

Bringing Dols and Conrad into the Genomic Age: What's New in the History of Infectious Diseases?

History of Infectious Disease in the Islamicate World

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Location in Jordan

Coordinates:  31°50'N 36°49'E

Arbaji *et al.* 2005, “A 12-case Outbreak of Pharyngeal Plague Following the Consumption of Camel Meat, in North–Eastern Jordan”

Abstract: Between late January and early February **1997**, an outbreak of plague, associated with cervical lymphadenopathy and fever, occurred in the Jordanian village of Azraq ad-Druze, which lies about 50 km west of the border with Saudi Arabia. The 12 cases who presented at hospital were initially assumed to have tularaemia, and **all were successfully treated with gentamicin**. When, however, their sera were tested for evidence of *Yersinia pestis* or *Francisella tularensis* infection (using haemagglutination, enzyme immuno-assays for specific IgM or the F1 antigen of *Y. pestis*, and micro-agglutination tests), all 12 were found to have anti-*Y. pestis* IgM. **Three dogs** shot near the Saudi Arabian border were also found seropositive for antibodies against *Y. pestis*. **Eleven of the 12 patients reported that, 2–4 days before their symptoms appeared, they had eaten the meat cut from the carcass of the same camel**, either raw (10 cases) or cooked (one case). All 12 patients were diagnosed as cases of pharyngeal plague (the first cases of plague reported in Jordan for more than 80 years), caused by *Y. pestis* that most had acquired when they ate raw meat from a camel that was infected with the pathogen.

—**Finales de la epidemia de peste principios *raġab* 750 (=aprox. 15 septiembre 1349):** Muḥammad b. Saʿīd b. Yaḥyà al-Anṣārī, Abū ʿAbd Allāh, al-Šaddād. Fue el último que murió en Almería por la epidemia. Fue enterrado en el exterior de la Puerta de Pechina.⁵⁷

Questions for today – The Biological Archive: thinking biologically across space and time

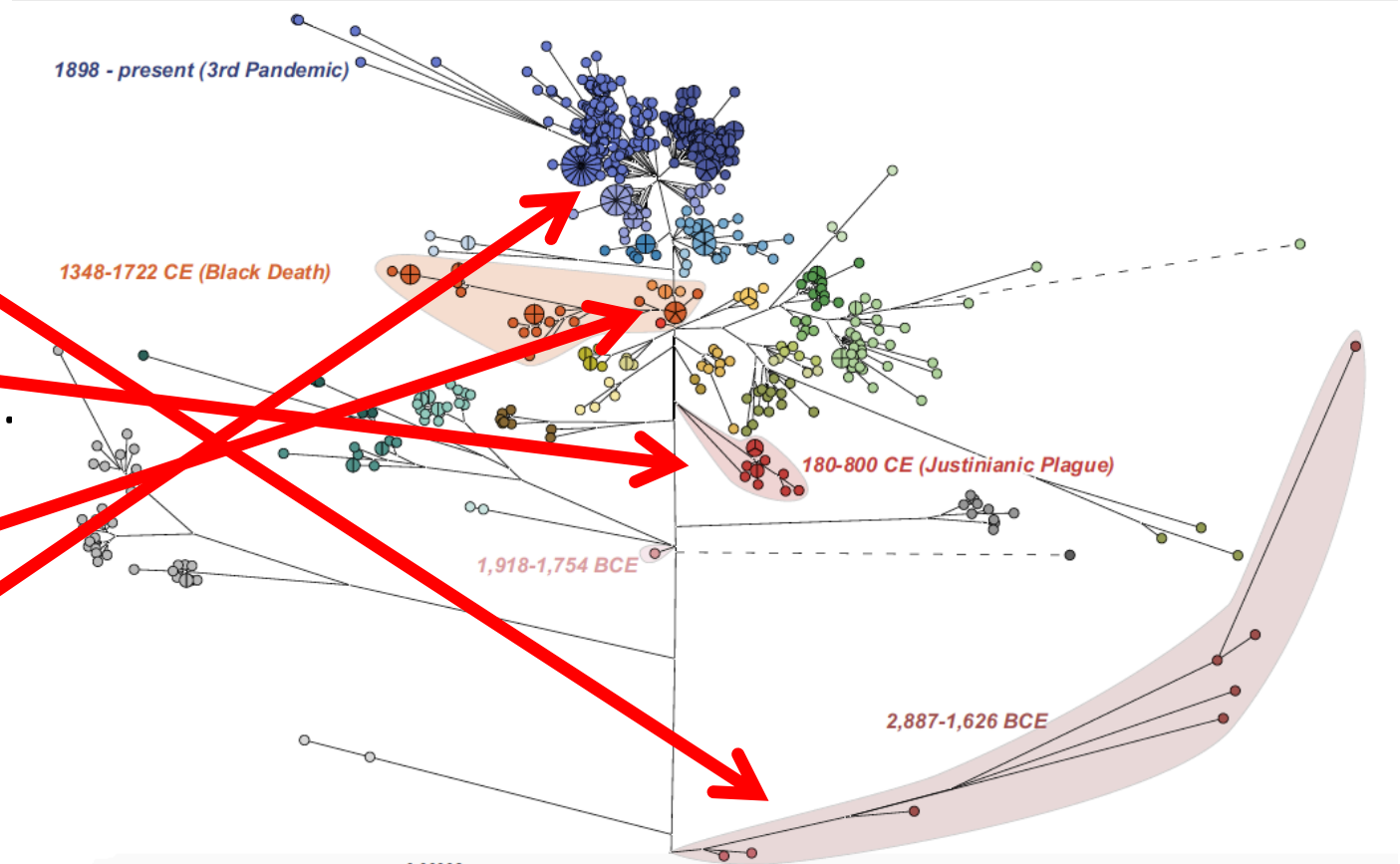
- How the biological archive creates an agenda for historians:
 - Tells us *when* to look
 - Tells us *where* to look
 - Tells us *what* to look for
- Where does the biological archive come from?
 - Contributions of modern plague studies
 - Contributions of palaeogenetics
- How does the biological archive tell us stories about times and places for which there are not yet any “accessions”?
 - Basics of phylogenetic inference
 - Maps, maps, maps
- A new history of infectious diseases for a new pandemic era

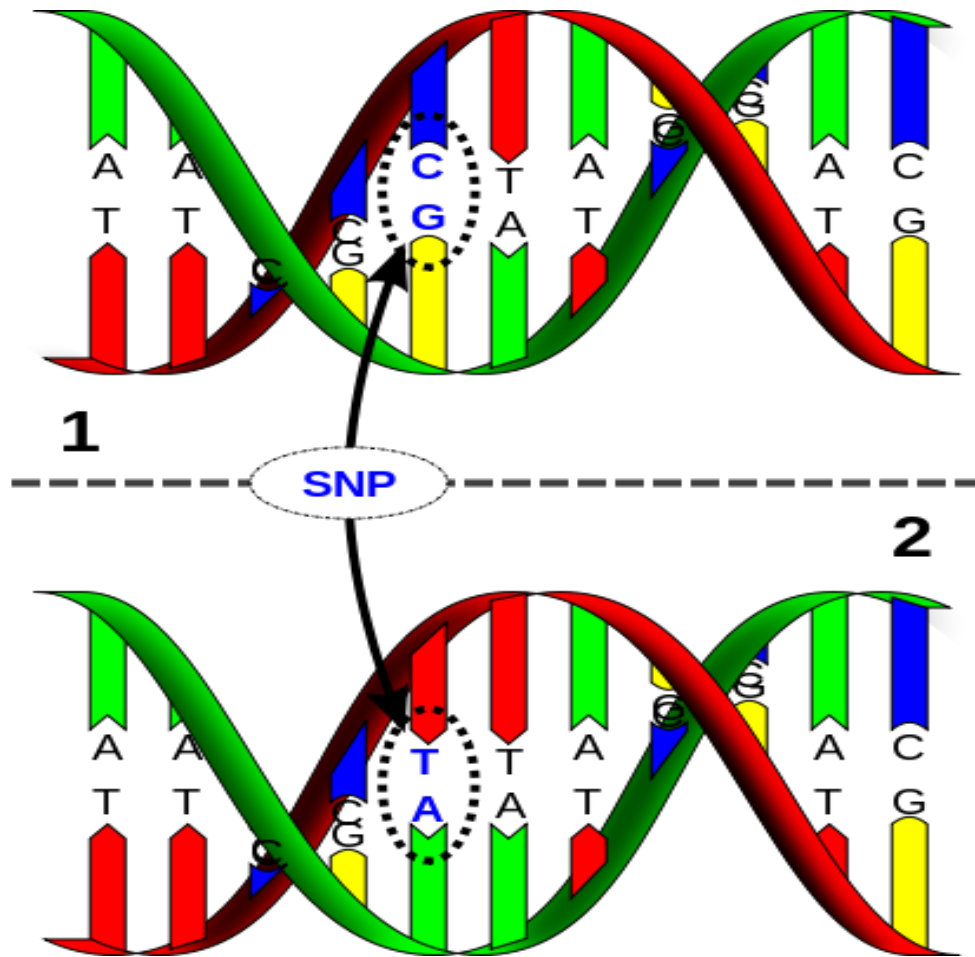
What We Know About Plague's History Now

The Pandemics we know

- Late Neolithic transition
- Justinianic Plague (541-ca. 750 CE)
- Black Death
- 3rd Plague Pandemic

Source of image: Zhou *et al.* 2020





Single nucleotide polymorphism (SNP)
Source: Wikipedia

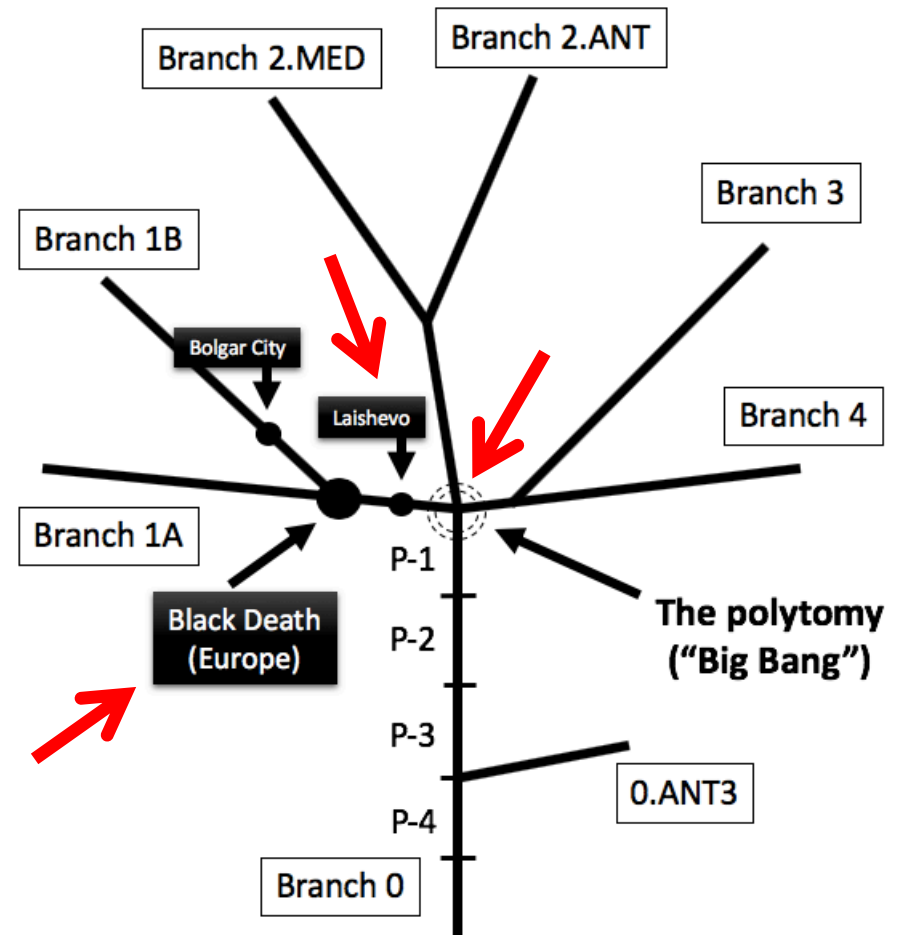
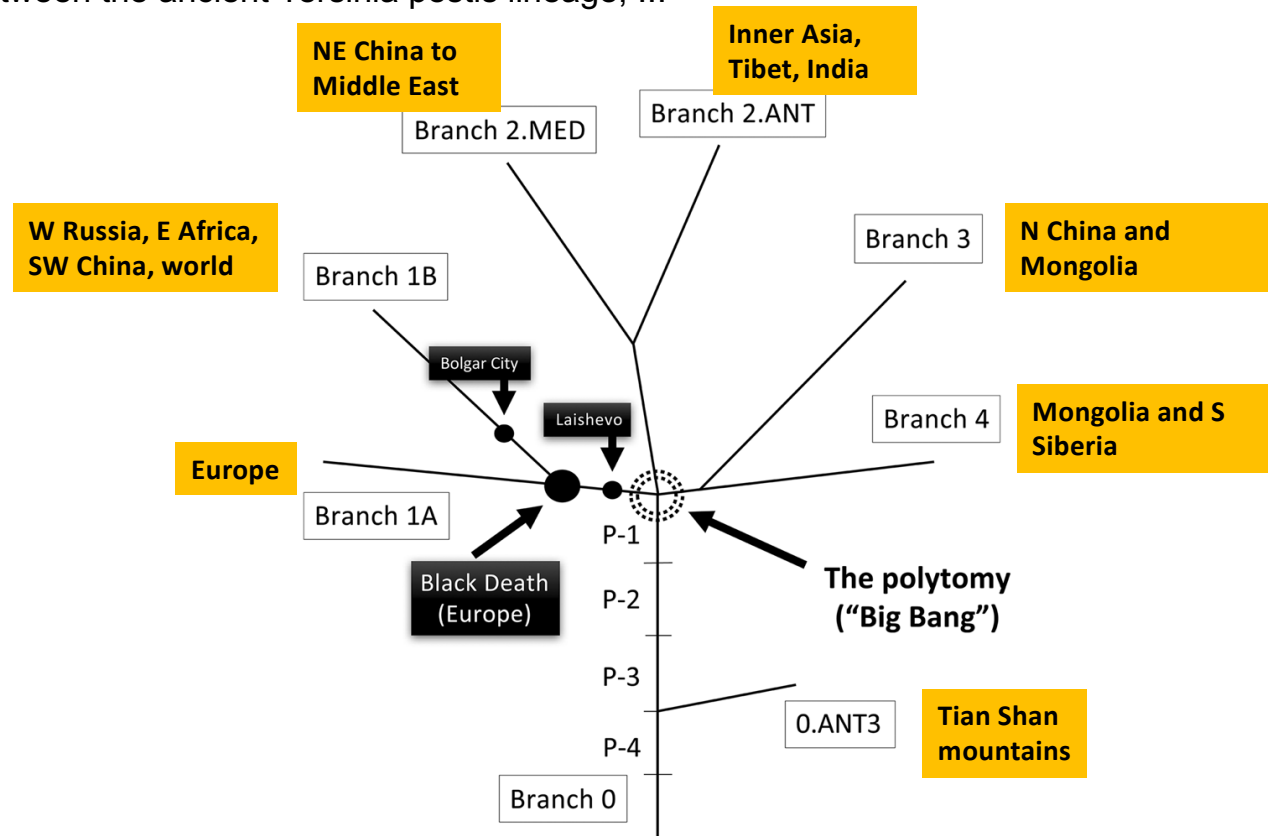
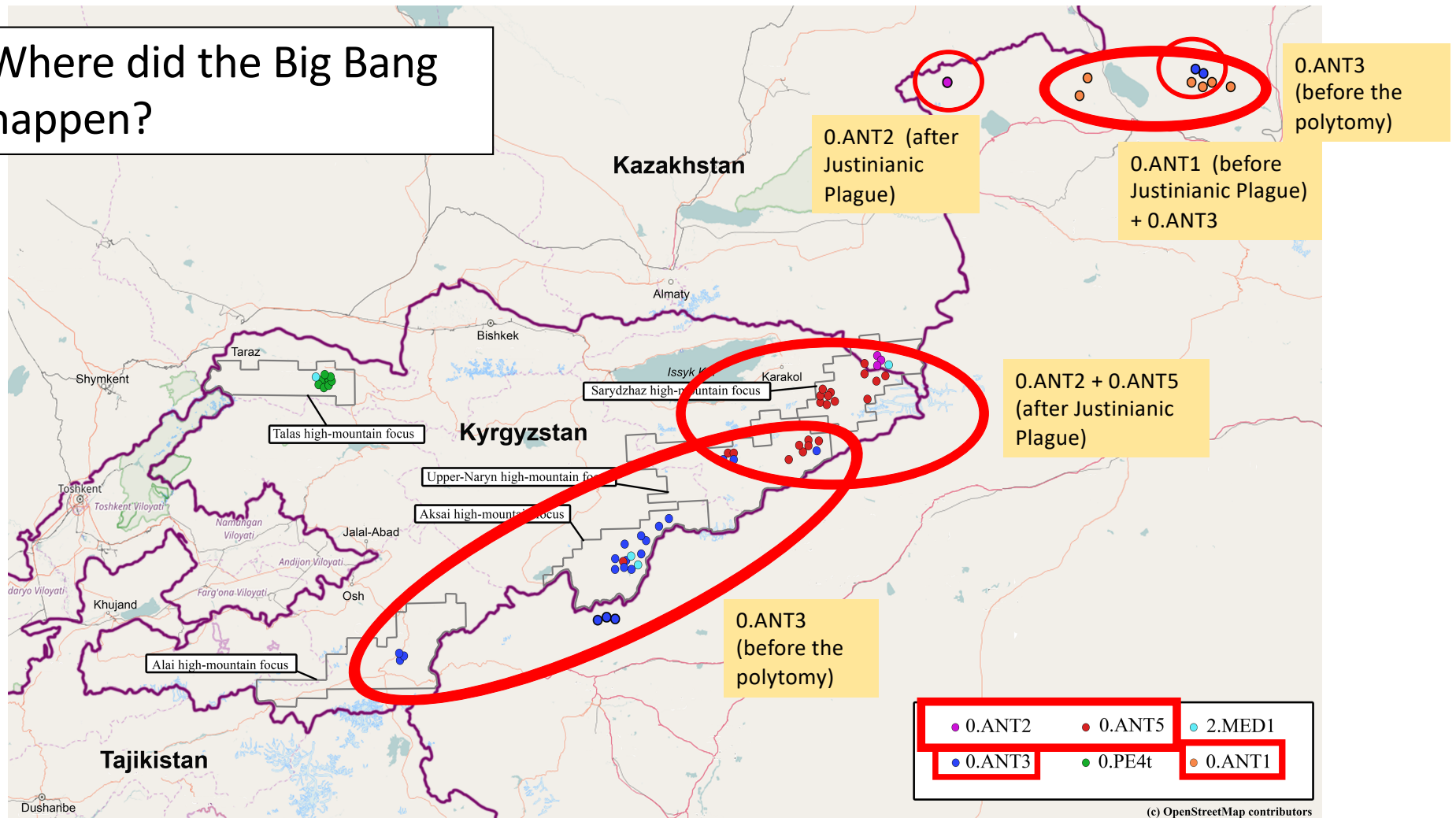


Figure 1: Diagram of the polytomy, showing the relationship between the ancient *Yersinia pestis* lineage, ...



Where did the Big Bang happen?

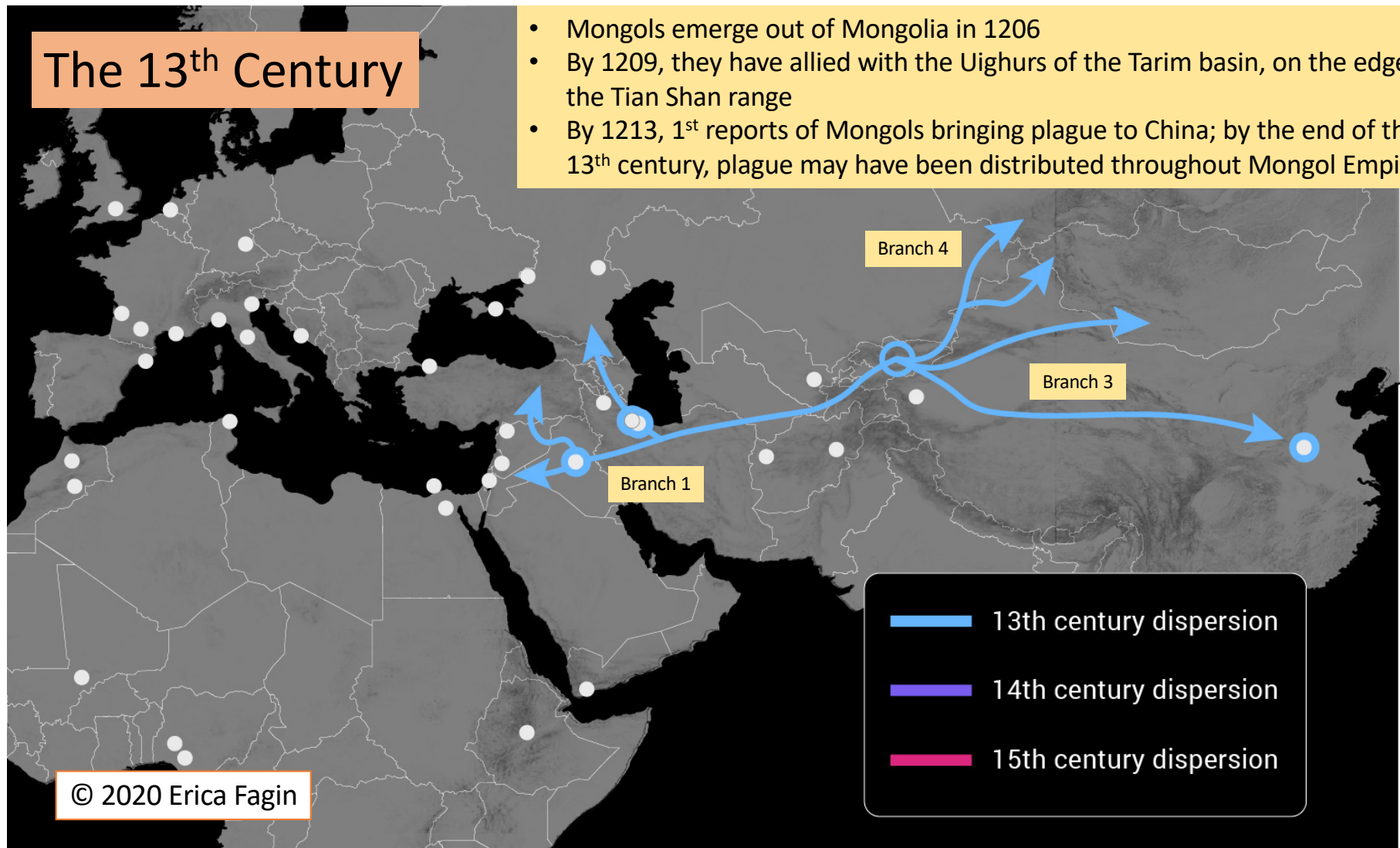


Eroshenko *et al.* 2017: Fig 1. Natural plague foci of Kyrgyzstan and distribution of *Yersinia pestis* strains of different phylogenetic branches across these foci. The geographical location of strains of the 0.ANT1, 0.ANT2 and 0.ANT3 branches in the territory of China are taken from Cui *et al.* 2013.

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The 13th Century

- Mongols emerge out of Mongolia in 1206
- By 1209, they have allied with the Uighurs of the Tarim basin, on the edge of the Tian Shan range
- By 1213, 1st reports of Mongols bringing plague to China; by the end of the 13th century, plague may have been distributed throughout Mongol Empire



Fancy and Green forthcoming: “Plague and the Fall of Baghdad (1258)”

Abstract The recent suggestion that the late medieval Eurasian plague pandemic, the Black Death, had its origins in the thirteenth century rather than the fourteenth, has brought new scrutiny to texts reporting ‘epidemics’ in the earlier period. Evidence both from Song China and Iran suggests that plague was involved in major sieges laid by the Mongols between the 1210s and the 1250s, including the siege of Baghdad in 1258 which resulted in the fall of the Abbasid caliphate. In fact, re-examination of multiple historical accounts in the two centuries after the siege of Baghdad shows that the role of epidemic disease in the Mongol attacks was commonly known among chroniclers in Syria and Egypt, raising the question why these outbreaks have been overlooked in modern historiography of plague. The present study looks in detail at the evidence in Arabic sources for disease outbreaks after the siege of Baghdad in Iraq and its surrounding regions. We find subtle factors in the documentary record to explain why, even though plague received new scrutiny from physicians in the period, it remained a minor feature in stories about the Mongol invasion of western Asia. In contemporary understandings of the genesis of epidemics, the Mongols were not seen to have brought plague to Baghdad; they *caused* plague to arise by their rampant destruction.

When an even bigger wave of plague struck the Islamic world in the Fourteenth century, no association was made with the thirteenth-century episode. Rather, plague was now associated with the Mongol world as a whole.

Keywords: *Yersinia pestis*; historical chronicles; Islamic medicine; miasmatic theory; Mongol Empire

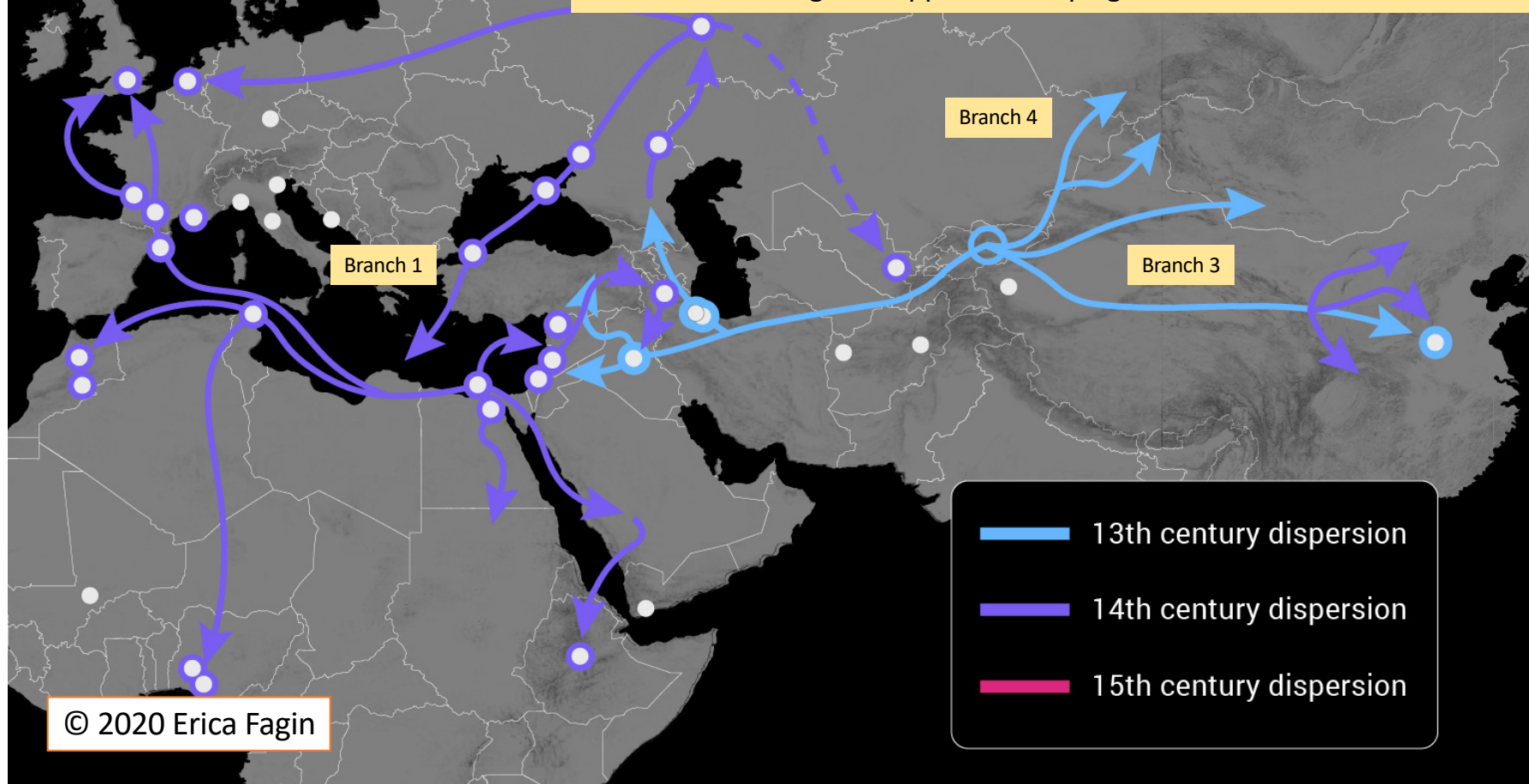
Image: Diez Album, Siege of Baghdad



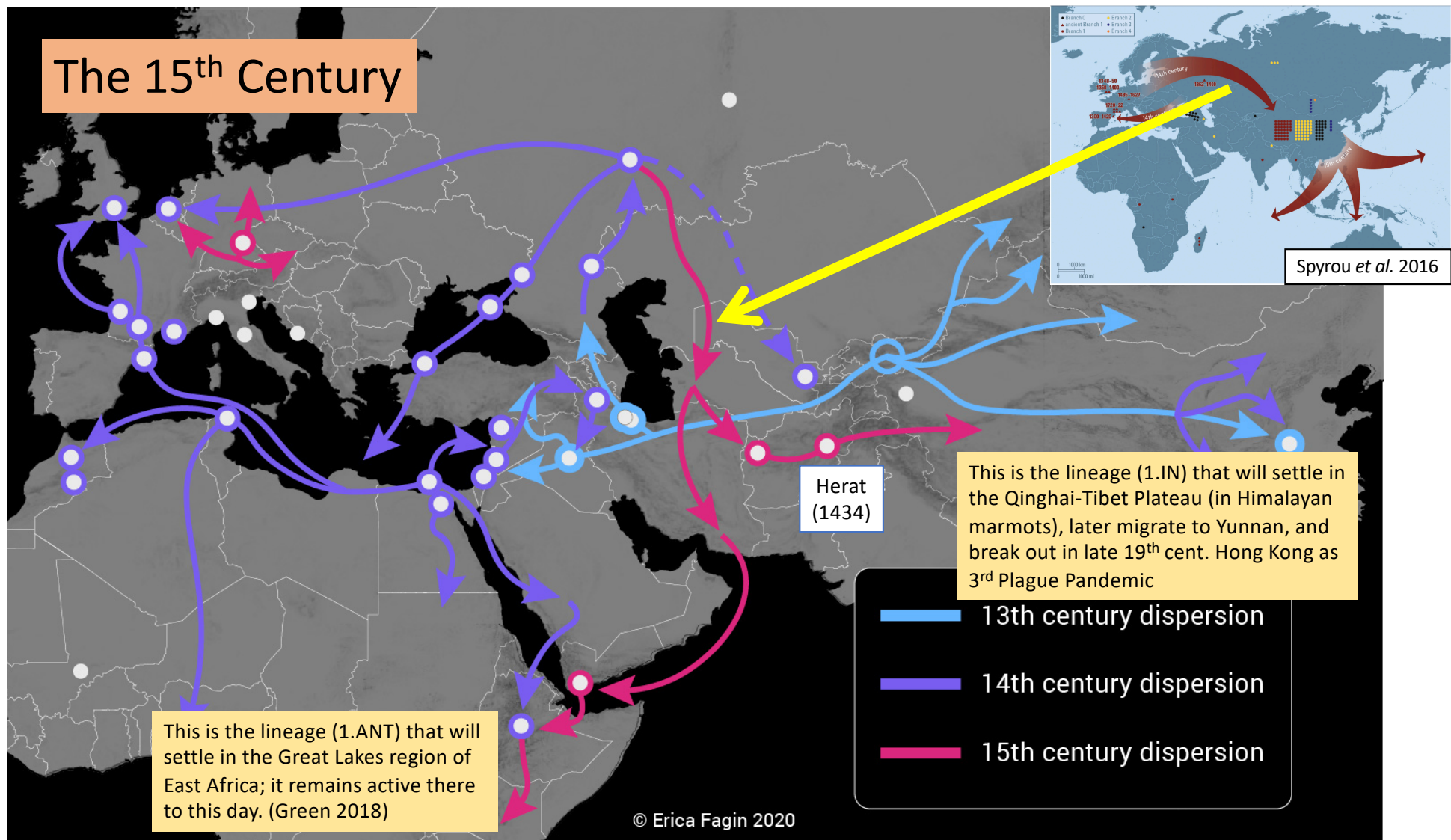
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The 14th Century

- shifting climate throughout Eurasia; widespread grain shortages
- **FIVE SEPARATE ACTIVE THEATERS OF PLAGUE in the 14th century: China, Mongolia, Altai, Caucasus/Volga basin, Mediterranean & Europe**
- contaminated grain supplies move plague into Black Sea & Mediterranean

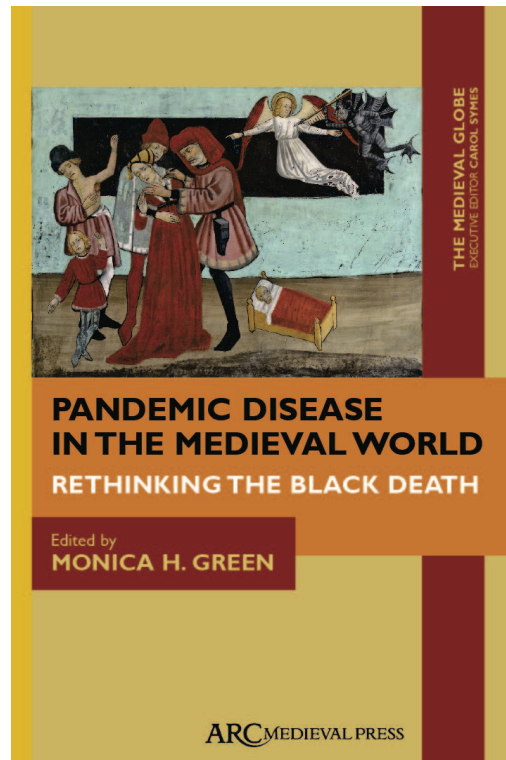


The 15th Century

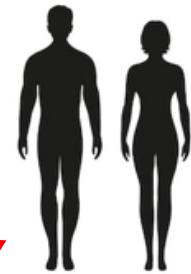


An Agenda for Future Research

Why Pandemic Thinking must be interdisciplinary ... And scalar



- The historian
- The archaeologist
- The geneticist



- The population biologist (modeler)
- The entomologist



An Agenda for Future Research

Major Arabic Plague Treatises	Translation ?
Ibn al-Wardī (d. 1349), <i>Risālah</i>	English
Ibn Mushtamil al-Bilyānī (d. 1363), <i>Iṣlāḥ al-niyya fī l-mas'ala al-ṭā'ūniyya</i>	no
Ibn Khātima (d. 1369), <i>Thalāth rasā'il andalusiyya fī al-ṭā'ūn al-jārif</i>	French
al-Shaqūrī (d. after 1369), <i>Naṣīḥa fī al-awbi'a</i>	French
Ibn al-Khaṭīb (d. 1375), <i>Muqni'at al-sā'il 'an al-maraḍ al-hā'il</i>	German (partial)
Ibn Abī Ḥajala (d. 1375), <i>Daf' al-niqma</i>	no
al-Manbijī (d. 1383), <i>Fī Akhbār aṭ-ṭā'ūn</i>	no
Ibn Ḥajar al-'Asqalānī (d. 1449), <i>Badhl al-mā'ūn fī faḍl al-ṭā'ūn</i>	no

Post-Black Death Plague Outbreaks – Questions

- When were they? (need fuller chronologies + criteria for “diagnosing”)
- Out of what reservoirs did they erupt?
- What were mechanisms of spread? (grain supplies? Camels? Sequential spillovers among rodents?)
- What were the networks of exchange of texts on “plague thinking”?

An Agenda for Future Research

CHRONICLES

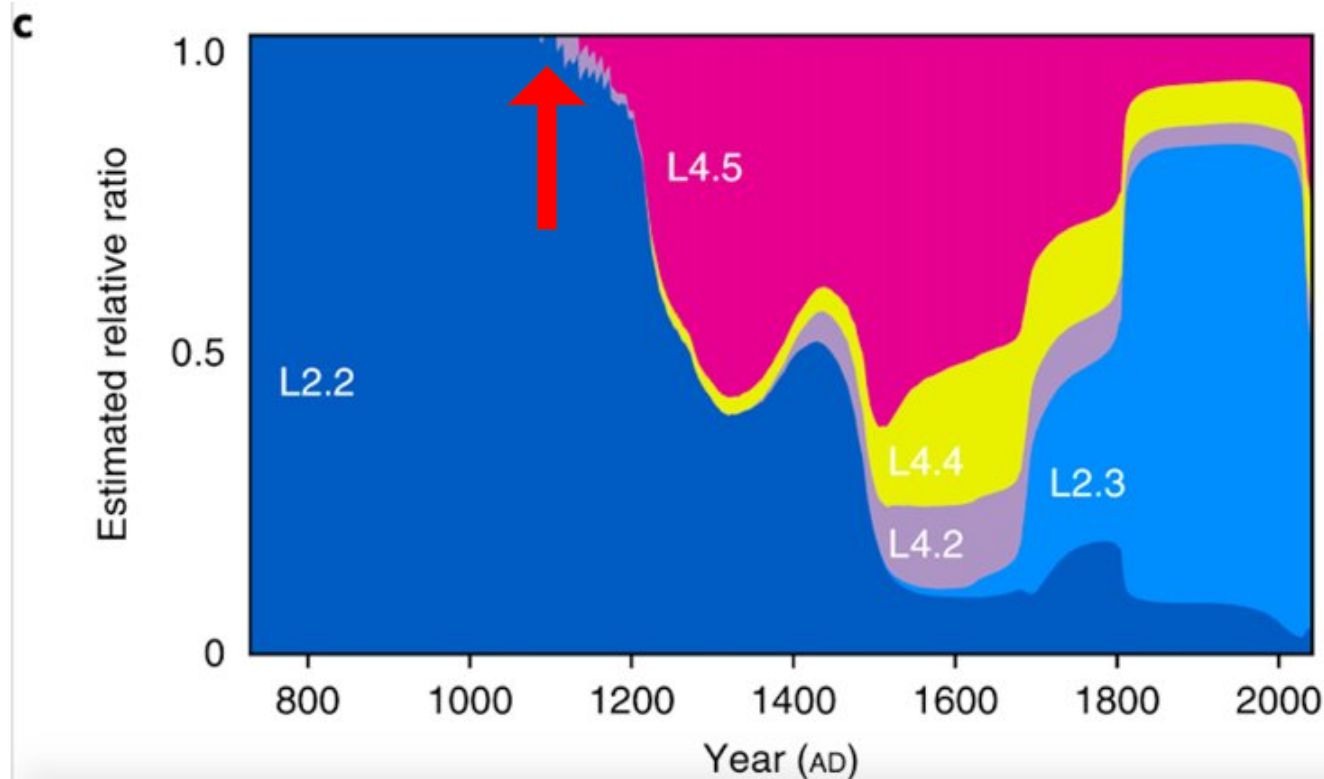
Varlik 2015, p. 102: The Jalayirids were a dynasty of Mongol origin that ruled in Iraq and northwestern Persia after the disintegration of the Ilkhanid power in the area in the 1330s. One of these chronicles, Abū Bakr al-Qutbī al-Ahrī's *Tā'rikh-i Shaikh Uwais*, has been already noted by Michael Dols. See Dols, *Black Death*, 45n32. Two other chronicles confirm the presence of plague in Tabriz and its surroundings in 747 H. (April 1346–47). See Zayn al-Dīn b. Hamd Allāh Muṣṭawfi Qazvinī, *Zayl-i Tārīkh-i Guzīda*, ed. Īraj Afshār (Tehran: Nagsh-i Jahān, 1372 [1993]), 41; Hāfiz Abrū, *Zayl-i Jāmi' al-Tavārīkh*, ed. Khānbābā Bayānī (Tehran: Ilmī, 1317 [1939]), 178. I am grateful to my colleague Pat Wing for bringing these sources to my attention. For further discussion of these chronicles, see Patrick Wing, "The Jalayirids and Dynastic State Formation in the Mongol Ilkhanate," PhD diss., University of Chicago, 2007.

KEEPING UP WITH PLAGUE BIOLOGY

KNOWN EXCAVATIONS (possibly yielding genetic material of pathogens):

- Cairo Black Death cemeteries (14thC)
- Otrar (Mongol invasion, 13thC)
- Byzantine Thebes (6thC, Justinianic Plague)
- Constantinople/Istanbul (century?)

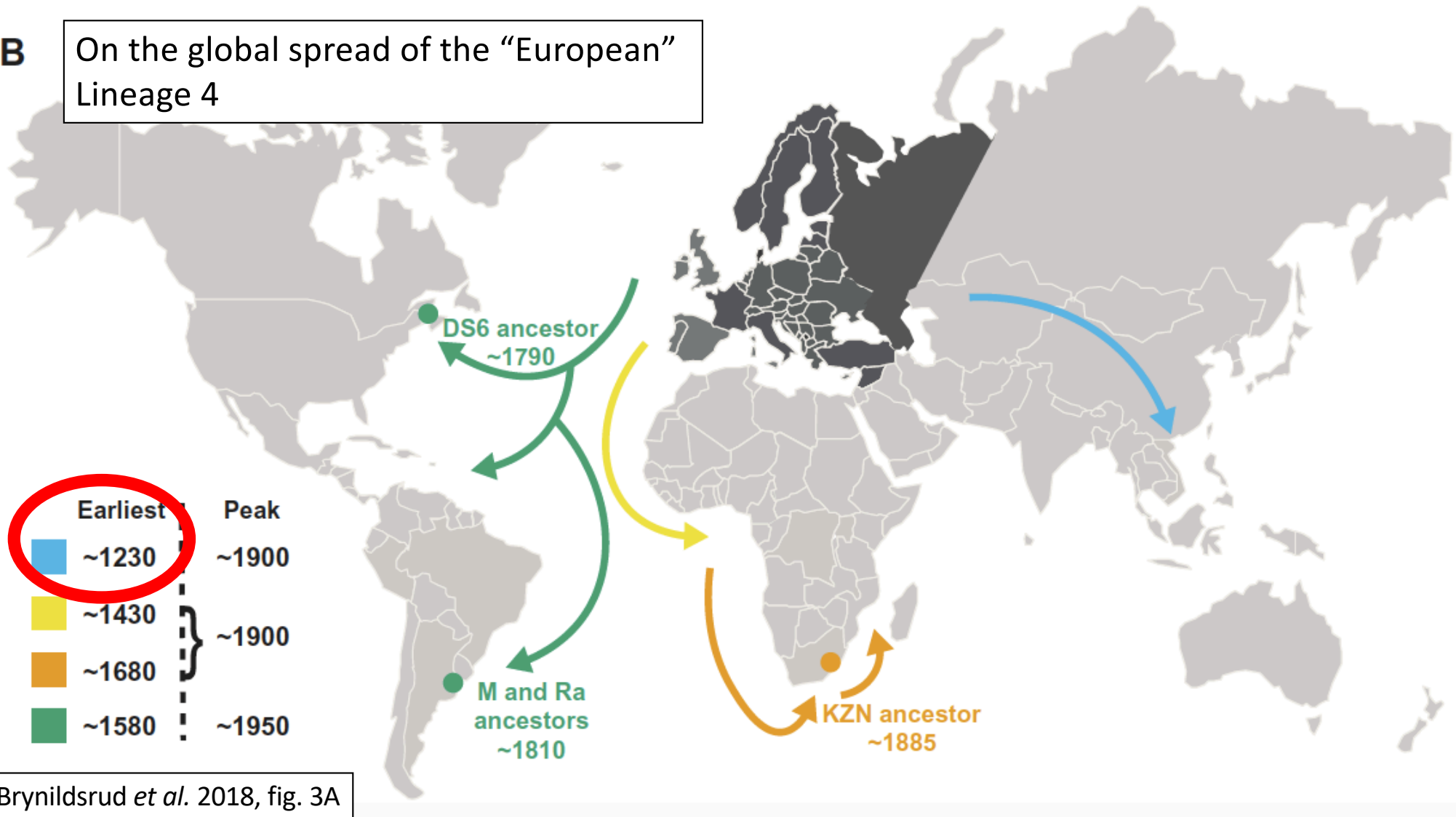
The Development and Increasing Prevalence of China's Four TB Lineages



“We estimate that L2 emerged around AD 223, L2.2 in AD 806 and L2.3 in AD 1520” ... “It is remarkable that new sublineages [L2 strains] formed in situ and important external introduction events [L4 strains] occurred during a short window (AD 1150–1268)”

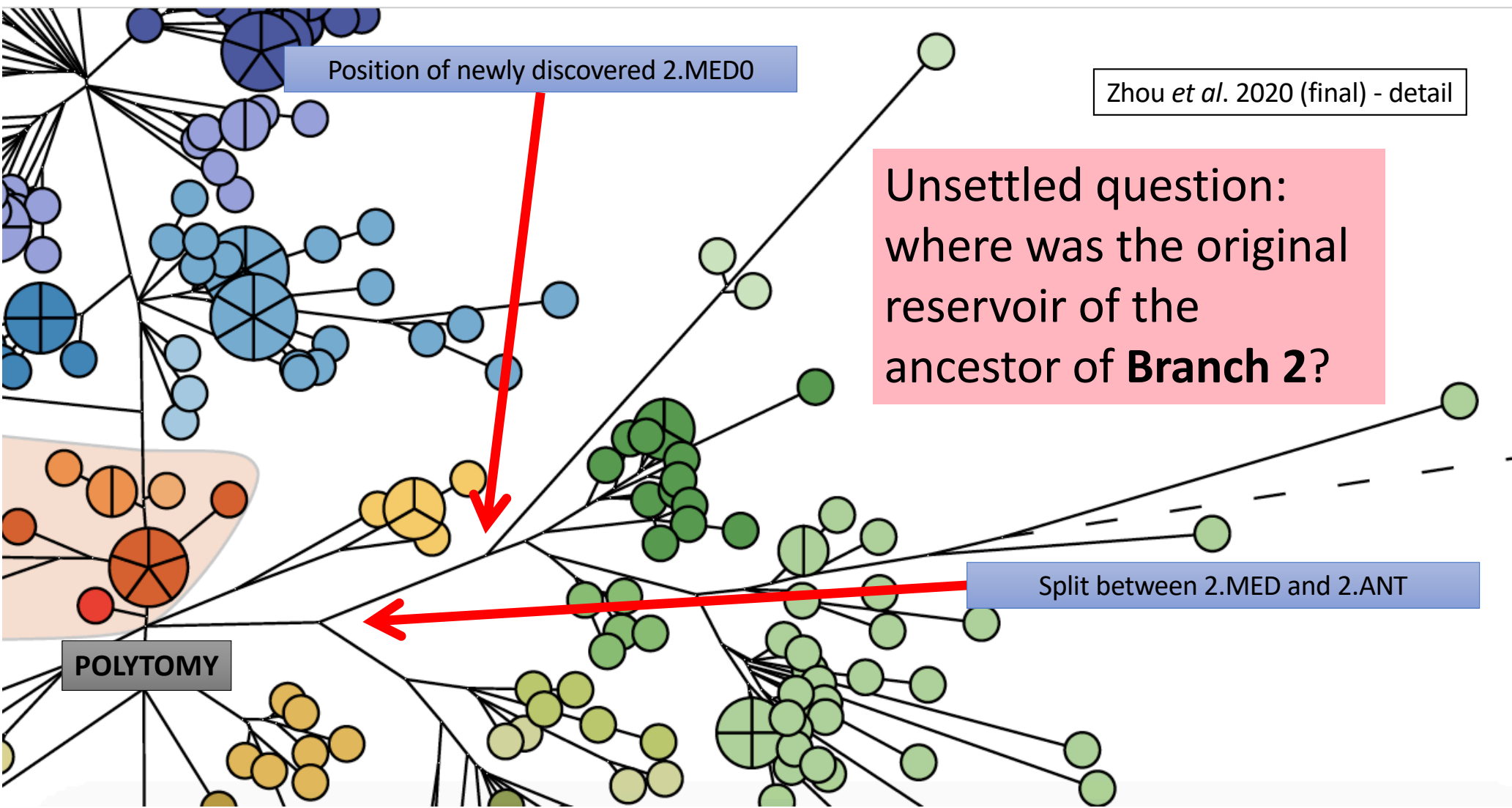
Liu *et al.* 2018, fig. 4c: Inferred past population dynamics of each sublineage in China, estimated from the effective population growth

B On the global spread of the “European”
Lineage 4



Bibliography

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- Green, Monica H. “The Four Black Deaths,” *American Historical Review*, 125, no. 5 (December 2020), 1600-1631; includes Supplemental Data, “Marmots and Their Plague Strains,” online only (<https://academic.oup.com/ahr/article/125/5/1601/6040962>).
- Ho, Simon Y. W., and Sebastián Duchêne, “Dating the Emergence of Human Pathogens,” *Science* 368, no. 6497 (19 June 2020), 1310-11.
- Roosen, Joris, and Monica H. Green, “The Mother of All Pandemics: The State of Black Death Research in the Era of Covid-19 – Bibliography,” 26 May 2020, <https://docs.google.com/document/d/1w80dd0iZJs5qQRwyXyfzq41BiZBWFrGRQURz9rTyDXM/edit>. This includes, as an appendix, an extensive bibliography on the Justinianic Plague (6th-8th centuries). All the plague-related work by Lawrence Conrad is included there.



Zhou *et al.* 2020 (final) - detail

Eroshenko *et al.* 2019a
Phylogenetic analysis of *Y. pestis* strains from Precaspian North-Western steppe focus according to the data from whole-genome SNP-analysis. Maximum Likelihood tree-diagram of 32 genomes of *Y. pestis* strains, based on 1655 SNPs, is constructed using PHYML 3.1 and HKY85 model, (500 boot-strap replica)

KIM10 is from Kurdistan/Iran; it was isolated in 1968 from a human patient & sequenced in 2002

Strains reused in Eroshenko *et al.* 2019b are underlined

