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Theorising the Natural Archive

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ABSTRACT

This article discusses the use of the ‘natural archive’ (for instance, ice cores, pollen samples, dendrochronology) to supplement historians’ traditional, documentary sources. It first explores the way insights from the archival turn have forced historians to interrogate not only their sources’ provenance, but also the sources of those sources: the origins of the archives themselves. This critical approach to archives – looking at archives as objects of analysis – can be applied to archives assembled from natural specimens as well. I examine two examples of natural archives (herbaria and ice core collections) and show that they have subjectivities and social mediation similar to archives that contain paper records. The archival processes of acquisition, appraisal, ordering, and description (as well as deaccessioning) are all mediated by cultural concepts. I examine both herbarium specimens and ice cores to see how their creation and assembly into archives results not in an objective reflection of natural phenomena but rather in subjective assemblages. I conclude by appealing to historians to draw on these sources in an era in which the distinction between human history and natural history is collapsing, but to treat the provenance of ‘natural’ sources just as critically as that of documentary ones. By broadening the sources they use and thinking archivally about all of them, historians can avoid reifying the distinction between the natural and human worlds and confront the challenges of writing history in the Anthropocene.

KEYWORDS

Natural archive, palynology, pollen, ice cores, proxy archives, herbarium, taphonomy, archival turn

Environmental historians pride themselves on having put the dirt back into history.¹ While other sub-disciplines can write about Venice without mentioning forests, the American Pacific Northwest without a river, and southern China without the silkworm, environmental historians see these features as not simply backdrops but rather as crucial, central variables to analyse. To a great degree, like other historians, they still find these variables – forests, rivers and silkworms – in documents. The trees were counted, their circumferences measured and the totals tallied in the seventeenth-century logs of the Amministrazione Forestale Veneta in Venice, a critical part of the state bureaucracy responsible for masts for the city-state's navy. The waters of the Columbia flow through miles of US government surveys, Bonneville Power Administration records and citizens' letters to their congressional representatives. The silkworms still curl in the elegant characters of the Ming archives.²

I

Historians, archaeologists, geographers, geologists, and other intellectuals dedicated to recovering the past have long drawn on collections of *naturalia*, of material objects produced 'naturally' and collected by humans. Now natural historians of all disciplines add many other kinds of collections to the sources they examine: not just pressed flowers, layers of rock or shells, but a broader natural archive made up of tree rings, specks of pollen in mud and bubbles of air trapped in ice. The metaphor is not a new one: in the early eighteenth century, Georges-Louis Leclerc, the Comte de Buffon, described natural historians as people who 'rummage through the archives of the world'.³ Though the phrase 'natural archive' has been in circulation at least since 1962,⁴ Geoffrey

1. Ellen Stroud has said that '...environmental historians read water tables, soil analyses, and storm damage the way other historians read diaries, court records, and newspapers'. 'Does Nature Always Matter? Following Dirt through History', *History and Theory* 42 (4) (2003): 80.
2. Karl Richard Appuhn, *A Forest on the Sea: Environmental Expertise in Renaissance Venice* (Baltimore: Johns Hopkins University Press, 2009); Richard White, *The Organic Machine* (New York: Hill and Wang, 1995); Robert Marks, *Tigers, Rice, Silk, and Silt: Environment and Economy in Late Imperial South China* (New York: Cambridge University Press, 1998).
3. Quoted in Paolo Rossi, *The Dark Abyss of Time: The History of the Earth and the History of Nations from Hooke to Vico*, trans. Lydia G. Cochrane (Chicago: University of Chicago Press, 1984), p. 108.
4. In this paper, I will use 'the natural archive' as a collective singular for all the various types of natural archives. The earliest citation I can find that is consistent with the sense of an archive of observable natural data that can be used to reconstruct the past is in Maurice Neville Hill, *The Earth Beneath the Sea History*, vol. 3, *The Sea, Ideas and Observations on Progress in the Study of the Seas* (New York: Interscience Publishers, 1962), p. 385 The citation reads: 'Furthermore, no natural archive exists that would permit reconstruction of ocean DIC concentrations, as we have for atmospheric trace gases in the form of ice core records.' The first person to make an explicit call to use what I've called collectively 'natural

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Parker was the first to discuss it in anything more than a passing way in his 2008 article. This article (later a book) discusses the dramatic effects of climate on the frequency of revolutions in the seventeenth century. Parker asserts that the data he will use consist of ‘two *distinct* categories: a “human archive” and a “natural archive”’.⁵ The latter includes narrative, numerical (i.e., statistical), pictorial, instrumental and epigraphic or archeological information. Parker’s ‘natural archive’ gives complementary material on long-term trends, and he lists important sources for his analysis: ice cores, palynology, glaciology and dendrochronology, as well as speleothems (deposits formed by groundwater, especially stalactites). In this paper, by ‘natural archive’ I specifically intend collections of physical objects that have been collected, processed, deposited in some sort of archive, and that permit analysis through various techniques. To Parker’s list of natural archives, one could add paleopathology, geographic spread calculated from divergence in genetic material, speleothem coring, carbon-14 assays, streambed analysis, coral analysis, evaluation of insect damage to fossilised leaves, fossilised plankton in deep-sea sediments, fossilised beetles in peat bogs, isotopes in both fossilised mammal teeth and paleosols (old dirt), and even bird feathers, which can be sampled for chemical pollutants to which the birds were once exposed. It’s worth noting that Parker has been writing on the general crisis in the early modern period since the 1980s but has added environmental history to his analysis of late. He does so (along with other historians who are drawing on this kind of source base) because he believes the natural archive will both complement and supplement the evidence he finds in manuscripts and correspondence – or perhaps tellingly contradict it.

Historians are hyper-critical of their sources but have perhaps lagged behind their colleagues in the world of STS studies in analysing the sources of their sources, the archives. As Sorara de Chadarevian and Theodore M. Porter recently pointed out in a special issue of the journal *Historical Studies in the Natural Sciences*, data is not neutral. Rather, it is ‘shaped by a wider economy, politics, culture, and other vectors of power, and it has consequences for those over whom power is exerted’.⁶ De Chadarevian and Porter stress both the materiality of data practices and the obligation of historians of knowledge, when confronting a database, to ponder the conditions under which it was created. This sort of systems thinking pervades STS studies’ analyses of what could be called bio-archives. Scholars in this field have considered the traces of the past left behind by animals, the ethics of the national biosampling campaign

archives’ was J.R. McNeil in 2005. In his short article he states that environmental historians ‘are well placed to serve the interests of the historical profession as a whole by filing reports from the geo-archives and bio-archives created by natural scientists’. J. R. McNeill, ‘Drunks, Lampposts, and Environmental History’, *Environmental History* 10 (1) (2005): 64–66.

5. Geoffrey Parker, ‘Crisis and Catastrophe: The Global Crisis of the Seventeenth Century Reconsidered’, *American Historical Review* 113 (4) (2008): 1059, emphasis mine.
6. ‘Introduction: Scrutinizing the Data World’, *Historical Studies in the Natural Sciences* 48 (5) (2018): 553.

in Iceland and the creation of seed banks as archives.⁷ Each of these archives shares characteristics: material traces are collected and stored for a specific purpose in the future.

While the use of these very different evidentiary bases is a positive development, historians have not yet theorised the limits of this archive – the ways in which these archives can to some extent be subjective and socially constructed like those filled with paper – as they have done for traditional archives. At first glance, the natural archive seems to be free of many of the problems that plague the human or paper archive. Instead of maddening gaps in correspondence or meeting minutes, each year of growth is available in tree rings, in perfect annual order. Biological categories, aside from mutations, seem to the historian thankfully free from ambiguity. Pollen from the sugar maple (*Acer saccharum*, a North American resident) is easily distinguishable from that of the Tree of Heaven (*Ailanthus altissima*, a Eurasian newcomer) under a microscope. The chronology of CO₂ concentrations trapped in ice is as transparent as the gas itself.

Historians have long recognised the limits of archival representativity. The traces of the past that make it into archives are not evenly distributed across axes of race, gender and class. The archival turn has added to this first kind of archival sampling error of a second kind. The process of archiving, of choosing and then classifying records, creates more silences and makes certain narratives harder to write. Historians using the natural archive will make better analyses of those sources if they think archivally. In other words, historians should consider the processes that cause distortions in the documentary archive and think how those same processes might be at work in archives of Himalayan ice or pollen samples from sediments in a Connecticut pond. Paleontologists and other scholars of physical remains of the past have also long recognised the uneven (and indeed sometimes totally stochastic) way in which these traces are preserved. Taphonomy, the study of the variables that contribute to an organism's fossilisation, is a well-developed subdiscipline. What historians who normally work with documents can bring to the study of the natural archives is their knowledge of the second kind of sampling error, the kind actually generated by the process of archiving.⁸

7. Etienne Benson, 'Animal Writes: Historiography, Disciplinarity, and the Animal Trace', in Linda Kalof and Georgina M. Montgomery (eds), *Making Animal Meaning* (East Lansing: Michigan State University Press, 2011), pp. 3–16; Vilhjälmur Árnason, 'Bioethics in Iceland: Recent Developments', *Cambridge Quarterly of Healthcare Ethics* 25 (3) (2016): 421–34; Sara Peres, 'Saving the Gene Pool for the Future: Seed Banks as Archives', *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 55 (2016): 96–104.

8. Environmental historians' critiques of the use of the natural archive have focused on errors of interpretation based on the first kind of sampling error. See V.M. Meher-Homji, 'Past Environments through Palynology: A Short Appraisal with Reference to the Western Ghats', *Environment and History* 2 (2) (1996): 249–52.

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The human and natural archives are surprisingly similar in that they both have these two kinds of sampling error. Applying the insights of the archival turn to the natural archives does productive historical work. First, like the notarial records of seventeenth-century Peru and of the nineteenth-century Dutch East Indies colonial administration, collections of pollen sediment samples, herbarium specimens, and ice cores can become new objects of inquiry, not simply sources of sources.⁹ Second, historians can transfer their knowledge of the biases inherent in paper archives to these new sources and better understand how the incompleteness of physical traces of the past might affect their narratives.

This article draws on the theoretical insights of the archival turn and STS studies to reflect on ways to understand the natural archive and integrate it into future work in environmental history. I examine both herbarium specimens and ice cores to see how their creation and assembly into archives (the second kind of archival sampling error) creates a source that suggests certain narratives and can impede the creation of others. I argue that while historians' use of the natural archive can broaden their available sources, the natural archive and the documentary archive are not fundamentally different: both are material traces of the past.¹⁰ There is a grammar of archives, whether the sources contained therein are old letters or old air bubbles: this grammar, marked by a syntax of omission and inflections built on uncertainty, is a result of the archiving process. Archives are not simply content; they are also a process undertaken by humans. It's this processing that makes the act of archiving dominate its contents. Perhaps even more importantly, rejecting the distinction between human history and natural history responds to recent calls to reunify these two histories and recast *Homo sapiens* as actors on a geologic scale.¹¹ A well-theorised unified archive of documents and material objects will provide environmental historians with the undergirding for narratives of the past with greater depth and accuracy, and will be of value to responding to the challenges of the Anthropocene.

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9. Two excellent examples of historians making archives the subject of their analyses are Kathryn Burns, *Into the Archive: Writing and Power in Colonial Peru* (Durham, NC: Duke University Press, 2010); and Ann Laura Stoler, *Along the Archival Grain: Epistemic Anxieties and Colonial Common Sense* (Princeton: Princeton University Press, 2009).
 10. William Cronon and Daniel Smail have both commented on the fact that documents and objects are not fundamentally different categories of sources. Cronon, talking about the boundary between archaeology and history, refers to 'a rather arcane dispute over what counts as a historical document'. William Cronon, 'Getting Ready to Do History', in *Envisioning the Future of Doctoral Education: Preparing Stewards of the Discipline - Carnegie Essays on the Doctorate*, ed. Chris M. Golde and George E. Walker (San Francisco, CA: Jossey-Bass, 2006), p. 327; Daniel Lord Smail, *On Deep History and the Brain* (Berkeley: University of California Press, 2008).
 11. Dipesh Chakrabarty, 'The Climate of History: Four Theses', *Critical Inquiry* 35 (2) (2009): 197–222.

II

Historians have always been very attentive to their sources and have long accounted for distortions and biases in footnotes and sometimes even the body text. But the recent archival turn suggests that historians consider not simply their sources, but *the sources of their sources*: the archives. In addition to contextualising their sources, historians who heed the archival turn's suggestions include in their analyses the history of the archives that hold their sources, and how the construction of those archives affects the availability (or absence) of certain documents, and therefore the stories that can be written from those archives.¹² For example, Michel-Rolph Trouillot's book *Silencing the Past*, examined in a concrete way the impact that silences have on the archive and history writing more generally. Trouillot suggested that silence enters the historical record in four different 'moments': 'the moment of fact creation (the making of *sources*); the moment of fact assembly (the making of *archives*); the moment of fact retrieval (the making of *narratives*); and the moment of retrospective significance (the making of *history* in the final instance)'.¹³ Following the archival theorist Suzanne Briet, who in 1951 had attempted to outline the characteristics of a document, Trouillot saw these various points of archival processing as moments where power could influence future history-making.¹⁴ Archival theorists have described the political nature of the archives and the ways in which they enable state power; STS studies has added how exclusions from the material archives can also be an exercise of state power.¹⁵

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12. The archival turn has a decades-long history. In addition to Trouillot, see Michel Foucault, *The Archaeology of Knowledge and The Discourse on Language* (New York: Pantheon Books, 1982); Howard Zinn, 'Secrecy, Archives, and the Public Interest', *The Midwestern Archivist* 2 (2) (1977): 20; Jacques Derrida, *Archive Fever: A Freudian Impression* (Chicago: University of Chicago Press, 1996); *Fiction in the Archives: Pardon Tales and Their Tellers in Sixteenth-Century France* (Stanford: Stanford University Press, 1987). For an excellent recent collection of articles on the archive, see Francis X. Blouin and William G. Rosenberg (eds), *Archives, Documentation, and Institutions of Social Memory Essays from the Sawyer Seminar* (Ann Arbor: University of Michigan Press, 2010). I'm indebted to Kirsten Weld for the term 'archival thinking', as well as the curiosity about archives. For her excellent review of recent archival theory and a model of 'archival thinking', see Kirsten Weld, *Paper Cadavers: The Archives of Dictatorship in Guatemala* (Durham: Duke University Press, 2014).
 13. Michel-Rolph Trouillot, *Silencing the Past: Power and the Production of History* (Boston: Beacon Press, 1995), p. 26.
 14. For a survey of theories about what constitutes a document, see Michael K. Buckland, 'What Is a "Document"?' *Journal of the American Society for Information Science* 48 (9) (1997): 804–09.
 15. Classic accounts of archival power describe the connection between the nation-state and the archive; more recent archival theory has shifted to examining the mundane and illogical exercise of archival power on a smaller scale. See Patrick Joyce, 'The Politics of the Liberal Archive', *History of the Human Sciences* 12 (2) (1999): 35–49; Matthew S. Hull, *Government of Paper: The Materiality of Bureaucracy in Urban Pakistan* (Berkeley: University of California Press, 2012); Londa L. Schiebinger and Claudia Swan (eds), *Colonial Botany:*

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The last two decades have seen an intense, post-modern investigation of the supposedly neutral archival repository. This is partially a result of a shift from archives collecting scarce documents (the medieval and early modern reality) to dealing with an ever-increasing stream of state-generated records. More files written (and, increasingly, typed) created the need for what archivists call ‘appraisal’. This is an archivist’s polite euphemism for ‘throwing most of the stuff out’. Historians may be horrified to think that everything is not being preserved, but in the last century, archivists have had to decide on a system to decide what records to keep from the cellulose deluge. If documentary records are only a fraction of possible sources historians could use, appraisal has major consequences for the accuracy of the social systems we can conjure from a nutmeg grinder. Archivist Terry Cook is blunt about this:

The major act of historical interpretation occurs not when historians open boxes but when archivists fill the boxes, by implication destroying the 98 percent of records that do not make it into those or any other archival boxes. This is the great silence between archivists and historians. It is called archival appraisal.¹⁶

Part of the work of post-modern archival theorists like Cook is to point out that archives are not neutral repositories, and archivists are not simply custodians or hewers of wood and carriers of water for historians. The archivist’s role in shaping what the historian can write is not limited to what s/he throws out during the appraisal of recently-arrived records: it starts earlier and continues long after the trash goes out. Archives are not staffed by a team of pack-rats: each archive has a collecting mission, so many potential collections are turned away. An archive, as Phil Delora and Alexander Olson have said, is “‘a collection plus a purpose’.¹⁷ Archival appraisal is driven by a collecting mission; that mission may change over time. A core collection in Harvard University’s Herbaria is the New England Botanical Club, blue-blood pressers of flowers who worried about the ‘replacement’ of native flora. Today part of the Herbaria’s collecting mission is aimed at finding plants that might be better

Science, Commerce, and Politics in the Early Modern World (Philadelphia: University of Pennsylvania Press, 2005).

16. Terry Cook, ‘Remembering the Future: Appraisal of Records and the Role of Archives in Constructing Social Memory’, in Francis X. Blouin, Jr. and William Rosenberg (eds), *Archives, Documentation, and Institutions of Social Memory: Essays from the Sawyer Seminar*, pp. 169–181 (Ann Arbor, MI: University of Michigan Press, 2006), 171. The nutmeg grinder analogy is from Carolyn Steedman’s playful critique of *Archive Fever* in her book *Dust: The Archive and Cultural History* (New Brunswick: Rutgers University Press, 2002), p. 18. For a review of the chief figures in archival theory and their responses to the paper deluge of the twentieth century, see John Ridener, *From Polders to Postmodernism: A Concise History of Archival Theory* (Duluth, MN: Litwin Books, 2009).
17. Philip J. Deloria and Alexander I. Olson, *American Studies: A User’s Guide* (Berkeley: University of California Press, 2017), p. 161.

adapted to climate change.¹⁸ Records that don't fit the archive's collecting mission either find a home in another archive, or in the trash heap (or, more recently, in the recycled paper stream – they may be in the historian's cardboard coffee cup holder). Historians build narratives of what is said to have happened in the past based on the two per cent of documents that make it to the archive. How the archive is constructed – in plainer terms, what its goals are, what its funding is and where it comes from, what space it has, what skills its staff has and what its archivists think is not worth keeping – has a huge effect on what can be written and, by extension, what we can know about the past.

Archival mediation of future history-making projects is not limited solely to the acquisition and appraisal stages. Archivists Michelle Light and Tom Hyry point out the subjectivities inherent in each stage of the accession process. What remains after appraisal still must be *ordered* (put into folders, then boxes) and then *described* in a finding aid. While the previous sentence has the words 'ordered' and 'described' in passive constructions, both are active processes whose effects on sources are difficult for the historian to discern *ex post facto*. While a central archival principle has always been *respect des fondes* – attempting to maintain the original ordering of documents – the foldering and boxing creates juxtapositions that may have never existed in the original collection. The finding aids are written in a neutral third person by an archivist striving to maintain a semblance of detachment. A historian might find this admirable, but it's also clear that the description's detachment obscures the exercise of power vested in the archivist: What is important in this collection, what's worth mentioning in the two-paragraph summary?¹⁹ The archival turn has helped historians – already painfully aware of the silences in their records – see the process of archival construction as one of the generators of these elisions. That knowledge is transferable laterally to the natural archives.

Both the lack of general representativeness of the 'human' archive (which creates the first kind of archival sampling error) and the actual process of archiving (which generates the second kind of sampling error) can affect what is said to have happened. The obvious biases built into the documentary archive are what makes the natural archive such a tempting source, one seemingly unsullied by human power relations. It seems to be free from decisions about inclusion and exclusion, ordering and describing. Plants grow and die no matter whether they are in a state, an empire or a protectorate. There is no appraisal of tree rings in living trees. But in fact, the natural archive, as other kinds of historians of the past like palynologists, paleontologists and environmental archaeologists have long recognised, is also maddeningly incomplete.

18. Jonathan Shaw, 'Reading Tea Leaves: How Dried Plants Help Diving The Future', *Harvard Magazine* (October 2016): 80.

19. Light and Hyry discuss the subjectivities inherent in each stage of the accession process and suggest some ways to make them more visible to researchers in 'Colophons and Annotations: New Directions for the Finding Aid', *The American Archivist* 65 (2) (2002): 216–30.

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These kinds of historians have a body of knowledge, taphonomy, that deals with the incompleteness of paleo-records. What the archival turn can add to this existing body of knowledge are the silences that the actual process of archiving pollen spores and speleothems creates. The natural archive is not fundamentally different and its construction too affects what sort of history can be written, as a close examination of two examples – herbarium samples and ice cores – reveals. I have chosen these two natural archives because they seemingly represent two different distances from the processed human archive. Herbarium specimens are more obviously processed: the actual flattened plants are surrounded by a surprising amount of metadata in the form of annotations, and the older annotations (e.g. outdated Latin binomials) highlight human intervention. Ice core samples, on the other hand, seem much less mediated: the ice is never touched by human hands and tiny air bubbles are sampled by machines. As I show below, both archives show the exact same archival grammar as the supposedly distinct human archive, the same elisions and silences.

III

Collections of dried plants, known as herbaria, provide a distinctive example of the subjectivities of the natural archive. Though these paper sheets with carefully dried plants attached to them have been assembled and traded by botanists throughout Europe since the sixteenth century, herbarium-building became both a hobby and an instrument of empire in the nineteenth century. The imperial herbaria were another form of knowledge gathering that European colonial empires used to make their possessions more legible and more profitable.²⁰ Jim Endersby has shown how imperial botanists in the metropole effectively dominated decisions about the boundaries between species.²¹ Left mostly unstudied, though, are the herbaria that are the result of simple accretion at various institutions. Harvard University's herbarium, for example, is actually a series of separate herbaria, each one made up of hundreds of smaller collections assembled by professionals but also by hobbyists. Depending on the assiduousness of the collector, the sample might also have, in addition to the Latin binomial of the plant, the date collected and location of the sample.

The 78 specimens of the common reed held in the Harvard Herbarium reveal the same sort of archival processing that occurs in documentary archives. Collected by dozens of different collectors, each specimen has been dried and flattened to some extent by pressing and is attached to a thickish sheet of rag

20. Londa L. Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge: Harvard University Press, 2004).

21. Jim Endersby, *Imperial Nature: Joseph Hooker and the Practices of Victorian Science* (Chicago: University of Chicago Press, 2008).

paper. While there are sometimes roots and almost always parts of the main stem (called a culm), all specimens of the reed contain the flowering head. This is important given that the Linnaean system uses reproductive structures as the basis for its classification system.²² The sheet also has various annotations, usually including where the specimen was collected, who collected it, the date and the presumed species. Some of the sheets have species names that, by botanical consensus, have been changed since the specimen was collected. The common reed is an example of this: while originally thought to be examples of *Phragmites communis*, a North American native, many of the specimens were actually determined more recently to be *Phragmites australis*. This species appears to have been inadvertently brought from Eurasia after colonisation but before the nineteenth century. Henry David Thoreau collected a specimen of *Phragmites* (which he called *Arundo phragmites* – see Figure 1) on 31 July 1859.²³

The reed was growing along the river on which he was paddling. In the last two decades it has spread out across North American wetlands (and even semi-wet places like drainage ditches and pond edges), filling in gaps in the ecosystem and crowding out *Phragmites communis*. Researchers in 1968 realised that the two species were distinct: their seed casings, called glumes, are noticeably different. In the 1990s writers working on the *Invasive Plant Atlas of New England* examined all the samples in Harvard's collection and marked the invasive ones with a seal stamped in ink onto the relevant specimen sheets.²⁴ While immaculate nineteenth-century penmanship may label a specimen *Phragmites communis*, it is now officially catalogued under *Phragmites australis*. Using the dates of specimen collection, historical ecologists can track the spread of *Phragmites australis* in North America.

The archival turn and its intent examination of the assembling of archives problematises or at least complicates this use of herbaria and their specimens. The problem is that what seem from the herbarium to be biological categories – 'non-native', 'invasive', 'exotic' – are in fact socially constructed. Decisions about what species are 'native' depend on spatial and temporal baselines. In American discourse about so-called 'invasive species', these parameters are often implicit: whatever biota were not present in 1492 inside of the boundaries of the present-day United States, or the state in question. A wild cherry (*Prunus serotina*) that grew on Boston's Harbor Islands in 1491 is *native*. The Queen Anne's Lace (*Daucus carota*) there today is a European transplant that

22. Botanists have moved beyond Linnaeus but his system was influential at the time when herbaria became widely used, and so remnants of that tradition linger in how we make these specimens.

23. *Phragmites australis* (Cav.) Trin. ex Steud. subsp. *australis*. U.S.A., Massachusetts, Wayland. H. D. Thoreau, 31 July 1859 (NEBC00274233).

24. *Phragmites australis* (Cav.) Trin. ex Steud. subsp. *australis*. U.S.A., Maine, Wells. Kate Furbish s.n., 20 July 1898 (NEBC00611958). 'Invasive Plant Atlas of New England-Home', Invasive Plant Atlas of New England, <http://www.eddmaps.org/ipane/> (accessed 4 Feb. 2015)

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Figure 1. *Phragmites australis* specimen originally collected in 1859 by Henry David Thoreau (subsequently sold to Edward Hoar) and later archived in Harvard University's herbarium. Image courtesy of the New England Botanical Club.

came with the colonists in the 1700s (as its common name suggests) and is therefore an *alien*. This distinction, reflected in herbaria as well as field guides, is problematic. It gives transplanting agency only to Eurasian settlers. The maize that Native Americans carried from the Mexican highlands to fields near what is now the Massachusetts coast are somehow timelessly outside of ecological history. The spatial boundaries are also artificially constructed. Imagine a riverine flower that grew only in what is now southern Texas: in 1845 that flower would have been a non-native to the US. If Thoreau had floated down the Nueces River in 1859, his specimen would have taken its place in US herbaria, happily (if silently) naturalised. A change in borders would have meant a change in civil status for this flower. These natural archives, stored in 12- by 17-inch manila folders, are not simply neutral repositories of data to be used by historians: they are sources whose organisation and processing has suggested certain stories about the changes in the land around Boston. This is Trouillot's fourth moment of silence, the 'moment of retrospective significance', when the retrieval of certain records – those that 'fit' into the archives' physical and epistemological dimensions – are retrieved and used to make narratives that become history.

A fuller discussion of the social construction of the category of invasive species is outside the scope of this paper and in fact has been the subject of a number of recent books.²⁵ What is worth emphasising is that, just as in archives filled with wills, court records and correspondence, the natural archives' 'documents' encourage certain narratives by obscuring their own creation. Again, archives are built with a reason in mind: the collections become an instrument for those with power to use. Environmental historians using these collections need to consider not only the actual records, but also how these collections were built, by whom, for what end. One of the largest collections in the Harvard herbaria is the New England Botanical Club Herbarium (NEBC, founded in 1895). Harvard's website states that the NEBC collection has particularly good representation for Mt. Desert Island (Maine), Cape Cod, Nantucket and Martha's Vineyard. It's easy to imagine the Club's well-to-do members busily collecting and pressing specimens while on their nineteenth-century summer holidays at the beach. A researcher interested in the species able to grow near sooty, working-class Medford might find far fewer species among the herbarium's specimens.²⁶ Herbaria also do not simply process the

25. See for example Emma Marris, *Rambunctious Garden: Saving Nature in a Post-Wild World* (London: Bloomsbury, 2013); Ken Thompson, *Where Do Camels Belong?: The Story and Science of Invasive Species* (Vancouver, BC: Greystone Books, 2014); Peter A. Coates, *American Perceptions of Immigrant and Invasive Species: Strangers on the Land* (Berkeley: University of California Press, 2006).

26. A recent study of Harvard's herbaria revealed tendencies, for example, of collection near roadsides rather than further into the landscape, at lower altitudes, and in summer rather than autumn. Far fewer specimens were added in the post-WWII period than before the war. Peter Reuell, 'Study Uncovers Botanical Bias', *The Harvard Gazette*, December 22, 22 Dec. 2017,

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specimens they accept in order of donation. Whether the specimen is already mounted on paper, whether the specimen is rare, who gave the specimen, whether there was additional funding for processing that came with the specimen, whether the staff know that taxa well and other subjective decisions can delay processing for decades. Here the relevance of Trouillot's moment of fact assembly and its impact on the narratives that can be told about New England's flora is important: 'Archives assemble', Trouillot said. 'Their assembly work is not limited to a more or less passive act of collecting. Rather, it is an active act of production that prepares facts for historical intelligibility.'²⁷

The herbarium's specimens allow certain stories to be told far better. An environmental historian tracing the development of the idea of so-called invasive species can not only access the actual reed specimens, but can also analyse the archive itself. The chronological accretions of metadata – the binomial used when the species was collected, or the 'invasive' stamp applied decades later – become themselves sources. The natural archive, just like the human archive, becomes not only a collection of sources, but a source that can itself be read and interpreted by historians. Many of the NEBC's collection came from an effort that pre-dated the actual founding of the club. Led by botanist Walter Deane, the people who later founded the NEBC focused their energies on the Blue Hills and Fells reservations just outside of Boston. Their project was explicitly nativist, as they wanted to document 'native' organisms for possible future re-nativising.²⁸ It seems clear, then, that an herbarium is just as mediated as a county historical society, or a university archive. Filters that remain mostly invisible during acquisition, appraisal, ordering and description – who has the time to prepare specimens, which ones are deemed acceptable for the herbarium, the taxonomy used to create relationships with the other 'documents' and the annotations that inevitably accompany them during Trouillot's moment of fact assembly into archives – both open up new analytical possibilities but also could potentially nudge historians towards certain narratives as well.

<https://news.harvard.edu/gazette/story/2017/12/harvard-study-illuminates-botanical-bias/>; Another ripple in the archival record is how important collecting herbarium specimens has been to professional botanists' activities in different periods. See Michael Mann and Matthias Schultz, 'Brandis the Forgotten Botanist', *Environment and History* Fast Track November 2019, <https://doi.org/10.3197/096734019X15631846928792>

27. Trouillot, *Silencing the Past*, p. 52.

28. See Walter Deane, *Flora of the Blue Hills, Middlesex Fells, Stony Brook and Beaver Brook Reservations, of the Metropolitan Park Commission, Massachusetts* (Boston: C. M. Barrows, 1896). For more on the political uses of the natural archive, see Christof Mauch and Priya Rangan, 'Towards a New Biogeographical and Economic History of the Indian Ocean World: Christof Mauch in Conversation with Priya Rangan', *Global Environment* (forthcoming, Spring 2020)..

IV

Ethnomethodologist Michael Lynch has argued that ‘the archive is never “raw” or “primary”, not only because the paper trail is the product of a selective sorting operation, but also because it is originally laid down to create a trail of evidence that leads future investigations along a carefully chosen path’.²⁹ That said, the objection could be made that the herbarium is not a good example for the ‘natural archive’, given the extensive processing and annotation that the specimens undergo. The seventeen kilometres of archived ice – neatly and precisely cut into one-meter sections – that are stored below zero Celsius in the US National Ice Core Laboratory (NICL) seem to represent an example of the kind of ‘documents’ in that natural archive that, frozen, are resistant to post-modern thawing (see Figure 2).³⁰



Figure 2. One of the storage freezers at the U.S. National Ice Core Laboratory in Denver, Colorado. Public domain photograph made available by Eric Cravens, Assistant Curator, National Ice Core Lab.

29. Michael Lynch, ‘Archives in Formation: Privileged Spaces, Popular Archives and Paper Trails’, *History of the Human Sciences* 12 (2) (1999): 69.

30. That said, there is a body of literature from historians of science analysing the techniques that scientists use to make what they study visible and knowable. For an example, see Michael Lynch, ‘Discipline and the Material Form of Images: An Analysis of Scientific Visibility’, *Social Studies of Science* 15 (1) (1985): 37–66.

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Climate scientists have used the bubbles trapped in the annual ice layers to recreate, among other things, a chart of the earth's temperature. It's this science – and specifically the monumental, three-kilometre-deep cores drilled from Greenland in 1993 – that provided dramatic evidence for the hypothesis of global climate change. Ice cores and other proxies that allow guesses about past temperatures have become important sources for climate historians. This subdiscipline of history, once a quaint side-interest of many historians, has gone from a backwater to the centre of a hurricane of interest lately.³¹

Yet the examination of this ice core archive reveals that it contains all of Trouillot's moments where silence enters the process of historical production: the moment of fact creation (when the ice is formed); the moment of fact assembly (at which ice is cored); and the moment of fact retrieval (at which sections of cores are studied), when certain facts are retrieved and used for the making of narratives more often than others.³² Some of the questions are the same as those I've put to herbaria: Who collects 'nature', and what parts are collected? To what end are they collected and who is empowered by the collection? Who preserves it and organises it for our use and contemplation? Who is allowed to contemplate these specimens, and what intellectual frameworks do they accept in order to contemplate them?

While one would imagine perfectly distinguishable layers of ice, the boundaries between the lower layers of ice are difficult to unpack. The enormous weight of the ice above and the slopes of bedrock below mean that the ice thins and flows, rather than remaining in perfect layers. The 1993 Greenland cores were originally thought to go back 200,000 years: later models of glacial flow reduced that by half.³³ Just as archives don't represent a perfect cross-section of the population, neither are the core samples representative. The overwhelming preponderance of ice in the NICL is from Greenland and Antarctica, and paleoclimatologists have expressed the same worries about overgeneralisation that historians often voice. Indeed, these are 'regions hardly typical of global climate, but nonetheless are commonly interpreted as being at least representative of the hemispheric state and commonly the entire globe'.³⁴ Despite these particular origin points, 'the ice cores themselves contain myriad matter-based

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31. Joyce Chaplin, commenting on the use of the natural archive, has warned historians to engage with this data at the risk of historical writing being seen as valuable only for corroborating science. 'Ogres and Omnivores: Early American Historians and Climate History', *The William and Mary Quarterly* 72 (1) (2015): 28.
 32. Most of the information for this section is from interviews with Professor Jeremy Shakun of Boston College (on 4 Aug. 2015 and 5 July 2016), as well as with Mark Twickler of the University of New Hampshire (14 July 2015). The latter is the science director of NICL. I am indebted to both for their help.
 33. See P.M. Grootes et al., 'Comparison of Oxygen Isotope Records from the GISP2 and GRIP Greenland Ice Cores', *Nature* 366 (6455) (1993): 552–54.
 34. Carl Wunsch, 'Towards Understanding the Paleocene', *Quaternary Science Reviews* 29 (17–18) (2010): 1960.

geographies ... and may hold atmospherically transported Saharan dust, tropical methane, and pollen spores from different geographic locations'.³⁵ While one-metre ice cores are kept in a rigorous chain of possession that ensures the ability to identify each one and its place in the column of ice drilled, its contents are a geographic jumble. Despite (or perhaps because of) government funding for the lab/warehouse, there is limited space. Whereas, before 1990, most coring was cooperative and the ice cores were divided among the partners – France got the first 50 cm, Russia the second 50 cm, the United States the third 50 cm, and repeat – now coring is done each country for itself. This means that each country collecting cores must either increase the space dedicated to them, or get rid of some of them. In May 1998, NICL announced that it was 'deaccessing' (using almost the same word – deaccessioning – as documentary archivists do when they throw out records no longer deemed useful) about ten per cent of its cores. A number of factors were used to determine which cores to give away: continuity, the reliability of the dating, whether there had already been publications on that core, the number of requests for pieces of that core, core quality, duplication of the core elsewhere, quality of the original drilling method, 'specific utility', uniqueness, and accessibility of the original site.³⁶ The NICL also announced that it would no longer be accepting 'shallow' (i.e. <200-metre-deep) cores. Though some of these factors seem straightforward, others sound much like the decisions about what archivists think historians in the future might want to look at.

Another bias lies not in the ice cores themselves, but in the scientific paradigm used to analyse them. This is simply what scientists are most interested in. Though there is a long temporal record available, more recent periods get more attention. This is Trouillot's moment of fact retrieval: some sections are retrieved and analysed, while others remain unstudied, and silent. Certain ice layers are analysed with greater regularity, and they are sampled perhaps every five years instead of, for example, every fifty, as many others are. Yet, just like historical inquiry done in archives, the examination and analysis of the cores is also shaped by what scientists expect to find. For example, the data from natural archives for the possibility of rapid fluctuations in the earth's climate had been available long before the now-famous 1993 Greenland core. Spencer Weart notes that 'over the decades, many scientists who looked at tree rings, varves,

35. 'Core Matters: Greenland, Denver and the GISP2 Ice Core', in Denis Cosgrove and Veronica della Dora (eds), *High Places: Cultural Geographies of Mountains, Ice and Science*, pp. 64–83 (New York: I.B. Tauris, 2008), p. 81. Heather Frazar's 'Core Matters' provides an excellent, and critical, introduction to the production of an ice core archive. Georg Toepfer has also described the similarities of the natural and what he calls 'cultural' archives, albeit without explicit use of archival theory. See Georg Toepfer, 'On Similarities and Differences between Cultural and Natural Archives', in Kjetil Jakobsen and Susi K. Frank (eds), *Arctic Archives: Ice, Memory, and Entropy*, 21–36 (Bielefeld, Germany: transcript Verlag, 2019); see especially his discussion of the term 'archive soils', 28–29.

36. Randy Showstack, 'As U.S. Ice Core Lab Reaches Capacity, Scientists Plan Future Storage Efforts', *Eos, Transactions American Geophysical Union*, 12 May 1998.

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ice layers, and such had held evidence of decade-scale climate shifts before their eyes'.³⁷ They dismissed this evidence because, as Weart says, 'people can see only what they find believable'. Ice cores and other sources were examined only at 10,000-year intervals (as opposed to 100-year intervals) because it was believed that climate change could only occur over these extremely long time-spans. In a strange (and perhaps telling) parallel to the discipline of history, climatologists had long thought that the North Atlantic was the centre of ice age onsets and examined ice cores and other paleo-sources from that region. More recent climate models suggest that cooling events may begin in the tropics, which has pushed paleoclimatologists to look at hitherto understudied ice cores from the middle latitudes.³⁸

The present-day preoccupation with global warming and its potentially devastating effects also means certain sections are studied more intensely. The most recent report from the Intergovernmental Panel on Climate Change (IPCC) has a chapter called 'Information from Paleoclimate Archives'.³⁹ In this section – and in much of the scientific literature on climate change – there is a great deal of evaluation of the most recent (i.e., last 200 years) of ice cores, those from the last ice ages and a period 55 million years ago called the Paleocene-Eocene Thermal Maximum (PETM). The PETM was a period that saw a rapid rise in global temperatures, not unlike those in recent years. Climatologists are therefore much more interested in (and can find better funding for) research on a geological moment that provides models for what to expect as far as future sea levels, hurricane patterns and other results of climate change. Present-day concerns and the availability of funding result in certain parts of the natural archive being intensely studied, while other huge (literally kilometre-long) sections are left untested. Trouillot's framework, then, applies equally to the Massachusetts Historical Society and NACL: certain facts are retrieved more than (and at the expense of) others to be examined and shaped into narratives.

There is also the question of access to archives. Even the deaccessioned ice cores were not simply given away: scientists had to prove their ability with ice core analysis before they were allowed to request these cores.⁴⁰ Though Eric

37. Spencer Weart, 'The Discovery of Rapid Climate Change', *Physics Today* 56 (8) (2003): 36. Varves are thin layers of sedimentary rock that vary in annual colour.

38. Mark A. Cane, 'A Role for the Tropical Pacific', *Science* 282 (5386) (1998): 59–61.

39. Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. T.F. Stocker et al. (New York: Cambridge University Press, 2013).

40. Mark Twickler made it clear, several times, that the NACL did not just give away 'ancient ice to use in cocktails', suggesting that this request has been made more than once (and perhaps frequently). Heather Frazar also mentions rumours at the NACL that 'authoritative hands' can make 'party ice' available for important visitors, 'Core Matters', 83. Even if these rumours are unfounded, they gesture at the recognition of differing levels of access to specimens.

Ketelaar has used the carceral metaphor in his review of how archives work to reduce access, I prefer to think of access in terms of benches, lockers, letters of introduction, overcoats and tenure-track positions.⁴¹ Peter Stallybrass has written on how the commodity with which Marx introduces *Capital*, a coat, was actually his ticket of entry to the British Museum. Without the coat he would not have been allowed into the Reading Room to do his research, though he often had to pawn the coat over the weekend to feed his family.⁴² Some archival institutions do not allow anyone but professors with Ph.D.s and tenure-track jobs access to their collections. Most archives are less strictly policed – all folders and purses in lockers, only scratch paper in the reading room – though even the simple fact of not having a convenient place to eat one's lunch at noon (e.g. on a nearby bench) reduces archival accessibility.⁴³

While the NICL does require a formal application and proposal for access to its archived cores, historians' access to the natural archives is less about their credentials and more about their knowledge. Like being able to decipher an archaic version of a foreign language or understand numbers in a ledger, reading this archive depends on training that many of us do not possess. This lack of certain technical training means that as sceptical as historians have become of scientific pronouncements in the past fifty years, when drawing on the natural archive, historians are prone to accepting the judgments of other disciplines' practitioners. The historian who finds 'Invasive Species' stamped on an herbarium specimen will be unlikely to second-guess her colleague the botanist's official determination. If 'nature always seems an irrefutable quantity', nature's representations, when created by knowledgeable colleagues with inscrutable techniques, seem equally irrefutable.⁴⁴ The problem is that the biologist may lack exactly the skill that the historian does possess: the training to always ponder the social construction and historical development of categories, as well as be reflexive about her role in the construction of an archive, and the consequences of her decisions about archival organisation. Historians, especially historians of science, have for decades made critical analyses of scientific categories and scientific sources. Growing use of the 'natural' sources means that this critical stance should also be applied to the sources of these sources. Again, this attention to *archives as constructed object* not simply *archives as convenient repository* is precisely what the archival turn has encouraged historians to do for documentary archives. The result will be

41. Eric Ketelaar, 'Archival Temples, Archival Prisons: Modes of Power and Protection', *Archival Science* 2 (2002): 221–38.

42. Peter Stallybrass, 'Marx's Coat', in Patricia Spyer (ed.), *Border Fetishisms: Material Objects in Unstable Spaces*, pp. 183–207 (London: Routledge, 1998).

43. I am indebted to Carla Cevasco for this example of a simple yet profound pressure on archival accessibility.

44. Joyce E. Chaplin, *Subject Matter: Technology, the Body, and Science on the Anglo-American Frontier, 1500–1676* (Cambridge: Harvard University Press, 2001), p. 34.

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new subjects for research – the history of the NICL archive has yet to be written – but also a more nuanced view of the sources the natural archives contain.

V

The natural archive seems to offer an environmental historian a purer archive. It's one seemingly without all of the exclusion, all the coercion, of Foucault's archive. Nationalistic projects are gone; international projects seem to be the norm.⁴⁵ The *arkhe*-magistrate is gone, and there's no archival temple: all that's left are pollen, trees and ice. Even before his call to actually use the natural archives, in his survey of the state of environmental history J.R. McNeill asserted that 'the geo-archives of the earth itself, and the bio-archives of human remains, for example, are open for consultation as never before'.⁴⁶ Archives, though, are not simply the random jumbles of *naturalia* that philosophers' chambers once contained.⁴⁷ They are repositories of objects that have already been processed: acquired, appraised, ordered and described. Without the intervention of a human collector with particular individual and institutional interests, there is no archive. Just as the archival theorist Suzanne Briet insisted that a rock became a document only when it was in a collection, a glacier is not an archive: a sub-zero room full of processed ice cores is.

While the scientists who work with these sources are already well aware of sampling error that results from coring a sample that is less than perfectly representative, they are likely less aware of the second kind of sampling error, the kind created by the process of archiving. Which ice cores are harvested, which

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45. These projects can be international and oriented towards a goal of facing climate change, like seed banks, but there are still national projects which may have unintended consequences. See Sara Peres, 'Saving the Gene Pool for the Future: Seed Banks as Archives', *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 55 (2016): 96–104; Rosalind Williams, 'Enactments of Race in the UK's Blood Stem Cell Inventory', *Science as Culture* 27 (1) (2018): 24–43, <https://doi.org/10.1080/09505431.2017.1322054>
46. J.R. McNeill, 'Observations on the Nature and Culture of Environmental History', *History and Theory* 42 (4) (2003): 40. A review of a book on North Africa's environmental history during the colonial era points to the reliance on a very limited number of pollen sources as a weakness in the book's argument. Douglas L. Johnson, 'A Review of "Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa"', *Annals of the Association of American Geographers* 100 (2) (March 31, 2010): 479. David Blackbourn has also commented on relying on palynological evidence: 'Making inferences from pollen analysis or mapping changes in species are, of course, also ways in which humans impose meaning on the natural world. The taxonomies are ours.' David Blackbourn, *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany* (New York: Norton, 2006), p. 17.
47. For a discussion of Harvard's 'Philosophy Chamber' and the decline of *naturalia* as sources of knowledge vis-à-vis documents in the early nineteenth century, see Whitney Barlow Robles, 'Flatness', in *The Philosophy Chamber: Art and Science in Harvard's Teaching Cabinet, 1766–1820*, ed. Ethan W. Lasser (Cambridge: Harvard Art Museums, 2017), pp. 192–209.

landscapes are analysed, even which language scientists use when conducting fieldwork can all have a tremendous effect on the data that is collected and what form it takes once written down. How ice core repositories are created, and the effects of their creation, are analogous to other collections of natural specimens. To return to an example cited above, the ducks that were shot and put into museum collections might have been those most contaminated (and sickened) by pollutants.⁴⁸

Though the documents that constitute the natural archive may seem less open to interpretation than paper records, their processing requires a kind of translation in which there is room for much to be lost, and for only particular histories to be found. When citing pollen counts and fossil species, environmental historians insert into their narratives not the microscopic grains or photographs of these records, but rather text that summarises them. The act of translation (not to mention interpretation) is still fraught with politics. In an almost comical essay, Bruno Latour describes his trip to Brazil to accompany a group of botanists and pedologists to the natural frontier, where the savannah meets the rainforest. What most puzzle Latour are the subtle iterations required to move from the messy reality of clods of dirt that vary very slightly from each other, translated by a universal colour scale for dirt to a series of numbers, which is in turn transformed into a solid line on a map.⁴⁹ Latour's description of the process is worth quoting at length:

'Sandy-clay or clayey sand?'

'No, I would say clayey, sandy, but no sandy-clay.' ...

'Heloïsa, make a note: at P2, between five and seventeen centimeters, *areno-argiloso a argilo-arenoso*.' (I forgot to mention that we are alternating constantly between French and Portuguese, the politics of language being added to the politics of race, gender, and disciplines.)

The combination of discussion, know-how, and physical manipulation allows for the extraction of a calibrated qualification of texture that can immediately replace, in the notebook, the soil that can now be thrown away. A word replaces a thing while conserving a trait that defines it. Is this a term-to-term correspondence? No, the judgment does not *resemble* the soil. [...] Is this compression of data? Yes, definitely, since four words occupy the location of the soil sample, but it is a change of state so radical that now a sign appears in place of a thing. Here it is no longer a question of reduction but transubstantiation.

Are we crossing a sacred boundary that divides the world from discourse? Obviously yes, but we have already crossed it a good ten times.⁵⁰

48. Jerald J. Dosch, 'Dead Birds' Tales: Museum Specimen Feathers as Historical Archives of Environmental Pollutants', *Environmental History* 12 (3) (2007): 661–65.

49. Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge: Harvard University Press, 1999), pp. 24–79. Latour was ultimately – and perhaps ironically – listed as a co-author on the paper the scientists wrote.

50. Latour, *Pandora's Hope*, pp. 63–64.

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Each iteration from clod to line is, to borrow a term from computer science, lossy. Each successive step loses a little of the complexity of the original source, a steady line erasing the messiness of the original data points.

This example underscores the central point of this article: collections, whether of flat pieces of paper with ink on them, or of metre-long cylinders of ice, are messy. I have argued here that these archives – despite our wish to separate them into ‘human archives’ and ‘natural archives’ – are fundamentally the same. Humans make both kinds of collections, in the most fundamental sense of the verb ‘to make’. The archives that hold these collections are reflections not only of the past, but of past state projects, past desires, past funding, past ideologies, past space availability and other pasts. Despite the subjectivities that these archives contain and the subjectivities in historians’ use of particular archives, it is important now more than ever to recognise the artificial division between natural history and human history. Donald Worster in 1984 suggested that environmental history would ‘combine once again natural science and history, not into another isolated specialty, but into a major intellectual enterprise that will alter considerably our understanding of historical processes’.⁵¹ Now, with the announcement (or, Latour might argue, the *pronouncement*) of the Anthropocene, that combination is not simply possible or intellectually desirable, but imperative. As Dipesh Chakrabarty has argued, anthropogenic explanations of climate change collapse distinction of natural and human history, as humans have moved from being a biological agent to a geological one.⁵²

In this moment of great trepidation for the future, a critical analysis of the past is of enormous importance, and environmental historians are uniquely positioned to contribute. The critical distance we bring to our sources – and, now more frequently, the sources of those sources, our archives – is something we can contribute to the literature on human-geological-natural history. Indeed, it is precisely this recognition of the weight of the various disciplines’ genealogies on their practices that is most needed in the climate debate today. Joyce Chaplin reminds historians that

even when [non-European people] did leave records, these may exist in forms that will require particular care when placed in dialogue with the natural archive. Much of modern science, which interprets the natural archive today, was historically specific to the cultures of the West, which were the same ones that invaded the Americas. But climate history, with its demand for close analysis of human experience and knowledge, must include how non-European people described nature in their own concepts and languages. There will be no adequate

51. Donald Worster, ‘History as Natural History: An Essay on Theory and Method’, *Pacific Historical Review* 53 (1) (1984): 2.

52. Chakrabarty, ‘The Climate of History’.

climate history if it fails to use either the Coromantee or the Inuit archives, for instance.⁵³

Not all environmental historians work on climate – indeed, most do not, and so these new yet very old sources will not be equally valuable to all historians. It is unlikely that many historians of the twentieth-century Moroccan history will make the trek to NICL (a parka is required, not simply white gloves), would be allowed in, or would have the expertise to assess the ice. Herbarium specimens collected outside the walls of Fort Sumter in 1850 will probably not add to the historiography of the causes of the American Civil War. What is fundamental to using these newly available sources well is ‘archival thinking’, a heightened attention to the power and contingency of, and effects of translation (in the broadest of senses) on archives.⁵⁴ In the passage above Latour also underlines a key debate in material culture, the distinction or lack thereof between texts and things. Making the case for a close relationship between the two categories, Christopher Witmore reminds us that ‘when we speak of a historical text, we are also speaking of archives, institutions, administrative personnel, curators, ordered shelves, air conditioning, organizational standards, databases, not to mention the long chains of articulation, selection, filtering, acquisition, and so on that gave rise to that text’.⁵⁵ Rejecting the distinction between the human/documentary/paper record and the natural/material makes us more likely to be attentive to the forces that shape our sources.⁵⁶ It also makes it clear that pollen counts and ice cores are not simply potential footnotes for environmental historians, but sources for historians in general. Historians will recognise in taphonomy a counterpart to their own concerns about a representative sample; they can bring to the natural archive an understanding of how building archives too injects subjectivities into a sample, creating the potential for other kinds of errors of analysis.

So let’s keep putting the dirt – and the ice, and the pollen, and the varves – back into history. But let’s continue to think about the muddled history of those collections before writing the narratives they suggest.

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53. Chaplin, ‘Ogres and Omnivores’, 30.

54. For a discussion of the term ‘archival thinking’, see Weld, *Paper Cadavers*, p. 13.

55. Leora Auslander et al., ‘AHR Conversation: Historians and the Study of Material Culture’, *American Historical Review* 114 (5) (2009): 1360.

56. For more on the importance of collapsing this distinction, see Kristin Asdal, ‘The Problematic Nature of Nature: The Post-Constructivist Challenge to Environmental History’, *History and Theory* 42 (4) (2003): 60–74.

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