Valley, see <https://www.open.kg/about-kyrgyzstan/nature/soil-and-minerals/313-pochva-chuyskoy-doliny.html> (accessed January 24, 2019); Maliya Alia Malek et al., “Yersinia Pestis Halotolerance Illuminates Plague Reservoirs,” *Scientific Reports*, VII (2017), doi: 10.1038/srep40022; Saravanan Ayyadurai et al., “Long-Term Persistence of Virulent Yersinia Pestis in Soil,” *Microbiology*, CLIV (2008), 2865–2871; Rebecca Eisen et al., “Persistence of Yersinia Pestis in Soil under Natural Conditions,” *Emerging Infectious Diseases*, XIV (2008), 941–943; Kenneth L. Gage and Michael Y. Kosoy, “Natural History of Plague: Perspectives from More than a Century of Research,” *Annual Review of Entomology*, L (2005), 505–528; 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*, VIII (2010), 1–14; Rivkus and Blyummer, *Endemiya chumy*, 20–21, 61, 138–139, 150–151, 155–169.

in 1227, his second son, Chagatai Qan, inherited the eastern part of the empire, which included the Issyk-Kul' area, ruling over his father's *ulus* (the Chaghadaid khanate) until his death in 1242. When the Mongol Empire fragmented after 1259, the Chaghadaid khanate, which was initially an integral part of it, became one of four co-existing Mongol khanates that covered Eurasia. The Mongol conquest of the Semirechye region brought about not only political change but also pronounced environmental shifts. As pastoral nomads, the Mongols needed a steady supply of pasturage for their livestock—horses, camels, cattle, sheep, and goats.

Contemporaries likely exaggerated the degree of “pastoralization” in the conquered landscape. For instance, in 1230, Yelü Chucai (1190–1244), an energetic Khitan administrator under both Chinggis and his son Ögedei, was said to have convinced Ögedei to spare the recently conquered Jin lands from conversion into pasturage and woodland via the imposition of taxation on agricultural and mercantile income. Similarly, ibn Faḍl Allāh al-ʿUmairī described the Trans-Volga lands of the Qipchaks during the reign of Özbek Qan (1313–1341) as abundantly arable until the Mongol conquest, when they all became pastures.<sup>12</sup>

Although those references may well have been apocryphal, substantial evidence about the piecemeal pastoralization of Central Asian landscape, and the Issyk-Kul' region in particular, is available. When Qiu Chuji (1148–1227), a notable Taoist alchemist, visited the region in 1222, shortly after Chinggis' conquest of the Qara Khitai in 1218, he described the local land as productive of good harvests, full of mulberry trees, crops, wine, and fruits, without any mention of pastoral husbandry. Franciscan diplomat Giovanni del Pian Carpini painted an altogether different picture in the course of his travels through the region in 1246, noting a multitude of ruined and deserted cities and villages. Carpini's narrative finds corroboration in an equally pessimistic account of 1253 by William de Rubruck, a Flemish Franciscan missionary, who reported that the Mongols destroyed the many cities that once occupied the Chu valley to create rich pastures for their livestock.

12 N.Ts. Munkuyev, *Kitayskiy istochnik o pervykh Mongol'skikh khanakh: Nadgrobnaya nadpis' na mogile Yeluy Chu-Tsaya* (Moscow, 1965), 12b; V. G. Tizengauzen (trans.), *Istoriya Kazakhstana v Arabskikh istochnikakh I* (Almaty, 2005), 173.

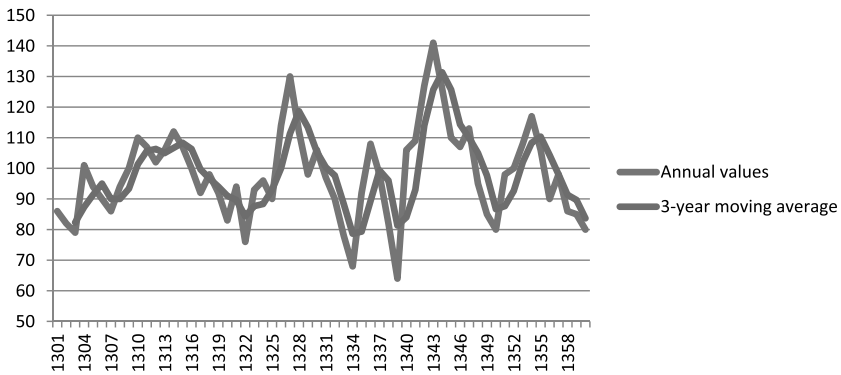
In a similar vein, a biographer of Yahballaha III, Patriarch of the Church of the East from 1281 to 1317, narrates that in the course of his travels in 1280 in Central Asia, the future patriarch saw a devastated local landscape, including the once-prosperous city of Loton (most likely, Khotan in Uyghuristan/Xinjiang), where crops used to grow in its hinterland, now with the surviving population reduced to hunger and flight. Ḥamdallāh Mustawfī Qazvīnī, a Persian geographer, who visited the region c.1320, reported that most of the people were nomads with lots of cattle and horses. He praised the hay crop and remarked about the absence of grain. The Chaghadaid rulers certainly valued the quality of the pasture land in Issyk-Kul'. Al-Qāshānī in his *History of Öljaitü* (c.1325) noted that Esen-Buqa Qan (1310–1318) had his winter pasture near Issyk-Kul' and his summer pasture in Taraz. Qaidu Qan (d. 1301) probably had his pastures between Taraz and the Chu River.<sup>13</sup>

CLIMATIC SHIFTS IN THE ISSYK-KUL' REGION: EVIDENCE FROM DENDROCHRONOLOGY Although the full extent of the impact that the Mongol conquest had on the transformation of the Issyk-Kul' terrain is unclear, by the early fourteenth century, the landscape there was predominantly pastoral, supplying both the native Turkic population and the Mongol rulers and settlers with enough grassland for their horses, cattle, sheep, goats, and, to a more limited extent, Bactrian camels (notorious herbivores and plague-pathogen transmitters).

Pasturage growth strongly depends on rainfall levels. Several contemporary sources indicate this pastoral society's dependence on rainfall. Al-Qāshānī's description of the unusual drought in the spring of 1282 in the Sarakhs area (in northeastern Khorasan province of Iran), highlighted the black soil of the steppe and

13 Qiu Chuji (trans. A. Waley), *The Travels of an Alchemist* (London, 1931), 88; Richard Hakluyt (ed. C. Raymond Beazley), *The Texts and Versions of John de Plano Carpini and William de Rubruquis* (London, 1903; orig. pub. 1598), 97; Peter Jackson (ed. and trans.), *The Mission of Friar William of Rubruck: His Journey to the Court of the Great Khan Mongke, 1253–1255* (London, 1990), 147–148; E. A. Wallis Budge (ed.), *The Monks of Kublai Khan, Emperor of China* (London, 1928), 44; Ḥamdallāh Mustawfī (trans. G. Le Strange), *The Geographical Part of the Nuzhat-al-qulūb* (Leiden, 1919; orig. pub. 1340), 249; Maryam Parvisi-Berger, "Die Chronik des Qāshānī über den Ilchan Ölgäitü (1304–1316): Edition und kommentierte Übersetzung," unpub. Ph.D. diss. (Univ. of Göttingen, 1968), 181 (138a); Michal Biran, "Rulers and City Life in Mongol Central Asia (1220–1370)," in David Durand-Guedy (ed.), *Turko-Mongol Rulers, Cities and City Life* (Leiden, 2013), 267.

Fig. 3 Reconstructed Precipitation Levels from the Tien-Shan' Region in Kyrgyzstan, 1301–1360 (Indexed on 1311–1320; 1311–1320=100).



SOURCE Hui-Qin Wang et al., “Comparison of Drought-Sensitive Tree-Ring Records from the Tien Shan of Kyrgyzstan and Xinjiang (China) during the Last Six Centuries,” *Advances in Climate Change Research*, VIII (2017), 21–22.

people made desperate by the lack of fodder for their livestock. The sudden torrential rain that followed two months of extreme drought, however, yielded plentiful grass for animals. According to al-Qāshānī, the rain saved people and animals from starvation in late 1307 Tabriz by producing grain and fodder. Al-Maqrīzī wrote that in 1303, after three years of drought in parts of the Golden Horde, many horses and sheep died for lack of pasture, and people starved on the account of the animal murrain.<sup>14</sup>

The sylvatic rodent population profited from the abundance of grassland as much as domesticates did. Marmots, susliks, gerbils, and pikas all thrive on grass and prefer to burrow either in grassland or under shrubs. The rodent population levels are determined by the availability of grassland resources, which, in turn, are determined by precipitation levels. In the twentieth century, local outbreaks of plague in Kazakhstan and Kyrgyzstan often occurred during damp, mild weather, which encouraged grass growth, an expansion of the rodent population, aggressive behavior on the part of fleas, and, hence, pathogen activity.<sup>15</sup>

14 Parvisi-Berger, “Chronik des Qāshānī,” 32 (11a–11b), 72–3 (50b); V. G. Tizengauzen (trans.), *Istoriya Kazakhstana v Arabskikh istochnikakh I* (Almaty, 2005), 308.

15 Rivkus and Blyummer, *Endemiya chumy*, 197, 218.

No contemporary accounts of annual weather and precipitation patterns are available for Chaghadaid Central Asia. To reconstruct these patterns, we must turn to the dendrochronological record of the tree rings of the Schrenk spruce (*Picea schrenkiana*) from the Tien-Shan' region in Kyrgyzstan, most recently compiled by Wang et al. (Figure 3). As the figure indicates, the period between 1301 and 1360 saw several intermittent episodes of rising and falling precipitation levels. After a decade or so of rising levels, the years 1314 to 1322 witnessed a gradual decline in rainfall, 1322 being a particularly dry year. The period from 1323 to 1327 underwent increased dampness; 1327 stands out as the second-wettest year on record. The next phase (1327–1334) saw a renewed decline in precipitation levels; 1334 was the second-driest year during that period. After a short-lived damper interval from 1334 to 1336 came two back-to-back extreme episodes of excessive drought (1336–1339) and wetness (1339–1343); 1339, the second year of the plague, was also the single-driest year on record, with precipitation levels about 36 percent below average. Conversely, 1343 represents the single-wettest year in that period, its rainfall levels peaking at 41 percent above average. The next seven years (1344–1350) saw a piecemeal decline in precipitation, followed by a short rise between 1351 and 1354 and then a decline (1355–1360).<sup>16</sup>

How does this chronology fit into the context of the plague outbreak? The damp and humid weather of the early 1310s and 1323–1327 produced more grass fodder for rodents and optimal conditions for the hatching and survival of flea larvae. The growth of both the host and vector population levels would also have increased the population-density levels of *Yersinia pestis*, thereby elevating the risks of a mortality outbreak in the rodent population. Indeed, as the evidence from Soviet Kazakhstan suggests, plague mortality in rodents tended to spike in warmer springs and wetter summers. Conversely, the extreme drought from 1336 to 1339 brought a sharp decline in vegetation, to the extent that it could no longer sustain the rodent population. Drought can have a devastating effect on rodent mortality and fertility, and the immune

16 Hui-Qin Wang et al., "Comparison of Drought-Sensitive Tree-Ring Records from the Tien Shan of Kyrgyzstan and Xinjiang (China) during the Last Six Centuries," *Advances in Climate Change Research*, VIII (2017), 21–22.

systems of surviving rodents can become increasingly susceptible to fleas (and thus to the pathogen).

The research of Eads et al. discovered that prairie dogs in New Mexico became infested with plague-carrying fleas much more readily during the dry spell of 2011 than during the wet spells of 2010 and 2012. Similarly, the drought from 1336 to 1339 and the decline in rodent population levels could well have induced the zoonotic crossover from sylvatic rodents to humans (either through commensal rodents or directly), when fleas actively sought an alternative host to spread the bacterium. This hypothesis finds confirmation in evidence from the early twentieth century. In Kazakhstan, between 1904 and 1945, outbreaks of plague in rodents seem to have occurred in wetter years, whereas human plague mortality tended to emerge in dry years (chiefly from 1910 to 1929 and in 1945).<sup>17</sup>

THE ZOOONOTIC STAGE: POSSIBLE MODES OF TRANSMISSION During the twentieth-century outbreaks in Central Asia, three main mammal hosts were responsible for the transmission of the plague bacillus to humans: (1) sylvatic rodents (primarily marmots but also susliks, gerbils, and pikas, and, in some instances, steppe polecats, ferrets, and stoats); (2) commensal rodents; (3) Bactrian camels. Neither the relationship between the old and new hosts nor the transmission mode was straightforward. Occasionally, the zoonotic stage involves a direct transmission of the pathogen from an old to a new host. Given the pastoral nature of Central Asian settlement, society, and economy, the direct contact between sylvatic rodents and humans can often be direct, through hunting. Furthermore, in dry years, with dwindling pasture resources, rodents sometimes migrate closer to human habitats in search of alternative food resources. There were numerous recorded cases of plague transmission

17 Nils Ch. Stenseth et al., "Plague Dynamics Are Driven by Climate Variation," *PNAS*, CIII (2006), 13110–13115, doi: 10.1073/pnas.06024471032006; Kenneth B. Armitage, "Climate Change and the Conservation of Marmots," *Natural Science*, V (2013), 36–43, doi: 10.4236/ns.2013.55A005; David A. Eads et al., "Droughts May Increase Susceptibility of Prairie Dogs to Fleas: Incongruity with Hypothesized Mechanisms of Plague Cycles in Rodents," *Journal of Mammalogy*, XCVII (2016), 1044–1053. The yearly variations in precipitation in Kazakhstan derive from Feng Chen et al., "Drought Variations in Almaty since AD 1785 Based on Spruce Tree Rings," *Stochastic Environmental Research and Risk Assessment* (2016), doi 10.1007/s00477-016-1290-y. The yearly volume of plague outbreaks derives from Kausrud et al., "Epidemiological History."

through the human consumption of rodents in parts of Central Asia (Mongolia, as well as the Altai and Transbaikal regions of the Russian Empire, during the Third Plague Pandemic in the early twentieth century). The pathogen could also be transmitted from sylvatic rodents to humans through commensal rodents—mice and rats—although this mode seems to be uncommon in the Central Asian context.<sup>18</sup>

Although the human consumption of rodents is uncommon in Muslim and Christian communities of Central Asia, it is prevalent among Buddhist Mongols, Buryats, Tuvans, and Kalmyks. A variety of contemporary sources confirm that the Mongols—at least those who did not convert (at a later stage) to Islam or Christianity—regularly ate rodents, especially marmots. Among the thirteenth-century European travelers who report it are C. de Bridia (1247) from Poland, William of Rubruck (1253) from Flanders, Marco Polo from Venice (c.1271 to 1275), Peng Daya (1233) from China, and Kirakos Gandzakets'i (1250s to the 1260s) from Armenia. The Chinese dietary treatise *Yinshan Zhengyao*, compiled in 1330 by Hu Sihui, a Yuan court therapist and dietitian, mentions marmot meat. Although widespread among the Mongols and other Buddhist and Shamanist inhabitants of fourteenth-century Central Asia, rodent consumption was certainly not encouraged by local Christian and Muslim communities by the time of the plague outbreak.

Although direct evidence from Central Asia is lacking, Christian communities elsewhere made several references to the rejection of “unclean food.” Gandzakets'i's maintained that during the Mongol conquest of Armenia in the 1230s, subjugated Christians refused to eat unclean animals and drink *kumys* (fermented mare's milk). Similarly, Rubruck wrote that Orthodox subjects of the Ulus Juchi did not drink it. Hymes studied the consumption of marmots in medieval Central Asia and the bio-ecological peculiarities of marmots and their interaction with humans.<sup>19</sup>

18 Gerald Chikozho Mazarire, “The Burrowed Earth: Rodents in Zimbabwe's Environmental History,” *Critical African Studies*, VIII (2016), 109–135; A. K. Belyavskiy, “O Chume tarbaganov: Zapiska po povodu 7 smertnykh sluchayev ot upotrebleniya v pishchu surkov, porazhennykh chumoyu v poselke Sok-tusvskom,” *Vestnik obshchestvennoy gigieny, sudebnoy i prakticheskoy meditsiny*, XXVI (1895), 1–6.

19 Peter S. Pallas, *Puteshestvie po raznym mestam Rossiyskoy Imperii* (St. Petersburg, 1773), I, 471; S.V. Aksenova and A.G. Yurchenko (trans.), *Khristiyanskiy mir i “Velikaya Mongol'skaya*



Bactrian camels must also be taken into account. During the Third Plague Pandemic in Central Asia, as well as a more recent outbreak in Mauritania (1973–1975), these camels played an important role as plague pathogen hosts. Camels can become infected directly via fleas because of their tendency to graze and rest in proximity to rodents' burrows. Having contacted the disease, camels can then transmit it to humans via riding or meat processing and/or eating. That Mongols stocked camels and ate their flesh is reflected in contemporary sources. A Latin report from c. 1330, previously (and erroneously) attributed to the Dominican John de Cora, depicts Mongols as consumers of camel meat at great feasts. However, as we shall see later, camels may not have been as numerous and prominent in the Issyk-Kul' region as they were elsewhere in the Chaghadaid khanate. Moreover, the connection between human–camel interaction and the spread of plague should not be taken for granted: During the Black Death outbreak in Damascus and Cairo, corpses were carried to their graves by camels, and local chroniclers did not mention an outbreak of the disease in camels.<sup>20</sup>

TRADE, TRIBUTE, AND WARFARE: THE ANTHROPOGENIC CONTEXT OF THE ISSYK-KUL' OUTBREAK Despite the suppositions above, neither the geographical origins of the Issyk-Kul' outbreaks nor their spread elsewhere can be established with any degree of certainty without palaeogenetic data. At this point, we can only tentatively sketch the anthropogenic context in which the Issyk-Kul' mortality occurred in order to ascertain its potential modes of transmission. Within the Mongol Empire, two main anthropogenic factors are highly significant—trade and military activity. As numerous studies of historical plague outbreaks have shown, international

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*Imperiya*": *Materialy Frantsiskanskoy missii 1245 goda* (St. Petersburg, 2002), 96, 122 (Ch. 54); Jackson (ed. and trans.), *Mission of Friar William of Rubruck*, 84, 101; Henry Yule (ed.), *The Book of Ser Marco Polo* (London, 1903), I, 252; Ye. R. Nesterova (trans.), *Hei Da Shi Lyue: Istochnik po istorii mongolov* (Moscow, 2016), 24; Robert BedSORIAN (trans.), *Kirakos Ganjaks'i's History of the Armenians* (New York, 1986), 212, 219; Paul D. Buell and Eugene N. Anderson (trans.), *A Soup for the Qan* (Boston, 2010), 513; John Masson Smith, "Mongol Campaign Rations: Milk, Marmots and Blood?" in Pierre Oberling (ed.), *Turks, Hungarians and Kipchaks: A Festschrift in Honor of Tibor Halasi-Kun* (Cambridge, Mass., 1984), 223–228; Hymes, "Hypothesis," 298–303.

20 Rivkus and Blyummer, *Endemiya chumy*, 198; Jean-Marie Klein et al., "La peste en Mauritanie," *Medecine et Maladies Infectieuses*, V (1975), 198–207; Yule (ed. and trans.), *Cathay and the Way Thither: Being a Collection of Medieval Notices of China* (London, 1866), I, 246; Dols, *Black Death in the Middle East*, 237.

and regional trade was instrumental in spreading the disease across time and space. During the Black Death of 1346 to 1353, Genoese merchants from Caffa imported the plague into Constantinople in May 1347 and then to Messina (in Sicily) in June of the same year; wine-carrying cargoes from Gascony brought the pathogen to Dorset in southwest England in late June 1348; and merchant vessels imported the disease from England to Bergen, Norway, in autumn 1349, before it migrated to northern Scotland, Shetland, and the Faeroe Islands. Regarding warfare's effect on the spread of plague (and other diseases), the Siege of Caffa in late 1346 is a well-known example. Later, in 1380, during the Genoese–Venetian war, the Genoese fleet brought the plague into Constantinople. The plague outbreak in the eastern Ottoman Empire from 1533 to 1535 coincided with a military campaign into northern Iran. The examples are legion. The same paradigm can be applied to Central Asia, and the Issyk-Kul' region in particular.<sup>21</sup>

Around the time of the 1338/9 outbreak, Issyk-Kul' and other parts of the larger Semirechye region (Zhetysu)—situated along the northern branch of long-distance trans-Asian trade routes (often erroneously called the “Silk Road”) from the Ulus Juchi to Yuan China—played an important role in international mercantile activity. Although the Mongol conquest of Semirechye (together with other parts of the future Chaghadaid ulus) in the early thirteenth century set back urban life and international trade in the region, a remarkable urban revival appears to have taken place in the first half of the fourteenth century, after the death of Qaidu Qan in 1301 and the return of the Chaghadaid dynasty. Thus, Almaliq (in western Uyghuristan/Xinjiang, on the modern-day Kazakh–Chinese border) was a vibrant, multi-religious city, a home to Christians (both East Syriac and Catholics), Muslims, Buddhists, and Shamanists, and an important commercial and political center. Similarly, both Jamal al-Qarshi (d. c.1303) and Shihāb ibn Faḍl Allāh al-'Umārī (d. 1348/9) refer to Jand (presumably today's Zhan-Kala), 115 km west of Kyzylorda in south Kazakhstan, as an important hub of international trade. William

21 Nükhet Varlik, *Plague and Empire in the Early Modern Mediterranean World: The Ottoman Experience, 1347–1600* (New York, 2015), 99–107, 171–174; Ole J. Benedictow, *The Black Death, 1346–1353* (Woodbridge, 2004), 127–128; *idem*, *The Black Death and Later Plague Epidemics in the Scandinavian Countries: Perspectives and Controversies* (Berlin, 2016), 136–146.

of Rubruck mentioned “a big town called Qayaligh” (near Qapal, in southeastern Kazakhstan) that had markets frequented by many merchants.

One especially important city on the trans-Asian, long-distance trade routes was Otrar (in southwestern Kazakhstan). After its destruction and the massacre of its inhabitants in 1218, the city was rebuilt anew by the mid-thirteenth century. But not until the reign of Erzen Qan (c.1310/5–1320) did Otrar see a dramatic revival and expansion, becoming a key hub of international business for merchants from the western and eastern parts of Eurasia. In his handbook of trade, *Pratica della Mercatura* (written c.1340 but treating the 1320s and 1330s), Pegolotti portrays the city as a popular place for merchants.

International trade in Central Asia was facilitated further by Tarmashirin Qan’s (1331–1334) conversion to Islam, which resulted in the abolition of tariffs and customs for Muslim merchants in accordance with Sharia law. Hence, as al-ʿUmari wrote, Syrian and Egyptian merchants flocked in large numbers to the Chaghadaid khanate. This preferential policy, however, may have been short-lived; it apparently ended with the ascent of Changshi Qan (1335–1338), who was either a East Syriac Christian or at least pro-Christian. Finally, the importance of the northern route, passing through the Chu Valley, seems to have increased after the disintegration of the Ilkhanate and the death of Abu Saʿid Qan in 1335, which made the southern route passing through Transoxania, connecting Central Asia with Iran, less secure.<sup>22</sup>

The Christian settlements in the Chu Valley were located in the heart of this trade network—halfway between the two linked trade emporia of Otrar and Almaliq. The route between the two points went along the north coast of the lake, through the Chu Valley. Eastbound travelers would have passed through or near the settlements of Sauram—on the outskirts of Shymkent (42°19′0″N,

22 Biran, “Rulers and City Life,” 269–274; Wilhem Barthold, “Almaligh,” *Encyclopaedia of Islam* (Leiden, 1986), I, 418–419; Sh. Kh. Vokhidov and B. B. Aminov (trans.), *Istoriya Kazakhstana v Persidskikh istochnikakh* (Almaty, 2005), I, 156; Vladimir G. Tizengauzen (trans.), *Istoriya Kazakhstana v Arabskikh istochnikakh* (Almaty, 2005), I, 175; Jackson (ed. and trans.), *Mission of Friar William of Rubruck*, 148; K. A. Akishev, K. M. Baypakov, and L. B. Yezakovich, *Drevniy Otrar* (Alma-Ata, 1972), 37; Francesco Balducci Pegolotti (ed. Allan Evans), *La Pratica della mercatura* (Cambridge, Mass., 1936), 21; Klaus Lech (ed. and trans.), *Das Mongolische Weltreich: al-ʿUmari’s Darstellung der mongolischen Reiche in seinem Werk Masālik al-abṣār fi mamālik al-amṣār* (Wiesbaden, 1968), 119.

69°35'45''E), Aktobe (43°27'55''N, 70°24'14''E), Sharvashlyk (Kendjak-Sangir near Taraz, 42°54'N, 71°22'E), and Sadyr-Kurgan (near Kyzyl-Adyr, 42°37'12''N, 71°35'24''E)—before reaching, first, Karadzhigach, Krasnaya Rechka, and Burana, then Almaty (43°16'39''N, 76°53'45''E), and finally Almaliq (44°14'12.60''N, 80°32'7.79''E). Pegolotti in his *Pratica della Mercatura* describes the route from Tana (Azov) in Crimea to Cathay during the 1320s and 1330s as perfectly safe (*sicurissimo*) by night and day. Three calamities caused conditions to deteriorate rapidly, however, from 1340 onward: (1) conflict between a pagan Yisun Temür Qan (1338–1342) and 'Alī Sulṭān (1342/3), a Muslim pretender to the throne; (2) 'Alī Sulṭān's persecution of Christians in 1339/40; and (3) a war between the Chaghadaid Qazan Qan (1343–1346) and Qazaghan, the emir of Qara'unas (1345–1358). By March 1345, two Venetian envoys in Caffa complained that “the road of the Middle Empire is totally ruined, and it is way worse than it used to be before.” Whether the 1338/9 outbreak contributed to the decline in international trade along the northern branch of the trans-Asian trade routes is a question that must be left unanswered for now.<sup>23</sup>

Although no written sources indicate any large-scale movement of goods through the Chu Valley in the 1330s, numismatic evidence, in the form of coin hoards recovered from various sites within the Mongol Empire, suggests otherwise. Researchers have found nearly 200 coins, mostly from the Ulus Juchi, dated to the 1290s until the 1360s (the majority minted in the 1340s, notwithstanding the reported decline of trade in the region), in the ruins of Zhan-Kala, the presumed site of Jand (Dzhend). The monetary exchange between the Chaghadaids and other parts of the Mongol Empire is also evident from other hoards—particularly the several non-Chaghadaid coins discovered in the Chu Valley near the Issyk-Kul' cemeteries—indicating the prominent place that the Issyk-Kul' region held in the international exchange of goods.<sup>24</sup>

23 K. M. Baypakov, *Srednevekovye goroda Kazakhstana na Shelkovom Puti* (Almaty, 1998); Gary Tiedermann (ed.), *Handbook of Christianity in China. I. 635-1800* (Leiden, 2009), 109–110; Pegolotti, *Pratica della mercatura*, 21.

24 Dmitriy Voyakin and Aleksandr Pachkalov, “Monetnye nakhodki na gorodishche Dzhan-Kala,” *Istoriko-kul'turnoe nasledie Aralo-Kaspiyskogo regiona: Materialy II mezhdunarodnoy nauchno-prakticheskoy konferentsii, Aktau* (2010), 55–63; P. N. Petrov and A. M. Kamyshev, “Chuyskaya dolina po numizmaticheskim dannym (XIII-pervaya polovina XIV vv.),” in *Tsentr'naya Aziya ot Akhemenidov*

The coin hoards implicate not only mercantile but also military activity. Silver bullion, which was a mainstay of the Chaghadaid monetary system, served as campaign booty and tribute from the Delhi Sultanate, a dependency of the Chaghadaid khanate. Although the 1330s was a decade of relative peace and stability in Central Asia, both Özbeg Qan of the Golden Horde (1313–1341) and Chaghadaid Changshi Qan (1335–1338) (whose reign witnessed the plague eruption in Issyk-Kul'), when dispatching Russian captives to the Yuan court of Tugh Temür Qa'an (1328–1332) in Qanbaliq, would have marched their soldiers along the same trans-Asia route that the traders took. The moving *ordo* (mobile court) of Changshi and that of his predecessors probably did, too. As noted above, both Qaidu and Esen-Buqa had their pastures around Issyk-Kul'. Esen-Buqa's pasture was captured and plundered by the Yuan forces of Buyantu Qa'an (1311–1320), under the command of Chongur in 1316/7, during the Chaghadaid–Yuan war from 1314 to 1318.<sup>25</sup>

What goods traveled along the northern branch of trans-Asian trade routes? First and foremost were the luxury goods going westward—primarily spices and silk but also cotton, linen, and exotic jewelry. These goods would have had little (if any) interest for bacterial hosts like the sylvatic rodents. The smell of spices tends to repel rodents, not attract them. Conversely, silk and especially cotton and linen may have provided bacterial vectors, namely, fleas, with perfect hiding places from which to jump on and bite humans. But the bacterium could theoretically survive in contaminated cloth, without live fleas, for long periods; dead fleas can sustain *Y. pestis* for 427 days.

The transmission of plague via clothes receives mention in numerous plague accounts, in different chronological and geographical

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do Timuridov: *Arheologiya, istoriya, etnologiya, kul'tura: Materialy mezhdunarodnoy konferentsii, posvyashchennoy 100-letiyu do dnya rozhdeniya A.M. Belenitskogo* (St. Petersburg, 2005), 286–290; Petrov, “Numizmaticheskaya istoriya Chagatayskogo gosudarstva 668/1270–770/1369 gg.,” unpub. Ph.D. diss. (Kazan State Univ., 2009); V. G. Koshevar, “O nakhodkakh Dzhuchidskikh monet v Chuyskoy Doline,” *Numizmatika Zolotoy Ordyy*, 1 (2011), 121–123; Arsenio Martinez, “The Use of Mint-Output Data in Historical Research on the Western Appanages,” in Denis Sinor (ed.), *Aspects of Altaic Civilization* (Bloomington, 1990), III, 87–127.

25 Emil Bretschneider, “Rusy i Asy na voyennoy sluzhbe v Kitaye,” in Vladimir I. Lamanskiy (ed.), *Zhivaya Starina* (St. Petersburg, 1894), 67–73; Parvisi-Berger, “Die Chronik des Qāshānī,” 181 (138a).

settings. Gabrielle de Mussis' contemporary *Historia de Morbo* tells of four soldiers outside of Genoa in 1348 who stole a fleece to use for overnight bedding and died the next morning. Likewise, the *Report of the Indian Plague Commission* about the Indian outbreak from 1896 to 1899 cites the transportation of contaminated clothing as a likely channel of the disease's transmission. Nonetheless, without an active presence and participation of rodents, the pathogen would have spread at a slower pace.<sup>26</sup>

Contrary to other parts of the Mongol Empire, the Central Asian steppe engaged in agriculture on a limited scale, some pockets of the region cultivating millet and sorghum for domestic consumption rather than for markets. By contrast, the Crimea/Caspian basin was a zone of intense arable farming that produced large surpluses of wheat for both domestic consumption and export to Paphlagonia and Pontos. Yet, grain certainly moved across the steppe, along the Chu Valley, for commercial and military purposes. Pegolotti instructed Italian merchants traveling from Tana to China to bring flour and salt fish, which were rare in the steppe. Likewise, several sources, including Qoṭb-al-Din Shirāzi's *Akhhbār-i Mughūlān* and Juvayni's *Tarīkh-i Jahān-gushā* (History of the World Conqueror) mention that the movement of Mongol armies or ordos involved setting up special stations for flour, which would then be transported elsewhere.

Rodents are notorious consumers of crops in any form, causing much damage and loss of post-harvest grains in developing countries. During the plague years, sylvatic rodents could conceivably have thrived on flour by congregating around the flour stations and by occupying the carts and wagons of merchants, armies, and ordos. To make matters worse, infected fleas can be transported in grain and flour. As McCormick pointed out, the international grain trade around the Mediterranean, which involved the movement of grain across Europe, facilitated the spread of plague during the active period of the First Pandemic,

26 Jackson, *The Mongols and the West, 1221–1410* (London, 2005), 290–328; L. Fabian Hirst, *The Conquest of Plague: A Study of the Evolution of Epidemiology* (Oxford, 1953), 303–455; Jeffrey Wimsatt and Dean E. Biggins, "A Review of Plague Persistence with Special Emphasis on Fleas," *Journal of Vector Borne Diseases*, XLVI (2009), 91; Rosemary Horrox (ed. and trans.), *The Black Death* (Manchester, 1994), 20; "The Report of The Indian Plague Commission," *British Medical Journal*, I (1902), 1093–1098.

from 541 onward. Could the same situation have prevailed in early fourteenth-century Chaghadaid Central Asia?<sup>27</sup>

The movement of cloth and grain was closely connected with human traffic—qans' ordos, soldiers, captives, and slaves—along the north branch of the trans-Asian routes. Several sources make references to slave markets in Chaghadaid Central Asia, especially the trade in young Turks and Mongols in Tana and Cairo. Similarly, Ibn Baṭūṭah described slave caravans traveling from India to Central Asia, and a document from 1333 Bukhara mentions Mongol field slaves. The implication is that there was a mass movement of people along the Chu Valley and its vicinity. Could slave caravans have been another possible mode of plague dissemination in that area? Poor hygienic conditions could have caused the infestation of lice among captives and slaves. As recent studies have shown, human ectoparasites are important vectors of plague transmission not to be neglected. Moreover, the grain and flour used to feed slaves could easily have attracted rodents and fleas, and their clothing could have sustained plague in both live and dead fleas.<sup>28</sup>

Regarding the modes of transportation in the Issyk-Kul' region, Pegolotti identified the most common method of transportation around Issyk Kul' as the donkey rather than the camel. As he stated, merchants traveled by camel all the way from Crimea to Otrar, where they switched to donkeys the rest of the way to Almaliq and beyond. Contemporary Uyghur documents attest to this reliance on donkeys in Uyghuristan/Xinjiang. As one recent study has shown, none of the seventy documents from the Turpan region (western Uyghuristan/Xinjiang) that deals with the postal system of the Mongol Empire mentions camels. Given

27 Michael McCormick, "Rats, Communications, and Plague: Toward an Ecological History," *Journal of Interdisciplinary History*, XXXIV (2003), 1–25; Benedictow, *What Disease Was Plague? On the Controversy over the Microbiological Identity of Plague Epidemics of the Past* (Boston, 2011), 115; Lorenzo Publici, "Il pane nella storia dell'Asia Centrale: secoli VIII–XVI," in Gabriele Archetti (ed.), *La Civiltà del pane: Storia, tecniche e simboli dal Mediterraneo all'Atlantico* (Spoleto, 2015), 1826–1827; Sergei P. Karpov, "The Grain Trade in the Southern Black Sea Region: The Thirteenth to the Fifteenth Century," *Mediterranean Historical Review*, VIII (1993), 55–73; Hirst, *Conquest of Plague*, 311–320; Pegolotti, *Pratica della mercatura*, 22; Qoṭb-al-Dīn Shirāzi, *Akhlbār-i Muḡhūlān (650–683) dar anbānah-'i Mullā Quṭb* (Qum, 2010), 23–24; Ata-Malik Juvaini (trans. John Andrew Boyle), *Genghis Khan: The History of the World Conqueror* (Manchester, 1997), 609, 621.

28 Olga Chekhovich, *Bukharskie dokumenty XIVgo veka* (Tashkent, 1965); Katharine R. Dean et al., "Human Ectoparasites and the Spread of Plague in Europe during the Second Pandemic," *PNAS*, CXV (2018), 1304–1309, doi: 10.1073/pnas.1715640115.

that only two documents from the Dunhuang region (eastern Uyghuristan/Xinjiang) further to the east mention camels in relation to the local postal system, camels apparently saw limited use as pack animals in the Issyk-Kul' region; donkeys dominated local and trans-regional transportation there. Although Bactrian camels can contract and spread plague, their relative scarcity in this area hints that they had little to do with spreading the disease around the Issyk-Kul'.<sup>29</sup>

PLACING THE ISSYK-KUL' OUTBREAK INTO A WIDER PALAEOGENETIC CONTEXT Recent palaeogenetic studies have advanced our knowledge about the history of plague to a new level, partially revealing the history of plague in areas where written evidence was not produced. Unfortunately, the available palaeogenetic data cannot help to determine the phylogenetic position of the Issyk-Kul' outbreak; nor can it help to determine the outbreak's relationship, or lack thereof, with the ravages of the Black Death from 1346 to 1353. Such an exercise is not feasible without the extraction, sequencing, and analysis of the aDNA from one of the victims of this outbreak. Yet, our growing corpus of palaeogenetic data about the history of *Yersinia pestis*, both before and after the Black Death, can raise important questions regarding the wider genetic and biological context of the Issyk-Kul' outbreak and crucial genetic developments in the "Age of the Great Polytomy," that is, in the thirteenth and fourteenth centuries.

The Issyk-Kul' outbreak occurred sometime after the big bang, or the great polytomy. Cui et al. placed the origins of the polytomy in the Qinghai-Tibet Plateau, which has the largest diversity of strains and so was likely to have been the original focus of the polytomy. But Eroshenko et al.'s 2017 study found an even more remarkable diversity of *Yersinia pestis* strains in the Tien-Shan' focus of eastern Kyrgyzstan (which covers Issyk-Kul'), suggesting the Tien-Shan' mountains as the original home of the polytomy instead. The precise dating of the polytomy is unclear. Cui et al.'s 2013 study dated it to c. 1142 to 1339, with a median date of c. 1268. Spyrou et al. recently recalibrated the dating of the

29 Pegolotti, *Pratica della mercatura*, 21; Márton Vér, "The Postal System of the Mongol Empire in Northeastern Turkestan," unpub. Ph.D diss. (Univ. of Szeged, 2016), 278–280.



divergence of the Black Death strain from Branch 1 to the median date of c.1238, which would imply that the actual polytomy had occurred even earlier, perhaps in the late twelfth century.<sup>30</sup>

The post-polytomy history of the new four branches starts with Branch 1, which was responsible for the Black Death from 1346 to 1353. At some point between the Black Death and the subsequent *pestis secunda* from 1356 to 1366, Branch 1 split into two sub-lineages—Branch 1A, which persisted exclusively in Europe and became extinct after the Plague of Marseille from 1720 to 1722, and Branch 1B, which caused the *pestis secunda* from 1358 to 1364, which seems to have originated in central Germany in 1356 before spreading in all four directions. Today, various phylogenetic branches of the Branch 1B lineage persist in East Asia, the western United States, and South America, as well as in sub-Saharan Africa. Branch 2 is also marked by phylogenetic diversity, as attested in virtually all of Eurasia, from the Russian Steppe to the Pacific Ocean and in Libya. The earliest phylogenetic branch of Branch 2 is 2.MEDo, which seems to have originated shortly after the great polytomy and which is currently found in the Caucasus. Conversely, Branch 3, found in China and Mongolia, and Branch 4, confined to eastern Siberia and Mongolia, are characterized by a lack of phylogenetic diversity. In addition to the “new” lineages, a dozen phylogenetic branches of pre-polytomy Branch 0 (represented by two main clades, o.PE and o.ANT), still prevail in Eurasia, from the Caucasus to China.<sup>31</sup>

How are these genetic developments relevant to our understanding of the Issyk-Kul’ outbreak on the eve of the plague’s

30 Cui et al., “Historical Variations”; Eroshenko et al., “Yersinia Pestis Strains”; Maria A. Spyrou et al., “Analysis of 3800-Year-Old Yersinia Pestis Genomes Suggests Bronze Age Origin for Bubonic Plague,” *Nature Communications*, IX (2018), doi: 10.1038/s41467-018-04550-9.

31 Green made the discovery that Branch 1 split into Branch 1A and 1B. She detected that one skeletal sample from the Museum of London (Sample 6330), originally thought to be from the East Smithfield burial of 1349, came instead from St. Mary Graces burial of 1361. She announced this finding in “Plague Dialogues: Monica Green and Boris Schmid on Plague Phylogeny,” available at <https://contagions.wordpress.com/2016/06/29/plague-dialogues-monica-green-and-boris-schmid-on-plague-phylogeny-ii/>. For other branches, see G. N. Odinokov et al., “Analiz polnogenomnoy posledovatel’nosti stammov Yersinia pestis na osnove stupenchatogo 680-SNP algoritma,” *Problemy osobo opasnykh infektsiy* (2013), 49–54; N.Yu. Nosov et al., “Filogeneticheskiy analiz stammov Yersinia Pestis srednevekovogo biovara iz prirodnykh ochagov Rossiyskoy Federatsii i sopedel’nykh stran,” *Problemy osobo opasnykh infektsiy* (2016), 75–78; Cui et al., “Historical Variations.” I am currently studying the outbreak and movement of the *pestis secunda* in its wider Eurasian and North African context.

arrival in Europe? The existence of pre-Black Death strains and their persistence in the post-polytomy era, as well as the appearance of four new branches and their subsequent diversification in the aftermath of the polytomy, indicates an incredibly complicated situation. Although it is tempting to connect the Issyk-Kul' outbreak to the arrival of the Black Death in Crimea seven or eight years later and hence shift the geographical origins of the Black Death outbreak eastward into Central Asia, we cannot establish any genetically direct link between the two outbreaks with any confidence. In the absence of palaeogenomic data from one of the Issyk-Kul' cemeteries, the Issyk-Kul' outbreak cannot be regarded as an early episode in the spread of the Black Death. After all, no evidence suggests that Branch 1 was the cause of the Issyk-Kul' mortality; nor do any palaeogenetic data, at least at this point, reveal which phylogenetic branch of *Yersinia pestis* was responsible for it. Moreover, we have no palaeogenetic evidence that Branch 1 even existed in the Issyk-Kul' area, or anywhere else east of Tatarstan, by the time of the Black Death's arrival in 1346. In fact, the phylogenetic analysis of the plague strains prevalent in the vicinity of Issyk Kul', extracted from modern strains (from vectors and hosts, both rodent and human), reveals that other phylogenetic branches dominated this region, especially o.ANT5 but also o.ANT2, o.ANT3 (all three pre-polytomy), and 2.MED1 (post-polytomy).<sup>32</sup>

The presence of these branches around Issyk-Kul' in the last seventy years or so (when their modern strains were isolated in local labs) hardly implies their existence in the early fourteenth century. Strains and branches can “migrate” to different areas at a late stage, long after their initial appearance. Strains can also seed a temporary reservoir in a certain area, only to “disappear” sometime after an outbreak, or several outbreaks, of mortality. Hence, the Issyk-Kul' outbreak could have been caused by a phylogenetic branch no longer observed in Kyrgyzstan. For instance, phylogenetic branch 2.MEDo is currently found only in the Caucasus highlands. It seems to have branched off the main Branch 2 lineage shortly after the great polytomy. The remarkable diversity of Branch 2, comparable to that of Branch 1, indicates that its multiple strains, including 2.MEDo, could have caused numerous mortality crises in

32 Maria A. Spyron et al., “A Phylogeography of the Second Plague Pandemic Revealed through the Analysis of Historical *Y. Pestis* Genomes,” available at <http://www.biorxiv.org/content/10.1101/481242v1> (accessed May 2, 2019).

different parts of Asia that have evaded our detection because no written records are available. 2.MEDo's positioning right after the polytomy may qualify this phylogenetic branch as a candidate for Issyk-Kul' mortality. In any event, without a genome from Issyk-Kul' plague graves, it is impossible to determine whether the local 1338/9 outbreak was an early Black Death event (from Branch 1, which *may* have been present around Issyk-Kul' around 1338, only to disappear later), or an unrelated plague outbreak, caused by another strain (say, o.ANT5 or 2.MEDo). Both scenarios are possible.

Equally puzzling are the geographical origins of the Issyk-Kul' outbreak. Were they in or around the Issyk-Kul' region, or did the outbreak derive from elsewhere? As we have seen, the diversity of *Yersinia pestis* strains in the Tien-Shan' focus of eastern Kyrgyzstan could imply that the great polytomy may have occurred in that area, which could also imply, at least in theory, that the Issyk-Kul' outbreak originated somewhere in the relative vicinity. Moreover, the excessive drought of the 1330s (and, thus, the potential reduction of biomass and decline in the rodent population) and the salinity of the soil and water reservoirs in the Issyk-Kul' area, which would have helped the bacterium to persevere without host for weeks on end, strengthens the hypothesis that the 1338/9 outbreak, at least for humans, arose in the vicinity of the Chu Valley, or at least somewhere nearby in Central Asia. The plague may have prevailed somewhere in Central Asia for decades after the big bang, ravaging sylvatic rodent populations before crossing over to humans in the 1330s.

Although the big bang may have indeed occurred close to Issyk-Kul', the 1338/9 outbreak did not necessarily originate there. The same strain responsible for the Issyk-Kul' outbreak could have left its native home after the polytomy, traveling back later to move from rodents to humans. Moreover, there is no evidence that the Issyk-Kul' outbreak was the effect of a post-polytomy strain; it could have come from one of the Branch 0 strains that preceded the big bang.

Arguments that the fourteenth-century pandemic had "Chinese" origins have a long history. Although, as discussed above, several sources report mass mortality among Mongol soldiers campaigning in the Jin state during the early thirteenth century, as well as an outbreak in the prefectures of Songjiang, Jiaying, and Hangzhou in 1333, none of them suggests that these episodes were related to the one at Issyk-Kul'. Moreover, these outbreaks occurred more

on a regional scale than a pandemic one, and the pathogen left no sign that it moved from these prefectures northwestward into Central Asia. Finally, whether these outbreaks were caused by plague remains a mystery, at least at this stage.

A possible clue that the Issyk-Kul' outbreak may not have derived from Yuan China is the absence of any known mortality spikes similar to that of 1338/9 at Issyk-Kul', nor any references to "pestilence" (*mawtānā*) in other surviving East Syriac cemeteries east of the Chu Valley. Although the sheer number of inscriptions extant in those cemeteries is considerably lower than that in the Chu Valley cemeteries—twenty-one in Almaliq, twenty-eight in Inner Mongolia, and ten in Zaitun (Quangzhou, in Fujian Province)—this paucity does not allow any *argumentum ex silentio* that these regions evaded mortality crises before or around the one at Issyk-Kul'. However, the fact that some Almaliq graves date to the 1350s, 1360s, and early 1370s (the latest tombstone is from 1371/2) indicates that the local East Syriac community continued to flourish after the likely demise of the Issyk-Kul' Christians c. 1345.<sup>33</sup>

One further speculation is that the Issyk-Kul' outbreak came from the north rather than the east. Ibn al-Wardī (1292–1349), himself a victim of the plague, reported that the pandemic began in the "Land of Darkness"—now western Siberia near the Arctic Circle, on the rivers Angara, Yenisey, Ob, Chulym, Irtysh, and Tom'—where it allegedly prevailed for fifteen years, before spreading in all directions. These distant territories—described by Marco Polo (1293), Ibn Baṭūṭah (1332), al-"Umarī (c.1342–9), and others—were settled by Ugric tribes, sometimes called *Yughra*. These peoples maintained their contact with the outside world largely through the fur trade, or through tribute and raids conducted by the Mongols from the south and the Novgorodians from the west. As the early authors observed, merchants and raiders imported exotic and valuable stoat and sable furs. Stoats, along with polecats and weasels, in addition to being common inhabitants of western Siberia also happen to be potential carriers of *Yersinia pestis*.<sup>34</sup>

33 Hymes, "Hypothesis," 288–294, 299–300; Kokovtsev, "Khristiyansko-siriyskiya nadgrobnyya nadpisi," 196; Ruji Niu, *La croix-lotus: inscriptions et manuscrits nestoriens en écriture syriaque découverts en Chine* (Shanghai, 2010), 149–278.

34 Dols, "Ibn al-Wardī's Risālah al-naba' 'an al- Waba': A Translation of a Major Source for the History of the Black Death in the Middle East," in Dickran K. Kouymjian (ed.), *Near Eastern Numismatics, Iconography, Epigraphy and History* (Beirut, 1974), 448. For the various

Although to this point, no *Yersinia pestis* genomes from those northern regions have been sequenced, recent genetic studies have established that the Altai region, to the south of the “Land of Darkness,” boasts several natural plague foci. Between 2015 and 2018, eighteen full genomes from the Gorno-Altai high mountain focus have been sequenced, two of which were from a couple of Bronze Age sites (Kytmanovo, c. 2887–2667 B.C.E., and Afanasyevo Gora, c. 1746–1626 B.C.E.). The Bronze Age strains belong to the so-called LNBA (Late Neolithic Bronze Age) lineage; modern samples belong to o.PE4a (which does not cause plague in humans), o.ANT4 (the same strain that caused the Justinianic plague in sixth-century Bavaria), 2.ANT3, and 4.ANT. Any migration of plague from western Siberia to Issyk-Kul’ and other regions in Central Asia remains, at this stage, highly speculative. Nonetheless, Ibn al-Wardī’s assertion should not be summarily dismissed, especially since western Siberia is replete with plague-transmitting rodents, some of which had gone southward around the time of the Issyk-Kul’ outbreaks (through trade and tribute), and several plague strains were present in the neighboring Altai region.<sup>35</sup>

A close analysis of the epigraphical evidence from the Issyk-Kul’ tombstones, from an environmental, socioeconomic, political, and palaeogenetic perspective, reveals that the sudden spike in burial levels in 1338/9 reflects an outbreak of plague mortality in local communities. The absence of palaeogenetic data to confirm it could

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descriptions (mostly Muslim) of the “Land of Darkness,” see Paul Lunde and Caroline Stone (trans.), *Ibn Fadlān and the Land of Darkness: Arab Travellers in the Far North* (London, 2011); Robbie A. McDonald and Serge Larivière, “Diseases and Pathogens of *Mustela* spp. with Special Reference to the Biological Control of Introduced Stoat *Mustela Erminea* Populations in New Zealand,” *Journal of the Royal Society of New Zealand*, XXXI (2001), 721–744; Julia M. Riehm et al., “*Yersinia pestis* Lineages in Mongolia,” PLoS ONE, VII (2012), doi:10.1371/journal.pone.0030624.g001 (supporting information, Table 1).

35 Simon Rasmussen et al., “Early Divergent Strains of *Yersinia pestis* in Eurasia 5,000 Years Ago,” *Cell*, CLXIII (2015), 571–582, doi: <http://dx.doi.org/10.1016/j.cell.2015.10.009>; Aida Andrades Valtueña et al., “The Stone Age Plague and Its Persistence in Eurasia,” *Current Biology*, XXVII (2017), doi: <https://doi.org/10.1016/j.cub.2017.10.025>; Vladimir V. Kutyrev et al., “Phylogeny and Classification of *Yersinia pestis* through the Lens of Strains from the Plague Foci of Commonwealth of Independent States,” *Frontiers in Microbiology*, IX (2018), doi: 10.3389/fmicb.2018.01106; Angelina A. Kislichkina et al., “Nine Whole-Genome Assemblies of *Yersinia pestis* subsp. *microtus* bv. *Altaica* Strains Isolated from the Altai Mountain Natural Plague Focus (No. 36) in Russia,” *Genome Announcements*, VI (2018), doi: <https://doi.org/10.1128/genomeA.01440-17>.

be partially rectified by both textual and palaeoclimatological data. As we have seen, the ratio of mortality rates between “normal” and plague years in the Issyk-Kul’ communities is not unlike that in Europe during the plague years 1348 to 1350. A proper appreciation of the pandemic outbreak requires setting its timing in a climatic context. After two pluvial episodes in the 1310s and 1320s, precipitation levels in Issyk-Kul’ during the 1330s underwent a sharp decline (especially during the severe drought from 1336 to 1339), thereby depriving sylvatic rodents of sufficient grass to sustain their high population density. Hence, the plague pathogen and its vectors needed an alternative host to maintain their activity. Such were the climatic circumstances in which mortality in the Issyk-Kul’ communities originated.

The paucity of written documents from the Chu Valley region makes any reconstruction of possible channels of the pathogen’s spread tentative. Nevertheless, certain anthropogenic factors may have contributed to the spread of the pathogen, such as local dietary habits and communication networks. Although local Christian communities probably did not make a habit of consuming rodent meat, Mongol nomads apparently were regular consumers of marmot meat. Reports from late imperial and Soviet Central Asia during the Third Plague Pandemic reveal that sylvatic rodents played a major role in spreading plague among humans; most likely, the biological interaction between the bacillus and the host was not much different during the Second Plague Pandemic.

Communications, too, may have been instrumental in the spread of the disease. Around the time of the plague outbreak, the Chu Valley was still involved in international trade along the northern branch of the trans-Asian mercantile routes. Because the merchants used donkeys, not camels, to transport their goods, camels were not significant hosts for plague transmission here as they were elsewhere. However, the silk merchandise that the pack animals carried could have attracted plague-infected fleas, and the flour transported by soldiers along the same routes could have lured rodents. Moreover, the poor hygienic conditions of captives and slaves could well have encouraged lice infestation, another possible plague vector. All of these factors could have contributed to the outbreak and spread of human plague around Issyk-Kul’ in 1338/9.

Crucially, a number of scholars, including Pollitzer, McNeill, and Campbell, interpreted the Issyk-Kul’ plague as an early

instance of the Black Death, which then moved westward to Ulus Juchi in 1345/6. This article does not attempt to link the two outbreaks but to study the Issyk-Kul' mortality as a local phenomenon within a wider Central Asian environmental, palaeoclimatic, socioeconomic, and palaeogenetic context. Nothing in the surviving evidence suggests that the two outbreaks were related, notwithstanding a few scholarly views to the contrary.

The big bang, occurring at some point in the late twelfth or the thirteenth century, created four new branches, meaning that each new lineage could potentially unfold into a deadly outbreak in humans. The Black Death is now known to have been caused by Branch 1, which is marked by a remarkable diversity of sub-branches and strains responsible for numerous outbreaks. But the same diversity also characterizes the pre-polytomy Branch 0 and post-polytomy Branch 2, the strains of which now dominate the Tien-Shan' sub-foci of Kyrgyzstan (in particular, 0.ANT2, 0.ANT3, 0.ANT5, and 2.MED1 lineages). The lack of a single Branch 1 genome detected or sequenced in the Issyk-Kul' region does not preclude the possibility that Branch 1 strains may have existed there historically, but without aDNA evidence from the Issyk-Kul' region (or, indeed, anywhere in Central Asia), any such claim does not go beyond speculation. In short, to prove or disprove a link between the Issyk-Kul' mortality and the Black Death requires aDNA evidence.

Regardless of whether the Issyk-Kul' aDNA happened to reveal Branch 1 or another lineage as causal, the results would be of a great scientific and historical importance. In the event of a Branch 1 strain, historians, archaeologists, and palaeoclimatologists will need to explore an expanded Eurasian palaeoenvironmental and socioeconomic context to account for a possible spread from Central Asia to Ulus Juchi. If the palaeogenetic analysis points to a different lineage, even bigger historical questions will arise, potentially encompassing a multitude of undocumented plague outbreaks in Central Asia and other territories, where written records were uncommon or nonexistent.

The pervasiveness of the Second Plague Pandemic outside of its traditionally known European and Middle Eastern territories may come to light only by placing the history of the fourteenth-century plague into more of a global picture. Until recently, scholars tended to study the Second Plague Pandemic almost exclusively

from a Eurocentric perspective, neglecting Afro-Eurasian roots and the extent of the medieval plague. Recent efforts, however, have raised awareness of Second Plague Pandemic as a global bio-environmental and sociopolitical phenomenon. To understand the pandemic, we need first to understand its proliferation. The question of its geographical scope remains one of the most pressing questions in this field. Only by departing from a traditional Eurocentric standpoint to a much wider geo-chronological framework can we start to appreciate the sudden appearance of the single deadliest killer that the human race has ever faced.<sup>36</sup>

No such approach to the study of the plague will be able to break new ground without a collaboration between humanists, archaeologists, and palaeoscientists working on different cultures and civilizations. Although words and bones can provide information about many aspects of the disease, the answers to many questions will require the constant replenishment of palaeoenvironmental and palaeogenetic data, especially in the case of nonliterary civilizations, about which material discoveries must replace or supplement written records to shed light on complex situations.

The case of the Issyk-Kul' plague outbreak of 1338/9 is just one such example. No Central Asian chroniclers reported on year-to-year weather variations in the Chu Valley; nor were any local mid-fourteenth-century literati aware of the genetic differences between outbreaks in different plague foci. Only with the help of dendrochronological and palaeogenetic evidence can we appreciate the full nature of what might have been the earliest documented outbreak of the Second Plague Pandemic. The future of plague study is therefore in the hands of multidisciplinary teams of humanists, archaeologists, and scientists.

36 Green, "Taking 'Pandemic' Seriously," 27–61.