INTRODUCTION

1. Chronology, as I use it, refers to the passage along a linear and regular timeline based on the idea of absolute time. It is the time reckoning system that we use throughout much of the globe today. For a critique and modification, see Jordheim (forthcoming) for his equally provocatively titled essay, “Return to Chronology.”


3. Long ago, Hayden White pointed to the rich work of historians throughout the nineteenth century, which in the end remained within a discursive whole. He writes that the various tropes “have permitted me to view the various debates over how history ought to be written, which occurred throughout the nineteenth century, as essentially matters of stylistic variation within a single universe of discourse” (1973: 427).

4. I have relied on the Lukács translation. The account in the Collected Works translates this phrase as “time’s carcase” (Marx 1976: 127). The use of carcase is common and goes back at least to H. Quelch’s translation (Marx 1900: 25) where he uses “carcase of time.” I read incarnation (or embodiment) to be closer to the German: “Die Zeit is alles, der Mensch is nichts mehr, er is höchstens noch die Verkörperung der Zeit” (Marx 1974: 85).

5. Digital humanities has been especially strong in building tools and approaches that facilitate and enhance analog modes of analysis. For a fine critique that suggests (like this book) that digital humanists must go further into conceptual and other realms, see Kleinberg (2017), especially chapter 4.
6. The implementation of this transition provides an example of my discussion on change in chapter 4. Change is not linear or a replacement but involves legacy structures, entrenched cultural practices, multiple rhythms, and attempted disruption. For a description of a similar but bolder case, see Shoemaker 2015.

7. I realize that the word *information* has more ambiguity than *fact* or *data*. I use it though for that reason. It has portability, an aura of autonomy, and (almost contradictorily) the suggestion of social situatedness. Above all, it is important to recognize these variations as we use it. Geoffrey Nunberg (1996) has a fine analysis of the word.

8. The compression of time-space has been occurring since the mid-nineteenth century, beginning with the railroad (Schivelbusch 1986) and the telegraph (Standage 1999; Kittler 1990).

9. In his essay “A Mathematical Theory of Communication,” first published in *The Bell System Technical Journal* in 1948, Shannon wrote, “The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning. . . . These semantic aspects of communication are irrelevant to the engineering problem” (Shannon and Weaver 1949: 3). This technical essay was republished with Weaver’s explanation in the book *The Mathematical Theory of Communication*. Weaver brings the level down a notch from that of the mathematician to describe the relation between this technical problem in relation to semantics and effectiveness (95–117). Wolfgang Ernst described a similar process of separation in his work on the archive where artifacts were “desemioticized” and then subjected to a “process of resemiosis” to support the narrative of the nation (2002: 108).

10. I recognize that throughout the twentieth century, there were many quite important efforts to bridge these knowledge systems. Overall, though, they have been marginalized if not forgotten.


12. Paul Roth frames Kuhn’s statement, pointing out that while Kuhn describes history as an explanatory enterprise, its narrative form or structure is hidden (2013: 550).

13. For a fine critique that recognizes both Benjamin’s quest for an alternative to this time and Ben Anderson’s misreading of this phrase as “being,” not “critique,” see Davis (2010: 60–63). Lorenz (2017: 118–19) argues that “empty” time did not exist during the European Middle Ages.

15. Historians have been questioning progress and considering multiple forms of change for decades. See, for example, Cole and Smith 2010; Shapin 1996; and Wagner 2016.

16. For example, writings that conceive of the past as a foreign country would not be conceivable prior to this application of absolute time. See, for example, Lowenthal (1985).

17. In his appeal to reappraise mystics, Certeau writes, “A set of new social and theoretical interests transforms the way mystics appears in the field of our interrogation. To specify that relation is to exhume the present postulates of our analyses and explore the issue of what work that past experience performs in our epistemological sites. It is to ‘historicize’ our research in placing it back into a contemporary configuration on which it is dependent, and to ‘dehistoricize’ mystics in showing that one cannot reduce it to a past positivit. In exploring what our sciences do with mystics, we also recognize what it writes into them” (2015: 9).

18. For a wonderful history that helped me think about this issue, see Edgerton (2007), where he discusses technological development through utility (e.g., donkeys and horses in World War I and corrugated metal throughout the twentieth century).

19. At the outset of The Writing of History, Certeau quotes Alphonse Dupront: “The sole historical quest for “meaning” remains indeed a quest for the Other; but, however contradictory it may be, this project aims at ‘understanding’ and, through ‘meaning,’ at hiding the alterity of this foreigner; or, in what amounts to the same thing, it aims at calming the dead who still haunt the present, and at offering them scriptural tombs” (1988: 2). For a statement on the relation of chronological time to classification, see his epigraph in chapter 2.

20. His actual words are the following: “It is only in appearance that the ‘facts’ in such a case speak for themselves, alone, exclusively, ‘objectively.’ Without the narrator to make them speak, they would be dumb” (Droysen 1967: 52–53).

CHAPTER ONE: TIME HAS A HISTORY

1. For a wonderful critique of linear historical thinking, see Ermarch (2011).

2. The writings are now vast. There are many important works today; I will not recount them here. Some of the most important influences on my thinking are Adam, Nowotny, Fraser, Wilcox, Certeau, Koselleck, Luckmann, Hartog, Runia, and Spiegel.

3. I am indebted to Geof Bowker for bringing this essay to my attention.
4. I have relied on the work of Mali and Blumenberg for my understanding of myth. Mali calls myth the “practical verities in which the members of the community all believe and live” (2003: 4).

5. There are many good works on this history. Beyond what I have already mentioned, David Landes’s *Revolution in Time* is a classic, especially in connection to clocks. The books of Barbara Adam have helped broaden and steady my understanding. Toulmin and Goodfield’s *The Discovery of Time* for quite a while seemed to be a standard, and I still return to Donald Wilcox’s *The Measure of Times Past*.

6. This would be a long list. A good start for history is the reference-like work of Richards, and I have frequently returned to Wilcox. In anthropology, Munn has a fine overview, and Birth has a more recent account. Fabian remains one of the best conceptual critiques, and Povinelli has brought a much more layered and conceptual understanding of multiple times and otherness.

7. In his work on Bali, Clifford Geertz succinctly described the significance of the calendar: “They don’t tell you what time it is; they tell you what kind of time it is” (1973: 393).

8. According to F. C. Haber, the purpose of early clocks was less to tell the time than to represent the motions of the heavens; it was a machine harmonized with religion (1975: 399). Price argues that the early mechanical clocks should be seen within a lineage of astronomical devices that go back to the Antikythera mechanism, not the sundial and clepsydra (1959).

9. Throughout this book, I will use the abbreviations for “before Christ” and “anno Domini.” Using these names, in my mind, is more accurate to the history of time; our linear time was connected to the church, and declaring it as common only seeks to naturalize the particularity of this reckoning of time, hiding its historicity.

10. Dionysus was four years off. Most scholars now date the birth of Christ in 4 BC.


12. Previous to the Meiji *ishin* one reign often had several *nengo*. Following the *ishin*, the reign and *nengo* became the same, an “invented tradition.”

13. I will discuss below the way that such conclusions—as an earlier moment of the modern—themselves are conditioned by modern chronology.

14. Barbara Adam (2004: 76) writes, “While there is no doubt that the temporal relations of archaic societies are different from those of ‘modern’ societies, we will see that they are no less complex, sophisticated or temporally extended.” In the next chapter, I will discuss how this separation of old from modern is essential to the maintenance of the modern.
15. Michael Young writes, “Habit is not only the most precious conservative agent of society, it is also its opposite, its most precious radical agent, enabling us to pay attention to new departures” (1988: 124).
17. We have come a long way: A fourteenth-century church document responds to the validity of what we now call interest: “In doing so he would be selling time and would be committing usury by selling what does not belong to him” (Le Goff 1980: 29). Le Goff is clear that we must be careful to see this not as proof of a secular/religious divide but as a transition to multiple understandings of time and changing society.
18. For example, Nicholas Malebranche used another new technology, mathematics, to measure relations between units (Schiffman 2011: 228–33).
19. I will discuss this notion of duration below. Newton’s duration is an activity between two points; this is a measurement that spatializes time. See also Adam (1990: 54–55).
20. This emphasis on the clock keeps our understanding of time within Newtonian physics. When we bring in other times—for example, that of energy use and of biological organisms—it becomes possible to move beyond physical time. This will be discussed later in this chapter and in chapter 4.
21. For an interesting criticism of how clock time imbricates intellectual life, see Levy (2007). The Slow Movement is an interesting effort that emerged in the 1980s to counter the ways that this accelerating time dominates the way we live. It started as a protest against the building of a McDonald’s fast-food restaurant near the Piazza di Spagna in Rome. A bowl of penne became the symbol of this movement.
22. See, for example, Glennie and Thrift (2009); Nead (2000).
23. The various ages of man describe the growth of man in relation to stages connected to world view. These stages recognize the life course but are not developmental.
24. Locke did not believe all men were capable, only gentlemen. Moreover, women had different roles (and abilities) in his scheme.
25. Darwin’s (1877) observations of his son are a fascinating read. For us, his descriptions are obvious, even naive, but his essay was important in fostering an understanding of child development in the latter half of the nineteenth century.
26. The use of mathematics in this discovery of the past and future were the components of what Alfred North Whitehead called the historical revolt, the use of history to revolt against the authority of the divine. He wrote
that the historical revolt “is the divination of some characteristics of a particular future from the known characteristics of a particular past” (1925: 44).

27. Bowker points out that Lyell’s geology was not structured linearly but was built on cyclical action (Bowker 2005: 53–62). See also Winchester (2001).

28. For recent work that discusses the synchronization of non-Western places to this world time, see Barak (2013), Ogle (2015), Tanaka (2004) and Wishnitzer (2015).

29. Serres writes, “When a system expands, in dimension, number, and complexity, it always has a tendency to form into subsets” (1995: 84).

30. A typical example of Lefebvre’s moments is in Meiji Japan and the Japanese historiography that celebrates the desire for and success of Japan’s transition into a modern state, illustrated with the slogan “Fukoku, kyohei” (Rich country, strong military).

31. Even though space has gained an elevated status in academia as a discrete mode of analysis, my reading of geographers such as Entriken, Harvey, Lefebvre, and Sack brought me to understand that space in modern society is the stoppage or slowing of time (see, for example, Lefebvre 1991: 84–85, 94–96). In his introduction to Rhythmanalysis, Stuart Elden argues that the reading of Lefebvre as spatial overlooks the historical and temporal dimensions of his writings (Lefebvre 2004: ix.)

32. Many scholars—for example, Certeau, Chakrabarty, Fabian, Harootunian, Marx, and Sharma—have pointed out that the primitive is the other that reinforces the view that the modern is always advanced.

33. Whitehead states, “Classification is the halfway house between the immediate concreteness of the individual thing and the complete abstraction of mathematical notions” (1925: 28).

34. Bergson writes, “In order that the number should go on increasing in proportion as we advance, we must retain the successive images and set them alongside each of the new units which we picture to ourselves: now, it is in space that such a juxtaposition takes place and not in pure duration. In fact, it will be easily granted that counting material objects means thinking all these objects together, thereby leaving them in space” ([1913] 2001: 77).

35. Georg Lukács writes that time “freezes into an exactly delimited, quantifiable continuum filled with quantifiable things . . . in short, it becomes space” (quoted in Gross 1982: 64). I will be discussing a different notion of duration in chapter 3.
36. One can, of course, dispute Whitehead’s argument, yet to do so goes against recent (twentieth-century) science—in particular, relativity and quantum mechanics and some social sciences, especially those of cognition.

37. Later, he writes, “We shall see that time, conceived under the form of an unbounded and homogeneous medium, is nothing but the ghost of space haunting the reflective consciousness” (Bergson [1913] 2001: 99). This is akin to Certeau’s discussion of tombs.

38. The transcription of the second five meetings of the Macy Conferences is a wonderful read on the effort of scientists to integrate cognition into a mechanical (physics) understanding of the brain (Pias 2016).

39. One of the problems of this formulation is that periods and nation-states become the naturalized containers, the “mass” that then must be filled in by history. The “becoming” is only a becoming of something that has a naturalized status.

40. Siskin uses a form of text mining where he looks at the title pages of Eighteenth Century Collections Online to discern the propensity of words appearing in the same title as the word system. He finds that between 1700 and 1739, history and system are distant, with ancient and modern more likely to appear with system. Between 1740 and 1779, he finds greater likelihood, but in the final two decades of the century (1779–1800), system, history, ancient, and modern are adjacent to each other (2016: 49–52).

41. If we measure the founding of a discipline through the formation of its national society, we see that the disciplines emerge as absolute time is superseded. The Modern Language Association was founded in 1883, the American Historical Association in 1884, the American Anthropological Association in 1902, the American Political Science Association in 1903, and the American Sociological Association in 1905.

42. For a description of proper time, see J. T. Fraser’s forward to Nowotny’s Time, whose German title is Eigenzeit.

43. Until recently, one of the few social scientists to apply entropy is Georgescu-Roegen (1986), an economist. I am indebted to Keith Pezzoli for bringing this intellectual to my attention. The work of Jennifer Gabrys (2011) invokes a Benjaminian-style natural history (as opposed to Darwin and evolution) that examines waste and decay. The media archaeologist Wolfgang Ernst (2002) uses entropy to build his interpretation of the archives, especially in relation to digital media.

44. Three papers stimulated the conference. They were McCulloch and Pitts (1943); Rosenblueth, Wiener, and Bigelow (1943); and Shannon and Weaver
(1949). There are several fine accounts of these conferences (Heims 1980, 1991; Dupuy 2000; and Hayles 1999).

45. The title was changed following the sixth conference in 1949. Cybernetics is the title of one of Norbert Wiener's books; etymologically it is from the Greek, translated as “steersman.”

46. In many ways, it was the foundational moment for today's emphasis on the STEM fields.

47. For a map showing genealogies of complex systems, see Brian Castellani (2013). I began this inquiry into complex systems through researchers connected to the Santa Fe Institute. I decided to focus on cybernetics and general system theory to draw attention to the potential for not just complex relations—usually applied to the social sciences as networks—but also how they bring a different epistemology and multiple times into our conceptual structure and understandings of society. For a recent effort to bring these ideas to the humanities and human sciences, see Clarke and Hansen (2009).

CHAPTER TWO: HISTORY HAS A HISTORY

1. Big History extends the past to the Big Bang. The Anthropocene is a proposed epoch that incorporates human impact on earth systems.

2. I hope that the Anthropocene will not be subsumed and can remain a separate but converging layer, but Chakrabarty's recent discussion on Anthropocene time shows the difficulty of moving beyond what he calls world history (2018).

3. I could actually begin my narrative with Herodotus. In contrast to the narratives that locate Herodotus as the father of history as a descriptive media, recent research has emphasized the multivocality, multiplicity, and relationality in his work, as well as his emphasis on communication. Egbert J. Bakker writes, “History’ for him is not an object of study, something you write, or write about; it is an intellectual tool and a communication activity” (2002: 3).

4. The Kojiki is the earliest extant text (completed in 712) of the mythical and historical rule of emperors and empresses in what we now call Japan. Rather than a “history,” it is closer to a genealogy described below.


6. For a recent argument on the value of such a singular time, see Le Goff (2015: 9). Importantly, Le Goff understands many of the problems wrought by a unified time but argues that the benefits are greater.

7. Having just read recent predictions on sea-level rise, Newton might be more accurate than I care to believe.
8. The analogy of physical mass and units of people becomes possible with the rise of aggregation described in the previous chapter.

9. For example, Montesquieu stated, “For the occasions which produce great changes are different, but, since men had the same passions at all times, the causes are always the same” (quoted in Schiffman 2011: 258). According to Schiffman, his past was essential for “the importance of context for understanding all things human” (263).

10. I will return to this in chapter 4. In her thoughtful extended essay The Cunning of Uncertainty (2016), Helga Nowotny’s call for a global contextualism echoes some of the characteristics of Herder’s cosmopolitanism. This is an example of thinking about modernity as the anomaly, where the thinking prior to modernity has similarity to the situated and heterogeneous thinking of today. To paraphrase Zielinski’s words, this is where we might find the new in the old (2006).

11. As Toulmin and Goodfield point out, this grounding of heterogeneity and historical change in race is, of course, wrought with potential for racist theories. German national socialists emphasized the racial dimension to justify their ideas, but Toulmin and Goodfield show that his writing is cosmopolitanism (Toulmin and Goodfield 1965: 139). It is fascinating that though Herder created greater space for heterogeneity, his world system was still ordered with Asia at the earlier level, Greece and Rome next, and then with Germany. For a recent reappraisal of Herder, see Zammito, Menges, and Menze (2010).

12. Peter Osborne (1992) argues that modernity is a qualitative, not chronological category.

13. I interpret these statements as truisms that have little use except to obfuscate notions of repetition and change. Change will be discussed in chapter 4.

14. In the social sciences, it is known as development; in biology, it is evolution. In technology, it was progress and is now innovation. Here, this mechanical, linear time becomes natural, an externality that exists.

15. For an example of a work that critiques the structure yet ultimately reinforces it, see my Japan’s Orient (Tanaka 1993).

16. Echoing Hegel’s world history, Ranke exclaims in the essay “On the Character of Historical Science” that “India had philosophy; she did not have history,” as if that were factual (Ranke 1973: 34).

17. Kathleen Davis (2010: 52) points to the similarity of the way that history positions the Middle Ages and Europe’s non-Western others. Both are prior and different.

18. Serres writes, “History is thus the projection of this very real exclusion into an imaginary, even imperialistic time. The temporal rupture is the equivalent
of a dogmatic expulsion” (Serres with Latour 1995: 50). For Marx and formal subsumption, see Tomba (2013) and Harootunian (2015).

19. Povinelli’s discussion is on recognition and experience rather than linear history. It is a rich discussion, especially in thinking beyond either the dominant or the victim, where recognition invokes experience as well as conditions of espionage and camouflage (2002: 76–79).


21. For example, Fukuzawa Yukichi, the intellectual celebrated for his enlightened (i.e., Western-oriented) views, lamented the previous state of society in his famous An Outline of a Theory of Civilization, “Therefore, throughout the whole twenty-five centuries or so of Japanese history, the government has been continually doing the same thing; it is like reading the same book over and over again, or presenting the same play time after time” ([1874] 1973: 142). Japan, with more than a millennium of recorded pasts, had no history.

22. In a very different field, the media theorist Marsha Kinder remarked that she was reluctant to date her ethnographic notes because of the way that dating signifies “objective detachment” (1991: 24–25).

23. For a concise critique of this emphasis on facts as objective, see White (1978).

24. She writes, “The aim was to ‘cleanse’ the facts to be able to put them on a solid foundation of proof that is stripped of their original context and thus generally valid” (2008: 16).

25. In Japan, the discipline of national literature emerged simultaneously with the historical discipline. For a description of a similar process transforming medieval texts, see Wilcox (1987: 137–42).

26. See, for example, his “Preface Universal History” (Ranke 1973: 160–64). For Ranke, the way to this universal history was through the specificity of national histories. Ranke died before he completed this manuscript.

27. When the British Association for the Advancement of Science was founded in 1831, statistics was not accepted, primarily claiming that it lacked theoretical basis and was influenced by values of its practitioners (Poovey 1994: 401).

28. For a fine discussion of the way that archives support the rule of the liberal state, see Joyce (1999).

29. Work that pays attention to recent findings in cognitive fields is a growing and important area. For a good beginning, see Wolf (2008) for work on reading, Vygotsky (1978) for interaction and learning, and Hutchins (1995) for distributed cognition. For examples of works that explore the ways that these fields alter the humanities (and vice versa), see Stafford (2007) for cognition
and visuality, Connolly (2002) for connection to politics, and Smail (2008) for rethinking subjects of history.

INTERLUDE

1. It is interesting to consider the similarity between history and its purpose and Norbert Wiener’s definition of cybernetics as “the study of messages as a means of controlling machines and society” (1950: 15).
2. An important exception to this conclusion is Caroline Arni, who on several occasions attempted to raise questions about history itself, categories of analysis, and the politics of time.
3. I am indebted to Sally Deutsch for bringing this work to my attention.

CHAPTER THREE: HETEROGENEOUS PASTS

2. Some scholars today are turning to “natural history” or “deep time” to avoid the limitations of chronology. See, for example, Gabrys (2011), Parikka (2014), and Russell (2011). We can also extend this search to the cognitive sciences. Humberto Maturana writes, “Living systems are cognitive systems, and living, as a process, is a process of cognition” (quoted in Clarke 2014: ix).
3. Herder’s emphasis on national language and race has been cited as a “romantic” aberration. Moreover, his rejuvenation by Nazi’s to support their argument for purity certainly taints him.
4. Rainer Wisbert comments on Herder, “Man is a unity of feelings, imagination and understanding and in all his powers—and this is the decisive—a creature of historicity” (quoted in Zammito, Menges, and Menze 2010: 665).
5. Herder writes, “Nature’s year is long; the blooms of her plants are as many as these growths themselves and as the elements that nourish them. In India, Egypt, China, that has come to pass which nowhere and never will again come to pass on the earth; and so in Canaan, Greece, Rome, Carthage. The law of necessity and congruity, which is composed of potencies and place and time, everywhere brings forth different fruits” (quoted in Toulmin and Goodfield 1965: 139).
6. David Allen’s very influential Getting Things Done is an example of this mechanization, or the Taylorization, of the mind.
7. Fraser indicates the limits of the analogy of recent physics to social forms. He argues that “time in the physical world is so primitive that it cannot accommodate the idea of a present with respect to which one could speak of a

8. There are numerous important works in this area. See, for example, Daniel Kahneman’s *Thinking, Fast and Slow* (2011), McTaggart’s classic essay (1908), and Alfred Gell’s *The Anthropology of Time* (1992).

9. Alterity and otherness tend to be conflated; they are related. I follow the work of Levinas (1969), Blumenberg (1985), and Buber (1970), who distinguish between a dualistic self and other and a process of interaction where the self (and other) are in constant flux, the face to face.

10. I have chosen to continue this system. BC and AD, after all, fit my argument better than the current use of BCE and CE, an effort to naturalize the Christian chronology.

11. Confusion did exist, showing the problems of synchronization. The 1896 Olympics in Athens was held March 25–April 3 (Julian) or April 6–15 (Gregorian). The US team planned to arrive two weeks early for preparation, but when it arrived in Italy, it learned that Greece was still on the Julian, rushed to Greece, and barely made the event. The 1908 Russian team was twelve days late for the London Olympics in 1908. To bring this closer to today, the Mars Climate Orbiter crashed into the Martian atmosphere (1999) because system engineers used two standards: US (foot pounds) and metric (newton).

12. Schiffman argues that a key moment was in the writings of Montesquieu. He writes, “The commitment to understanding any given entity from within its context derived from an analytical view of the world that contextualized from without, by gauging the differences between entities” (2011: 209).

13. Fasolt writes, “Only the faith that some real boundary exists between the present and the past lends plausibility to the belief that historians can actually place things past into the context of ‘their’ time and place” (2004: 12).


15. See, for example, Guldi and Armitage (2014), who sought to address recent attacks against humanistic study and a decline of history enrollments, arguing that historians should embrace new methods, especially digital technologies and Big Data, to explore pasts beyond traditional time frames. A rather vitriolic critique by Deborah Cohen and Peter Mandler (2015) followed. For my purpose, the debate is over the boundary markers (beginning and end) and the nature of the content, spatialized time.

16. In 1958, Braudel reflected on the impact of the *longue durée*: “In all logic, this orchestration of conjunctures (political and social), by transcending itself,
should have led us straight to the *longue durée*. But for a thousand reasons this transcendence has not been the rule, and a return to the short term is being accomplished even now before our very eyes” (1980: 30).

17. See, for example, a wonderful video produced by Claire L. Evans, “The Evolution of the Earth in Sixty Seconds” (Lores 2009), which literally punctuates the shortness of the history of humans, let alone the Anthropocene.

18. For an inquiry that takes up the Anthropocene but operates using different times, see Parikka (2014). I find the work that invokes “deep time” to be more willing to question the ordering and classing propensities of classical time. See, for example, Smail (2008), Zielinski (2006), and Parikka (2013).

19. Young writes, “Initially, I wrote about all these [wars] as if war and peace were discrete: prewar, war, peace, or postwar. Over time, this progression of wars has looked to me less like a progression than a continuation: as if between one war and the next, the country was on hold” (2012: 1).

20. In psychology, an important thread is the work that translates the ideas of Lev Vygotsky for US psychological sciences. See Cole (1985), Wertsch (1985a, 1985b), and Vygotsky (1978).

21. See especially the work of Edwin Hutchins.

22. I am thankful to Harry Harootunian for bringing this classic to my attention.

23. In my reading, they develop this idea independently of Lave and Wenger (1991), which in my mind further supports the similarity across disciplines, especially the shift away from categories of being to activities that constitute groupings or categories.

24. This is a particularly apt term coined by Jonathan Walton in my seminar, the Politics of Time.

25. McGann writes, “The simplicity of the computer is merciless. It will expose every jot and tittle of your thought’s imprecisions” (2001: 142).

26. History has generally ignored this understanding of time. See, for example, Novick 1988: 134–43; Liakos (2017: 144–45).

27. For a discussion of how the document narrows the archive of history, see Smail (2008: 43–66).


29. Bertalanffy explained psycho-physical organization: “Thus what is seen depends on our apperception, on our line of attention and interest which, in turn, is determined by training” (1968: 236).
30. I recognize the debate that has surfaced in reaction to Marcus. A key issue in that debate, perhaps the central one, is whether deep learning should work with the cognitive sciences.

31. Certeau, though, in criticism describes this well: “Historiography tends to prove that the site of its production can encompass the past: it is an odd procedure that posits death, a breakage everywhere reiterated in discourse, and that yet denies loss by appropriating to the present the privilege of recapitulating the past as a form of knowledge” (1988: 5).

32. What shall we call these? They are accounts, often rather narrative, of historic matter. See, for example, Doxiadis and Papadimitriou (2009). They include pictures; thus are they historical comics?

33. See, for example, Scott McCloud’s discussion of the multiple temporalities, pacing, and motion possible in comics (1994: 94–117). In Unflattening, Nick Sousanis (2015) uses the comic to argue that textual narratives are “flat” and that greater nuance and more dimensions are possible in the comic medium.

34. This is especially evident in Foley’s website, http://pathwaysproject.org. The electronic site uses the affordances of the technology to show relations. The same networked topics in the book are organized alphabetically. The juxtaposition between print text and electronic print demonstrates the affordances of electronic media where, in the words of Bolter and Grusin (2000: 34), “the logic of hypermediacy multiplies the signs of mediation and in this way tries to reproduce the rich sensorium of human experience.” It is debatable whether Foley succeeds, but the contrast to print demonstrates well its limitations.

35. For a sophisticated and honest appraisal of the false certainties in our current system and a wonderful meditation on the possibilities that can emerge from this weakening of previous certitudes, see Nowotny (2016).

36. Certeau finds this characteristic in de Cusa, who “devoted himself to thinking potentiality in terms of positions defined by a reciprocal determination” (2015: 28).

CHAPTER FOUR: CHANGE AND HISTORY


2. Bergson describes this cognitive process, the spatialization of time: “We need immobility, and the more we succeed in imagining movement as coinciding with the immobilities of the points of space through which it passes, the better we think we understand it” (2002: 257).
3. I think of Augé’s description of the airport as “supermodernity’s” nonplace, a nowhere we pass through, in solitude. Sharma (2014) reminds us that circulation is only possible through the production of and dependence on marginalized temporalities, especially that of labor.

4. I use the twentieth century because the understanding of time that follows is from the late nineteenth and twentieth centuries. This is still much more recent than seventeenth-century Newtonian time.

5. For a fine analysis that brings entropy to considerations of time in social theory, see Adam (1990, especially chapter 2).

6. For a trenchant analysis of ways that economics ignores thermodynamics, see Georgescu-Roegen (1986). Recently, scholars in the humanities (Ernst, Parikka) and social sciences (Gabrys) have incorporated entropy in their analyses.

7. The original title was (and it still makes me pause) “Feedback Mechanisms and Circular Causal Systems in Biological and Social Systems.”

8. Bertalanffy writes, “It can be shown that the primary regulations in organic systems . . . are of the nature of dynamic interaction. They are based upon the fact that the living organism is an open system, maintaining itself in, or approaching a steady state. Superposed are those regulations which we may call secondary, and which are controlled by fixed arrangements, especially of the feedback type” (1968: 44).


10. Smail juxtaposed the Darwinian biological model to the Lamarkian model of cultural influence (ontogeny vs. philogeny) to question intention and causality. Instead, he argued for “blind variation and selective retention” (2008: 111).


12. DeLanda writes, “The identity of any assemblage at any level of scale is always the product of a process . . . and it is always precarious, since other processes can destabilize it” (2006: 28).

13. We are the only major industry in the twenty-first century of which I am familiar that gives away intellectual property to businesses and corporations that then charge us for access to what we gave away! It is actually worse than this sounds.

14. For a provocative work that thinks of the Anthropocene through entropy, see Parikka (2014).

15. Chakrabarty (2018) points to a fundamental difficulty in Anthropocene time, the copresence and tension between a world history and an earth history.
epistemological shift is necessary to move from the human-centered to an earth-centered form of knowledge and problem solving.


17. Serres writes, “Two distant points suddenly are close, even superimposed. If, further, you tear it in certain places, two points that were close can become very distant” (Serres with Latour 1995: 60).

18. Several recent works on change, invention, and innovation argue that change often results from repetitive processes, collaboration, serendipity, and/or accidents (Ashton 2015; Kennedy 2016).

19. Sewell (2008) calls this bifurcated temporality “surprising” (520) or “weird” (533). It is only strange if one accepts chronological time of progress and newness.

20. Foley (2012) uses the metaphor of the agora, the ancient Greek notion of a site of exchange. He identifies three principal agoras: oral, textual, and electronic. The pathways project is accessible through its website, http://pathwaysproject.org. The same material is available in a book, Oral Tradition and the Internet (Foley 2012). The website is organized through networked associations; the book is organized alphabetically. Foley writes, “The common misconception that the advent of writing technology cues the immediate closure of the oAgora [oral exchange] has proven time and again to be nothing more than blind tAgora [textual exchange] bias. Writing is used initially for record-keeping and similar accounting procedures, most certainly not for preserving group and personal identity, remembering history, transmitting remedies for disease, and the myriad other social functions performed by oral traditions” (60).

21. I am thankful to Cornelius Holtorf for bringing this essay to my attention. My contact with Cornelius, ironically, was due in large part to the closed, rather than open, access to publications (and the affordances of the internet).

22. The early disdain for John Okada’s powerful account of the dilemmas faced by Japanese Americans in the camps in No-No Boy ([1957] 1976) is indicative of this early attempt at forgetting.

23. For a fine example of multiple and layered times that come together a musical piece, see “The Nature of Time” by Lorren Stafford and Chris Strouth (2001).

24. By science, I am thinking of the human sciences.
CODA

1. Cornelia Vismann writes, “Those who work with records are familiar with the problem: files pile up on desks, accumulate in offices, and fill attics and basements. Though registered, their order collapses time and again; though collected, quashed, dispatched, sold, shredded, or destroyed in some other way, they keep mushrooming” (2008: xi).

2. There are many works that are troubled by social change and identify problems as the dysfunction wrought by technology (sometimes for good reason), such as Carr (2010), Turkle (2011), and Twenge (2017).

3. Henri Lefebvre writes that mobility and stability are contradictory but constituent elements of modernity (1995: 190).

4. An interesting problem in a major subfield of AI, deep learning, is the difficulty of algorithms making sense of “commonsense reasoning,” while it excels in categorization (Marcus 2018). What if the categories are abstractions that organize life rather than those that have emerged from life?

5. Through my work in scholarly communications with the Force11 community, I cannot help but wonder whether the obsession with progress and innovation, fueled by digital technology, is akin to Lucy Ricardo and Ethel Mertz working on the candy production line in an episode of *I Love Lucy*: initially charmed by the ease of technology but increasingly pressured and ultimately frantic as production continues to accelerate.

6. See, for example, chapter 4 of Ethan Kleinberg’s wonderfully titled book, *Haunting History*. He writes, “If anything, recent advances in the digital humanities have led us toward a resurgent neopositivism, chasing empiricist dreams toward the grail of history as a hard science” (2017: 118).

7. I riff this subheading from the title of Chris Lorenz’s fine article on history and time that proposes we look for alternatives to “European chronocentrism” (2017). It is, of course, the title of a Bob Dylan song. I extend this search by considering how pasts are changing in the face of digital media.

8. For fine monographs on the relation of cybernetics and the humanistic sciences, see Hayles (1999) and Clarke (2009).

9. Jasanoff goes on to describe these technologies: “Humility instructs us to think harder about how to reframe problems so that their ethical dimensions are brought to light, which new facts to seek and when to resist asking science for clarification. Humility directs us to alleviate known causes of people’s vulnerability to harm, to pay attention to the distribution of risks and benefits, and to reflect on the social factors that promote or discourage learning” (2007: 33).