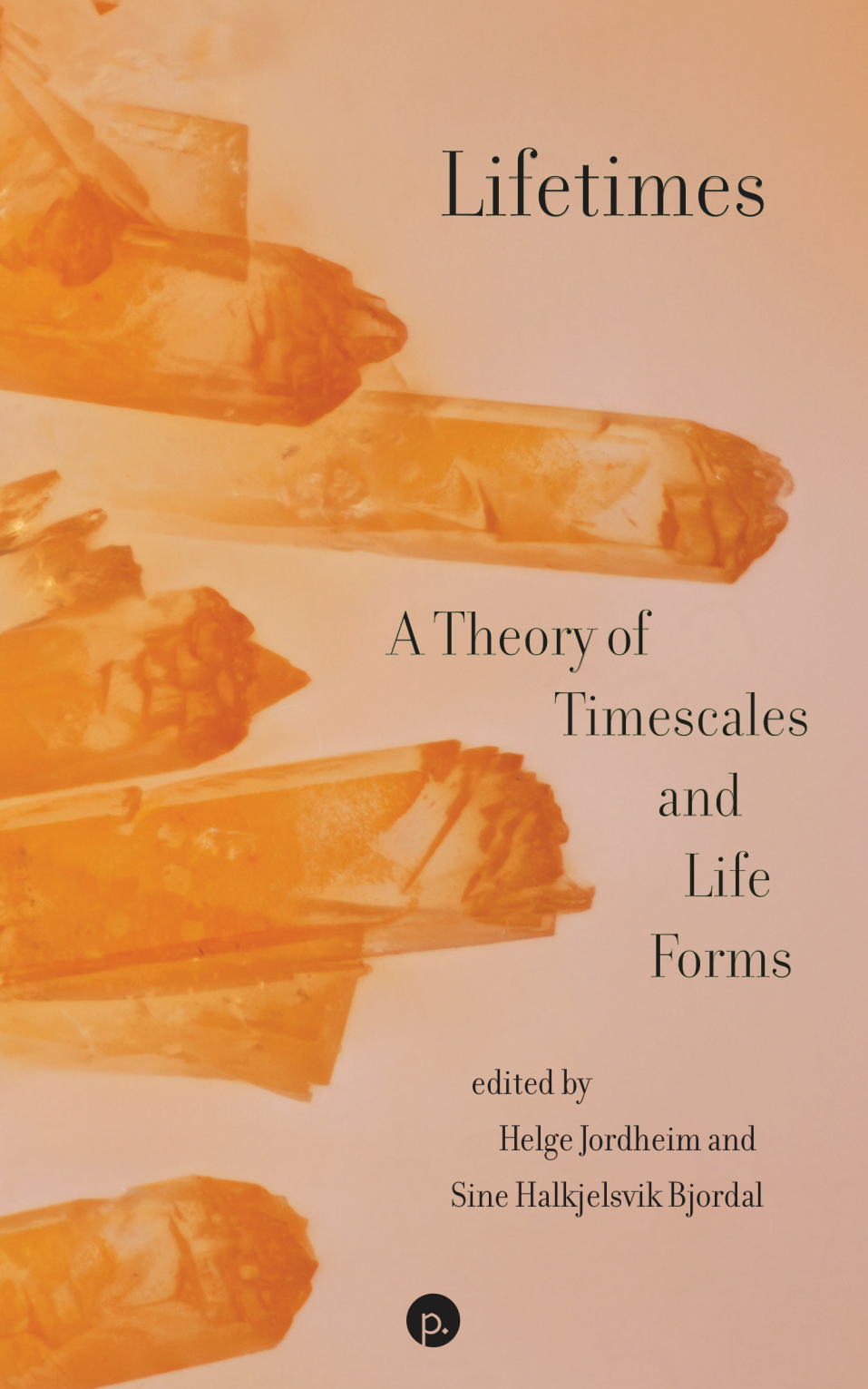


Lifetimes

A Theory of Timescales and Life Forms

edited by
Helge Jordheim and
Sine Halkjelsvik Bjordal

LIFETIMES

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Fig. 1. Detail from Hieronymus Bosch, *Ship of Fools* (1490–1500)

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In memory of the endlessly rich and inspiring lifetimes of Thomas Hylland Eriksen (1962–2024)

A Theory of Lifetimes

Helge Jordheim and Sine Halkjelsvik Bjordal

In the title of his book *Around the Day in 80 Worlds,* Martin Safransky brings time to a standstill. He reduces its extent to a day, whereas he multiplies the world and even the universe. Safransky's point of reference is the pluralistic worldview of William James, which he combines with the ontological turn in anthropology and his own fieldwork around the globe to think about the radical multifariousness of reality, or the "pluriverse."[1] The common reference point for all of these explorations is the day, a temporal interval encompassing 24 hours, or 1,440 minutes, or 86,400 seconds, according to standard universal time. Different worlds, spanning from sorcery in Mozambique to ghosts in Japan, are thus synchronized to this specific unit of time. In reality, however, this "day" contains various durations and rhythms, aligned with the movements of the sun, religious rituals, or schedules of the workplace. In this sense, Safransky's eighty worlds might turn out to have eighty different days, rather than one.

1 Martin Safransky, *Around the Day in Eighty Worlds: Politics of the Pluriverse* (Duke University Press, 2021).

Safransky's inversion of Jules Verne's title reminds us that we do not live in one world, either in a spatial or in a temporal sense. Instead, we find ourselves in spaces and times that we share with other forms of life, human and nonhuman. Often, this sharing is little more than mere coexistence. We are *at* the same time, not *in* the same time.

At the beginning of the twenty-first century, we find ourselves in a historical moment that Adam Tooze has coined as a "polycrisis" — echoing Safransky's "pluriverse," only with a more explicitly temporal and potentially catastrophic inflection.[2] In Russia, an autocratic ruler is drawing on ancient myths about Russian greatness to legitimate his sudden attack on a sovereign neighboring state. Even though an endgame is not yet in sight, these events have inaugurated a new epoch in European history, heralded by increased defense spending and calls for more military cooperation among EU countries, in response also to the threats by the Trump administration to turn its back on NATO. At the same time, people all over the world are asking themselves whether the COVID-19 pandemic has really ended or just slowed down before the next mutation, or the emergence of another virus, and who will be the victims this time. All the while, the slow but steady buildup of climate emergency is bringing us closer to a future "tipping point," after which the world will not end, surely, but will become increasingly unrecognizable and uninhabitable, for humans and for other species. In response, scientists have taken it upon themselves to name and define their own geological epoch, when humanity has become a geological agent and thus must be historicized according to their effect on a billion-year timescale.

The overall aim of this book is to present a new framework for studying lives and times and the relationships between them. In an ontological sense, time is part of all reality, but not as just one thing, rather as many different things. In an epistemologi-

2 Adam Tooze, "Welcome to the World of the Polycrisis," *Financial Times,* October 28, 2022, https://www.ft.com/content/498398e7-11b1-494b-9cd3-6d669dc3de33.

cal sense, temporal multiplicity allows the world to appear in different ways, according to temporal categories and formats. Either way, time is not an abstraction, but something embodied and emergent: in things, in assemblages of things, in relations between things. To the extent that these things, assemblages, and relations embody time, they have lives. Among them are the lives of humans, but also lives of viruses, plants, animals, rocks, computers, nations, concepts, policies, technologies, infrastructures. These lives of things are represented in the various chapters in this book. To link multiple times to multiple lives, we have adopted the term "lifetimes."

Building on postwar theories of history, we include approaches to time from anthropology, cultural studies, science and technology studies (STS), and critical time studies. The result is a bottom-up theory of temporal multiplicity that is conceptually and theoretically open enough, we hope, to be productive across various academic disciplines. The book explores theoretical foundations while at the same time developing them through case studies presented in individual chapters. Rather than discussing how different disciplines relate to time, our aim is to present a theoretically sustained, empirically diverse range of cases, in which times become politically and historically salient.

In this introduction, we lay out the theoretical foundations, conceptual frameworks, and methodological implications for studying the world through the lens of lifetimes. To return to Safransky's title, we study how the "pluriverse" of eighty and more worlds embody not one but innumerous "days," in terms of specific intervals and forms of time. These "lifetimes" are emergent in things, relations, and forms of agency, out of which these different worlds are made.

Origins of Time

Almost unavoidably, questions about time — albeit often considered interesting and intriguing — come with the assumption of abstraction. In other words, they entice us to leave the world

of material existence, lives, and events behind, and ascend into the higher spheres of abstract thinking, often associated with pure mathematics, theoretical philosophy, or elementary physics. One way to understand the aim of this book is as an attempt to flip this coin, to do what Marx claimed he was doing when he "stood Hegel on his head." We want to show how the abstractions that we think of as universal absolute time emerge from real, material, historical existence, and how temporal paradoxes give rise to dramatic and transformative events and processes. Lives are at stake, in the most comprehensive sense.

The assumption about time as an abstraction dominating everyday discourse and highly specialized science alike is accompanied by an assumption of time as universal. Fundamentally, the human interest in time as organizing principle, locating events in successive order, along imaginary or actual timelines, draws on this universalism. Time is assumed to be the same everywhere and always, if we just make a few concessions for time zones and Einstein's principle of relativity, and also time travel and quantum physics.

In most historiographies, the publication of Newton's *Principia* in 1687 marks the advent of universal, absolute time.[3] In different contexts, Newton's innovation has been touted as the breakthrough of modern temporal rationality and the fall of more complex, heterogeneous concepts of time. Both narratives agree about the main historiographical stake, namely, that Newton, accompanied by the progress of clock technologies, brought about a new kind of time that was absolute, quantitative, homogeneous, and universal and that became essential for the rise of modernity as a global force, fueled by capitalism, industrialism, and colonialism.[4]

3 See, e.g., Stephen Hawking, *A Brief History of Time* (Bantham Books, 1996), 15–36.

4 Barbara Adam, *Timescapes of Modernity: The Environment and Invisible Hazards* (Routledge, 1998), and Donald J. Wilcox, *The Measure of Times Past: Pre-Newtonian Chronologies and the Rhetoric of Relative Time* (University of Chicago Press, 1987).

At the top of the list of famous academic quotes on time is undoubtedly Augustine's quip that he has a perfect understanding of time until someone asks him about it. A viable contender for second place, however, is Newton's phrase from the *Scholium* to the Definitions in his 1687 *Principia*:: "Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without regard to anything external." Among the "external" things that gave contemporary chronologists, natural historians, and antiquarians the most headaches were Egyptian dynasties and fossils, discussed by the French philologist Johann Justus Scaliger and the Danish theologian and natural historian Nicolaus Steno, respectively, when time was pluralized and made specific to materials and life forms.[5] Most quotations from Newton's *Scholium* stop after the first sentence, thus highlighting what is perceived as one of the main innovations of Newtonian physics: absolute time, alongside absolute space. In the original, however, Newton has more to say: "Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration: relative, apparent, and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time; such as an hour, a day, a month, a year."[6]

If we were less occupied with Newton's position as the founding father of modern physics, and more with his engagement with late seventeenth-century ideas about time, we might be less prone to cut off the second part of this quote. Rather, we could read it as containing the twin origins of post-Newtonian time. On the one hand, there is Newton's absolute, homogene-

5 Nicolaus Steno, *The Prodromus of Nicolaus Steno's Dissertation Concerning a Solid Body Enclosed by Process of Nature within a Solid* (The Macmillan Company, 1916), and Joseph Justus Scaliger, *Thesaurus temporum, complectens Eusebi Pamphili Chronicon* (Thomas Basson/Commelini, 1606).

6 Isaac Newton, *Mathematical Principles of Natural Philosophy. Translated by Andrew LaMotte. To which is added Newton's System of the World* (Daniel Adee, 1846), 77.

ous, universal time, which has become the basis for all natural science, according to increasingly accurate time-measurement technologies, from the mechanic to the atomic clock. This time, Donald J. Wilcox claims, is also the foundation for the uniform, progressive time of historiography.[7] On the other hand, Newton brings up the pluralization of "measures" that are neither abstract nor universal, but "sensible and external," exemplified by three of our best-known calendrical intervals, "a day, a month, a year." For Newton these "measures" are derivative. They are not "true time," since "true time" for him is abstract, universal, and absolute, and thus cannot be dependent on any external measures "by the means of motion," that is, by movements and changes taking place in physical space. Already in Newton's *Scholium,* there is a tension between the absolute and universal and the relative, plural, and sensible. In other words, the foundational text for modern universal time already comes with an ambivalence and a double perspective, which opens the way for another perspective on time in Western knowledge and offers a different take on many of the tensions and entanglements we are faced with in the present, because of climate change, technological acceleration, pandemics, and such.

According to Newton, "relative, apparent, and common time" comes in different shapes and forms. Time in the world is shaped by historical, cultural, and technological ideas and practices, which are local and contextual. This kind of time is not characterized by universality and homogeneity, but particularity and heterogeneity. Newton points out that common time is absolutely and unavoidably dependent on technologies such as clocks, timelines, and calendars, and on practices such as working hours, meeting times, and publication rhythms. For Newton, relative time was not an alternative conception of time, but a form of measurement. "Relative quantities, therefore, are not the actual quantities whose names they bear but are those sensible measures of them (whether true or erroneous) that are

7 Wilcox, *The Measure of Times Past,* 34–39.

commonly used instead of the quantities being measured," he writes in the *Scholium*.[8]

That time has a double nature, even in Newton's *Scholium,* does not come as a surprise. It can easily be added to the long list of dichotomies that frame time research in the humanities and social sciences — between absolute and relative, universal and experienced, mathematical and phenomenological, and natural and social time. Furthermore, many mobilize the twin terms "time" and "temporality" to open an allegedly unbridgeable gap between the universal time of physics and other natural sciences and the plural temporalities of the social and historical world, while nodding in the direction of the century-old Einstein–Bergson debate, in which Einstein was said to deal a deadly blow to Bergson's claims about temporal plurality.[9] Drawing on this more taxonomic work, this book suggests that both the dichotomy of time and temporality and the insistence on the plurality of natural, social, and historical temporalities are useful starting points more than real results and findings. We want to push this agenda forward by offering both conceptual tools and exemplary case studies of how times come about and interact, entangle, come into conflict with, or reinforce each other, all across the nature–culture divide.

Embodied and Emergent Times

At the same time as Newton was performing his grand theoretical gesture in his *Principia,* setting aside Christian, dynastic, and seasonal time in one fell swoop, a different approach to time was developed, fueled not by ideas of singularity, universality, and homogeneity, but of plurality, particularity, and heterogeneity. Philosophers and intellectual historians have pointed to the German philosopher Gottfried Leibniz as the harbinger of this

8 Newton, *Mathematical Principles,* 81.

9 Jimena Canales, *The Physicist and the Philosopher: Einstein, Bergson, and the Debate That Changed Our Understanding of Time* (Princeton University Press, 2015).

alternative theory of time, also drawing a line to later philosophers of time, such as Henri Bergson and Gilles Deleuze.[10] For our purposes here, however, the point is less the canon of male geniuses than the idea to which they contributed. Leibniz makes the following argument in the third letter from his correspondence with Newton's student Samuel Clarke, wherein he blames Newton for the decline of natural religion in England and for plagiarizing his work on calculus:

> Supposing anyone should ask why God did not create everything a year sooner, and the same person should infer from this that God has done something concerning which it is not possible that there should be a reason why he did it so and not otherwise; the answer is that his inference would be right, if time was anything distinct from things existing in time. For it would be impossible that there should be any reason why things should be applied to such particular instants rather than to others, their succession continuing the same. But then the same argument proves that instants, considered without the things, are nothing at all and that they consist only in the successive order of things; this order remaining the same, one of the two states, namely, that of a supposed anticipation, would not at all differ, nor could be discerned from the other which now is.[11]

In his attempt to prove God's eternal existence and absolute power, and his *ex nihilo* creation of the world, Leibniz develops an argument that will become a touchstone for later non-Newtonian philosophies of time. Time, he claims, has no existence independent of things, thus reversing Newton's argument about time's independence of "anything external." Instants — that is, the smallest unit of time — "are nothing at all" without things.

10 See Robert W. Luzecky and Daniel W. Smith, eds., *Deleuze and Time* (Edinburgh University Press, 2023), esp. 1–74.

11 Gottfried Wilhelm Leibniz and Samuel Clarke, *Correspondence,* ed. Roger Ariew (Hackett, 2000), 15.

More precisely, they only exist "in the successive order of things." From these and other similar claims, we can infer that Leibniz conceives of time as both embodied in things and emerging from the relations between them. Contrary to Newton, he understands time not as an abstract dimension, into which everything else can be fitted, but as material processes unfolding in and between the things themselves.

Another key term for non-Newtonian philosophies and theories of time is Bergson's *durée,* "duration." Newton also uses this term in his definition of absolute and relative time, which are named "duration" and "measure of duration," respectively. By contrast, Bergson coins "duration" as a counter-concept to time as defined in Newtonian physics, and the natural sciences more broadly. In his work, "duration" is introduced as a phenomenological, even psychological term, denoting time as experienced by human consciousness. One of the starting points of the French celebrity philosopher was the paradox attributed to Zeno, the Greek mathematician-philosopher, about Achilles and the tortoise, in which the former can never catch up with the latter. The problem, Bergson states in *Matter and Memory* (1896), is that Zeno turns time into space.[12] As long as we consider Achilles's attempt to catch up with the tortoise in terms of distance or a trajectory, it can be divided into increasingly smaller parts, thus immobilizing the Greek hero. As a movement in time, however, it is unitary and indivisible. Time is a progression that comes into being, not a thing that is given and can be divided endlessly. The same argument sets up Bergson's concept of "duration," which lies at the core of his non-Newtonian philosophy of time. In science, he argues, time is spatialized, turned into an infinite set of discrete instants that can be counted and measured. About the transition from one instant to the next, what we perceive as change, science cannot know or say anything. For Bergson, by contrast, this transition is the very essence of time, what he refers to as "duration." Our lives unfold

12 Henri Bergson, *Matter and Memory,* trans. N.M. Paul and W.S. Palme (Dover, 2004), 30–35.

not from one discrete moment to the next, but as a "stream of experience."[13] Time can be compared to a melody, Bergson often states, which can only be perceived as a whole and not as discrete notes.

Although his theory of duration is based on human experience, and thus fundamentally phenomenological, Bergson also considers how the concept applies to the outer world, which includes and conditions human lived experience. In this book, we follow this line of thinking from Bergson's later work. Like Leibniz and later Deleuze, Bergson conceives of time not as an absolute or universal dimension, but as something that is inherent to all elements of the world. Lived duration, to Bergson, does not unfold in time, but brings time about, constituting it in ceaseless emergence. Duration is time as emergent in things and events, continuously bringing about something new — the future as becoming. Even the past is not given and bounded but is continuously created together with the present. In other words, time is a constitutive dimension of life, and vice versa.

In her path-breaking book *Time and Social Theory,* Barbara Adam, who was instrumental in bringing time back into the social sciences, both as theory and object of study, expands Bergson's theories by linking them to thermodynamics and nonlinear physics, especially the works of the Russian-born, Nobel Prize–winning chemist Ilya Prigogine. In both bodies of work, attention is shifted from "events in time" to "time in events." Adam writes: "Social scientists chart a historical development of the awareness and understanding of time from 'time in events' to 'events in time'; the former being associated with traditional societies and the latter with Western industrial ones. In the physical sciences the development seems to have been the reverse: *events occur in time* in classical physics whilst *time is in action and events* in thermodynamics and the work of Prigogine."[14]

13 Henri Bergson, *Time and Free Will: An Essay on the Immediate Data of Consciousness,* trans. F.L. Pogson (Dover, 2001), 75–139.

14 Barbara Adam, *Time and Social Theory* (Polity Press, 1990), 68.

Prigogine developed his ideas about time in close collaboration with the philosopher Isabelle Stengers, who cowrote the works that introduced Prigogine's ideas about irreversibility and the universe as an open system to an Anglophone audience, in conversation with the philosophy of Gilles Deleuze: *Order out of Chaos* (1984) and *The End of Certainty* (1997).[15] Time as embodied and emergent in things, events, and actions makes up the philosophical underpinnings of our book. Instead of probing the theoretical implications of this claim, we turn it into an analytical moment. We study how, in what ways, and with what effects time emerges in things, events, and actions, across a range of historical moments and situations, which together make up what we here call simply "life."

In the introduction to *Time and Social Theory,* Adam narrates an anecdote about a discussion she had with a friend at a party. The friend questions whether Adam's investigations of roles and functions of time in society are really worthwhile. Why bother, the friend asks, when the answer is really so "fundamentally straightforward and simple"? "Time is a fact of life."[16] In her responses, watched by other sociologists curious to learn how she will counter this attack, Adam first proceeds to complicate the idea of a "fact of life," since both lives and the roles of time in them are so diverse. When that does not really convince her interlocutor, she retreats to her role as a social scientist and argues that what she really wants to question are the simplified concepts of time prevalent in social science research. At this point, one of her colleagues intervenes to label her as a representative of a particular form of critical theory. Unable to give a satisfying answer, Adam takes this phrase — "Time is a fact of life" — as the title of her introduction and indeed as the main tenet of her book about time in the social sciences. Although our aims are

15 Ilya Prigogine and Isabelle Stengers, *Order out of Chaos: Man's New Dialogue with Nature* (Bantam, 1984), and Ilya Prigogine and Isabelle Stengers, *The End of Certainty: Time, Chaos and the New Laws of Nature* (The Free Press, 1997). For a further discussion of the theories of Prigogine, see Jordheim's contribution in this book, Chapter 4.

16 Adam, *Time and Social Theory,* 1.

more historical, and although we understand life in a broader sense than Adam does, this insight also remains at the core of our study of emergent and embodied "lifetimes." Social and natural and historical and chronological times are not treated as opposites but as part of a continuum, encompassed by the category of "life."

Lives and Times

As the programmatic concept for our explorations, "lifetimes" should not be understood according to its traditional meaning as the span of a human life in its social and historical context. In everyday language, but also in science, life is both the name for something unique and singular, in an almost metaphysical sense, reflected in the question about the origin of life, and something more trivial, the mere fact that something exists for a certain period of time, as in the lifetime of any object. This duality is also reflected in the entry on "life" in the *Oxford English Dictionary,* which first lists "the condition or quality of being alive," then, as the second definition, lists simply "with reference to duration." The *OED* uses "duration" in the Newtonian sense, as a discrete temporal interval that can be divided into ever-smaller instants. However, "duration" also has other meanings, such as, according to Bergson, temporal progression inherent to human consciousness, or Prigogine and Stengers's idea of "time in actions and events." The concept "lifetimes" draws on these different meanings of "duration," combining, one the one hand, the multiplicity of temporal scales, the intervals and periodizations, and the long term and the short term, and, on the other hand, the rhythms, accelerations and decelerations, mediatizations, conceptualizations, materializations, networks, and entanglements emergent in and across different scales of life. Thinking in terms of "lifetimes" rather than more familiar temporal frameworks, such as Newtonian time, history, the past-present-future nexus, temporal experience, the ethnographic present, memory, clock-time, calendrical time, and evolution, offers a new understanding of the temporal configuration of the world, across multiple

disciplines, ontologies, epistemologies, and forms of power and politics.

The concept "lifetimes" opens a new line of inquiry into the multiple times of pasts, presents, and futures. According to the classic study by J.T. Fraser, time has its origin in "the life process," or, as we argue, in life processes.[17] This book offers a multispecies and multimaterialist reconceptualization of "life," which, in combination with the pluralization of abstract singular "time," opens itself to a wide range of possible durations, moving beyond the human and the phenomenological. In this sense, our concept of "lifetimes" differs radically from the concept found both in ordinary use and in disciplines such as anthropology, sociology, and philosophy to designate an individual life and career, or, in some cases, someone's individual, indeed personal, experience of time. An interesting example is the STS scholar Susan Traweek's *Beamtimes and Lifetimes,*[18] in which "lifetimes" refers to the lives and careers of physicists, as opposed to the "beamtimes," which designate the pulses of the accelerator beam. Like us, Traweek is interested in how the two become entangled. Unlike us, she reserves the term "life" for human life. Nor does our use of "lifetimes" follow directly from the phenomenological concept of "lifeworld," *Lebenswelt,* first coined by Husserl and since then much discussed and used both in philosophy and social theory in reference to the horizon of all our experiences.[19] In his discussion of the term "lifetimes," *Lebenszeiten,* the German philosopher and intellectual historian Hans Blumenberg attacks what he sees as Husserl's absurd combination of *Leben* and *Welt*. On the contrary, Blumenberg argues, the confusion of *Lebenszeiten* with *Weltzeiten* is what causes madness, mania, extremism, and totalitarianism.[20] In

17 J.T. Fraser, *Time, the Familiar Stranger* (University of Massachusetts Press, 1987).

18 Sharon Traweek, *Beamtimes and Lifetimes: The World of High Energy Physicists* (Harvard University Press, 1992).

19 Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology* (Northwestern University Press, 1970), 121–34.

20 Hans Blumenberg, *Lebenszeit und Weltzeit* (Suhrkamp, 2001).

spite of this interesting twist to the phenomenology of "lifetimes," Blumenberg's concepts lack the fundamental ontological openness intended in this book. To understand the kind of temporal disruptions we are interested in here — climate change, pandemics, apocalypse, existential crisis, traffic jams, species extinction — the concept of life cannot be reserved for human consciousness. As much as this book centers on the human, especially on human concepts and practices of time, and hence builds on insights from phenomenology, it does not take for granted the distinction between "the time of our lives" and "the time of the universe," as the philosopher David C. Hoy puts it.[21] "Lifetimes" explicitly oscillates back and forth through this divide, continuously asking when and how "times of the universe" become "times of our lives," on a collective, social, and political level. We offer our own twist to the classical slogan from critical time studies, "all time is social time," by counterpointing it with another phrase, "no time is only social time" — it is also geological, biological, cosmological, or technological, and so on

Despite our opposition to the phenomenological theory of lifetimes, another piece of German philosophy — from the late eighteenth century — remains our most prominent source of inspiration. In his *Metakritik* of Kant's new "critical philosophy," published in 1799, the German theologian and philosopher Johann Gottfried Herder offers one of the most paradigmatic formulations of the multiplicity of lifetimes, at least in a Western context:

> In reality, every mutable thing has its own inherent standard of time; this exists even if nothing else is there; no two things in the world have the same standard of time. My pulse, my step or the flight of my thoughts is not a temporal standard for others; the flow of a river, the growth of a tree is not a temporal standard for all rivers, trees and plants. Lifetimes of elephants and of the most ephemeral are very different from

21 David C. Hoy, *The Time of Our Lives: A Critical History of Temporality* (MIT Press, 2012), xiii.

> each other, and how different are not the temporal standards on all planets? In other words, there are (one can say it earnestly and courageously) in the universe at any time innumerable different times.[22]

Against Kant's concept of time as *Anschauung,* "intuition," Herder insists that time is inherent to things, that each thing in the world has its own time or, he says, its own "standard of time." The examples he offers have a lot in common with Bergson's idea of temporal progression, such as "growth" and "flow," but they also include more bodily and indeed rhythmic elements, especially in the references to "step" and "pulse." That Herder also includes "the flight of my thoughts" among the things that have their own time seems to anticipate Bergson's idea of "stream of experience." Whereas Bergson gave primacy to phenomenology, Herder presents the multiplicity of time as inherent to the real, as an ontological fact. Human consciousness is just one of its many manifestations. Multiple times imply multiple realities, or, in a more current idiom, "multiple ontologies."[23] The passage from Herder's *Metakritik* also draws on earlier traditions of a natural history when he makes his ways through all the "kingdoms" of the world, to use a term from the same period: the animal kingdom (elephants and humans), the vegetative kingdom (trees and plants), and the mineral kingdom (rivers and planets), all of which at Herder's time were increasingly being split up into separate fields of knowledge.[24] Another contemporary reference is the encyclopedia, distributing things in the world onto the branches of a tree of knowledge.

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22 Johann Gottfried Herder, "Eine Metakritik zur Kritik der reinen Vernunft," in *Schriften zur Literatur und Philosophie, 1792–1800* (Deutscher Klassiker Verlag, 1998), 360; our translation.

23 Annemarie Mol, *The Body Multiple: Ontology in Medical Practice* (Duke University Press, 2002).

24 Nicholas Jardine, *"Naturphilosophie* and the Kingdom of Nature," in *Cultures of Natural History,* ed. N. Jardin, J.A. Secord, and E. Spary (Cambridge University Press, 1996).

To sum up, three elements from this passage are salient for developing our theory of lifetimes. The first concerns the connections between the plurality of times and the plurality of life forms, spanning the entire world, all three "kingdoms" of nature, human culture, and experience, and even the possibility of life on other planets, which indeed emphasizes and radicalizes the variations of life forms. The second crucial concept mobilized by Herder is that of a "standard," or, in the German original, *Maß*. On the one hand, "standard" is used as a placeholder for temporal structures or patterns, such as intervals, periodizations, beginnings, and ends, thus indicating the quantitative aspect of duration. On the other hand, however, "standard" implies a possible alignment and adjustment between the "innumerous times" inherent to the respective life forms, by which they can form connections and networks, but also become disconnected, as a result of processes of synchronization and desynchronization. The third element concerns the idea of scale. Both times and life forms are conceived in relation to an idea of scale and scaling. The most explicit mention of scale is found in the reference "lifetimes of elephants and of the most ephemeral," which implies a scale of durability and ephemerality, on which elephants are placed at the one extreme, whereas the other is left open. However, there are also other scales implied: from the small ("my pulse") to the large ("other planets"), and from the simple ("my step") to the complex ("the flight of my thoughts"). Our theory of lifetimes is fundamentally based on these three principles: the plurality of lives and times, the possibilities of coordination and synchronization, and the links between timescales and scales of life, or life forms.

Times across Disciplines

This book responds to a pressing question and an overdue task in current scholarship, namely, to draw together insights from different disciplines and place them on a new theoretical footing, brought about by the concept of "lifetimes." At the same

time, we want to acknowledge an "exigence"[25] in the present historical moment to rethink our relationship to time, brought about not least by the onslaught of "polycrisis," one crisis leading onto the next, from financial crisis and migration crisis to pandemic and war.

Over several years, scholars — some of whom are represented in this book[26] — have been gauging the implications of various theories of multiple times, as part of what in the social and human sciences has come to be known as the "temporal turn."[27] Other scholars less prone to proclaiming "turns" have seen themselves as continuing long-standing traditions of thinking about times in the plural, originating in Greek antiquity, local time practices, eighteenth-century philosophies, or postcolonial theory. In every instance, the starting point is a historically and culturally inflected suspicion toward homogeneous, linear, chronological time, which in Western and increasingly global modernity is connected to clock and communication technology, ideas of historical progress, and colonialism and Western hegemony, often at the same time.

In anthropology, Johannes Fabian's pivotal *Time and the Other* (1983) insisted on the inherent Eurocentrism in the ethnographic approach to non-Westerns cultures. Alerting anthro-

25 Lloyd F. Bitzer, "The Rhetorical Situation," *Philosophy and Rhetoric* 1, no. 1 (1968): 1–14.

26 Geoffrey C. Bowker, *Memory Practices in the Sciences* (MIT Press, 2008); Bowker, "All Together Now: Synchronization, Speed, and the Failure of Narrativity," *History & Theory* 53, no. 4 (2014): 563–76; Geoffrey C. Bowker, "Life at the Femtosecond," in *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities,* ed. Axel Volmar and Kyle Stine (Amsterdam University Press, 2021); Helge Jordheim, "Against Periodization: Koselleck's Theory of Multiple Temporalities," *History & Theory* 51, no. 2 (2012): 151–71; Helge Jordheim, "Introduction: Multiple Times and the Work of Synchronization," *History & Theory* 53, no. 4 (2014): 498–518; and Helge Jordheim, "Natural Histories for the Anthropocene: Koselleck's Theories and the Possibility of a History of Lifetimes," *History & Theory* 61, no. 3 (2022): 391–425.

27 Robert Hassan, "Globalization and the 'Temporal Turn': Recent Trends and Issues in Time Studies," *Korean Journal of Policy Studies* 25, no. 2 (2010): 83–102.

pologists to the "denial of coevalness" they effectively impose on their preferred objects of study, Fabian opened the discipline up to other temporalities beyond standard European time.[28] This awareness soon became a staple in postcolonial critique both outside and inside the anthropological discipline, for instance in the work of Homi Bhabha and Achile Mbembe.[29] Recently, anthropologists such as Anna Tsing and philosophers such as Deborah Bird Rose and Michelle Bastian have expanded Fabian's attack on chronocentrism to include the lack of engagement with the lifetimes of other species, both plants and animals.[30] Inspired by these works, but also by the ongoing discussion about humanity as a geological agent, this book insists on enrolling the lifetimes of nonorganic entities, such as rocks, fossils, and sediments, in the same discussion.

From critical time studies, as it has been practiced during the last decade at the hands of Elizabeth Freeman, Elizabeth Povinelli, Sara Sharma, and others, another set of perspectives has made it into this book.[31] Their premise is that any order of time is fundamentally linked to power, giving rise to systems of "chrononormativity" (Freeman) and "power-chronography" (Sharma) and to "asynchronies" and "temporal dissonances," through which radical transformation and alternative ideas about pasts, presents, and futures emerge. Often analyzed in

28 Johannes Fabian, *Time and the Other: How Anthropology Makes Its Object, with a New Postscript by the Author* (Columbia University Press, 2014).

29 Homi K. Bhabha, *The Location of Culture,* 2nd ed. (Routledge, 1994), and Achille Mbembe, *Necropolitics* (Duke University Press, 2019).

30 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press, 2021); Deborah Bird Rose, "Multispecies Knots of Ethical Time," *Environmental Philosophy* 9, no. 1 (2012): 127–40; and Michelle Bastian, "Encountering Leatherbacks in Multispecies Knots of Time," in *Extinction Studies: Stories of Time, Death and Generations,* ed. Deborah Rose, Thom van Dooren, and Matthew Chrulew (Columbia University Press, 2017).

31 Sarah Sharma, *In the Meantime: Temporality and Cultural Politics* (Duke University Press, 2014); Elizabeth Freeman, *Time Binds: Queer Temporalities, Queer Histories* (Duke University Press, 2010); and Elizabeth Povinelli, *Economies of Abandonment: Social Belonging and Endurance in Late Liberalism* (Duke University Press, 2011).

terms of social and political hierarchies, these orders of power-time, analogous to the orders of power-knowledge analyzed in the works of Michel Foucault, reach beyond the social into the materialist multispecies realities of a "damaged planet," to use the term from a recent book by Tsing and colleagues.[32]

Drawing on the works of STS scholars such as Geoffrey Bowker and Susan Leigh Star,[33] we also approach time as a form of infrastructure, which gives shape and direction to life. Temporal infrastructures can be studied conceptually, by identifying terms that name various time forms and processes, but also materially, in objects, practices, media, and technologies. Temporal infrastructures are part of situations, processes, behaviors, and contexts, which are investigated throughout this book. Built infrastructures (roads, railways, airplanes) allow humans and goods to move across the globe. Information infrastructures (the internet, mobile communications) generate knowledge about these movements. Nevertheless, infrastructures tend to fade into the background in favor of what is perceived to be the real story — the development of a social movement, the toppling of a power structure, the discovery of the standard model of particle physics.[34] Yet by paying attention to infrastructure and its properties, carrying out an "infrastructural inversion,"[35] new understandings of time unfurl.

Since our ambition in this book is a fundamentally interdisciplinary one, based on the collective efforts of scholars from different areas of the humanities and social sciences, we also find inspiration in similar collective endeavors. In *Time: A Vocabulary of the Present,* historically situated concepts are

32 Anna Lowenhaupt Tsing et al., eds., *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene* (University of Minnesota Press, 2017).

33 Geoffrey Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (MIT Press, 1999).

34 Susan Leigh Star and Karen Ruhleder, "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces," *Information Systems Research* 7, no. 1 (1996): 111–34.

35 Star and Bowker, *Sorting Things Out,* 34.

presented in keyword essays exploring different forms of "sociocultural time."[36] Another recent anthology dealing with social and political time, employing Hartog's concept of "temporal regimes," albeit more broadly defined, is *Power and Time,* edited by Edelstein, Geroulanos, and Wheatley.[37] Here, examinations of "temporalities in conflict and the making of history" are presented through a collection of case studies, focusing on the link between time and power, and coining the overarching concept of "chronocenosis" for temporal coexistence, cooperation, contestation, and conflict. Although the questions we pose and examine in this book are generated in the human and social sciences, they cannot be answered except through engagement with knowledge practices and traditions in the natural sciences. Inspiration for this can be found in the anthology by Katinka Ridderbos entitled simply *Time,* which takes as its starting point the rather ambitious question "What is time?" and searches for answers in different disciplines, from physics to genetics, to religion.[38] Although we share the cross-disciplinary perspectives, mobilizing insight from geology, biology, engineering, psychology, and modern physics, our focus is not on time-concepts and time-practices in the disciplines, but how they are employed and become entangled in particular events and situations. In this way, we make our own contribution to the temporal "vocabulary of the present," launching or giving new meaning and force to concepts such as "lifetimes," "timescales," "synchronization," and so on.

Synchronization and Power

In *Time and the Other,* Fabian points out the "need to steer between such closely related notions as synchronous/simulta-

36 Joel Burges and Amy Elias, eds., *Time: A Vocabulary of the Present* (NYU Press, 2016).

37 Dan Edelstein, Stefanos Geroulanos, and Natasha Wheatley, eds., *Power and Time Temporalities in Conflict and the Making of History* (University of Chicago Press, 2020).

38 Katinka Ridderbos, ed., *Time* (Cambridge University Press, 2002).

neous and contemporary," which corresponds to physical and chronological time and typological and historical time. "Coeval," he adds, introducing the term for which he became famous, "covers both ('of the same age, duration, or epoch')," indicating a "common active 'occupation,' or sharing, of time."[39] "Denial of coevalness," on the other hand, comes down to a willful use of temporal difference to keep so-called primitive people out of the present of Western scholarship. Fabian's trope was in part a reworking of a more general phrase that originated in German historiography, sociology, and philosophy: *Die Gleichzeitigkeit des Ungleichzeitigen.* In addition to Fabian's somewhat idiosyncratic translation, the phrase has been rendered as "the contemporaneity of the non-contemporaneous," the "synchronicity of the non-synchronous," and "the simultaneity of the non-simultaneous," thus putting more emphasis on either the historical experience ("contemporaneity") or the chronological coincidence ("simultaneity"). The German original has enjoyed a mixed career in European intellectual history, mobilized by scholars touting colonialist, National Socialist, and right-wing revisionist agendas, in addition to more left-wing uses.[40]

First coined by the art historian Wilhelm Pinder to make sense of the role of generations in art history, the trope was picked up by the sociologist Karl Mannheim in his attempt to theorize "the problem of generations" more generally, and by the philosopher and Marxist Ernst Bloch in his work on the backwardness of National Socialism.[41] The most systematic historiographical treatment is found in the work of the German historian and theorist of history Reinhart Koselleck. After working through how key concepts of political and social language (*Grundbegriffe*) contain layers of meaning that are out of

39 Fabian, *Time and the Other,* 31.

40 Achim Landwehr, "Von der 'Gleichzeitigkeit des Ungleichzeitigen,'" *Historische Zeitschrift* 295 (2012): 1–34.

41 Wilhelm Pinder, *Das Problem der Generation in der Kunstgeschichte Europas* (Bruckmann, 1961); Ernst Bloch, *Erbschaft dieser Zeit,* exp. ed. (Suhrkamp, 1985); and Karl Mannheim, "Das Problem der Generationen," *Kölner Vierteljahrshefte für Soziologie* 7 (1928): 157–85, 309–30.

sync with each other, and how nonsynchronicity is an anthropological constant in human societies, he comes to a definition that has much in common with our understanding in this book: In nature and history, Koselleck points out, "times pluralize themselves, they are attributed to cosmic, or social and political systems, which each lay claim to their own time." Then he concludes: "Different systems bring forth different times at the same time: the synchronicity of the non-synchronous."[42]

Human societies, and also human or nonhuman ecologies, work to adapt and align these multiple and often conflicting times. In previous studies, Helge Jordheim and Espen Ytreberg have shown how collective times and shared rhythms are the result of synchronization, which might happen both intentionally, as the result of some kind of concerted action, and by means of a more networked, self-governing logic.[43] Production of collective, "chrononormative" times takes places by means of "work of synchronization,"[44] by which different times are adapted and aligned, either to each other or to a given temporal standard. Contrary to Vanessa Ogle in her book on the global standardization of clock times in the period 1870–1950,[45] Jordheim and Ytreberg considers synchronization practices as ubiquitous to any society and culture, indeed as a necessary basis for social interaction in general. Synchronization as alignment of emergent times in things and events takes place by means of a wide range of tools and practices, including concepts, narratives, and diagrams, along with a wide range of ritual practices and communication technologies. Indeed, the cultural history of time can be understood as a history of synchronization. In relation to power and hierarchies, synchronization can both be a tool of discipline and suppression, as in factory work or curfews, and

42 Reinhart Koselleck, "Zeit," in *Lexikon Geschichtswissenschaft,* ed. Stefan Jordan (Reclam, 2003), 331–35.

43 Helge Jordheim and Espen Ytreberg, "After Supersynchronisation: How Media Synchronise the Social," *Time & Society* 30, no. 3 (2021): 402–22.

44 Jordheim, "Introduction."

45 Vanessa Ogle, *The Global Transformation of Time 1870–1950* (Harvard University Press, 2015).

a tool for disruption, as in the case of revolutions. Among the most prevalent and effective tools of synchronization in modern societies are the concepts of "progress," "crisis," and, indeed, "history."

Many of the examples discussed above also bring out how coexisting, competing, and conflicting times are linked to power, violence, and suppression. Non-Western societies around the world that were "denied coevalness" by anthropologists — but also, much more brutally, by colonialist states and empires — were enslaved or forced to subject themselves to foreign rule. In a similar vein, Bloch analyses how the National Socialists rejected "coevalness," that is, the contemporaneity with modern liberal culture and politics, and instead opted for a return to premodern values and lifestyles, made possible by the expansion of German *Lebensraum* at the genocidal expense of Jews and Slavs. In both cases, temporal conflicts are used for political purposes, with brutal and devastating results. With their term "chronocenosis," Edelstein, Geroulanos, and Wheatley want to offer "a sense that multiple temporal regimes are not merely concurrent but at once competitive, conflictual, cooperative, unstable, and sometimes even anarchic."[46] The term itself is a calque of the term "biocenosis," from the Greek words for "life" and "mingling or sharing," coined by the German zoologist and ecologist Karl Möbius in 1877 to describe the interacting organisms living together in a biotope.[47] A more prevalent term today is "biological or ecological community." In the introduction to *Power and Time,* the editors discuss how the multiple times, or regimes, as they call them, "inhabit a complex temporal ecosystem with intricate patterns of reliance, adaptation, and violence."[48] Replacing *bios* with *chronos,* they evoke — albeit unintentionally — a concept seemingly similar to "lifetimes." Both books share their main concern: to understand what happens

46 Edelstein, Geroulanos, and Wheatley, *Power and Time,* 27.

47 Karl Möbius, *Die Auster und die Austernwirtschaft* (Wiegandt, Hemple & Parey, 1877).

48 Edelstein, Geroulanos, and Wheatley, *Power and Time,* 27.

when conflicting times occupy the same spatial or temporal extension. "Chronocenosis," however, is never developed beyond the scope of human history and experience, neither temporally nor spatially. Unlike Edelstein and colleagues, who see the need of an overarching spatial concept through which multiple temporalities and their conflictual relationships can be understood, "lifetimes" is multispatial and multilevel. Lifetimes form on a range of scales, through manifold temporal interactions — lives and times combine into lifetimes, and the lifetimes of the world entangle and emerge in varieties of situations, things, moments, and places that are politically and historically salient to varying degrees.

The production of shared collective times or dominant temporal standards — or rather, the disruption of the same — comes down to a question of agency, more specifically temporal agency. In *Power and Time,* temporal agency is limited to humans. The struggle to shape and control time is a political struggle, performed and controlled by human wills, intentions, and actions. A similar but less politically inflected concept of "temporal agency" is developed by Michael G. Flaherty, Anne Line Dalsgård, and Lotte Meinert in their introduction to *Time Work* (2020). This concept, they write, "sensitizes us to the intentional alteration of our own temporal experience, or that of others," in other words, how "the individuals in question chose to modify their own temporal experience."[49] However, they also allow for "less conscious or unintended forms of temporal agency," when people "follow local practices for reasons that have little or nothing to do with temporal agency." For this volume, we follow the broadening of the concept of agency that has taken place in actor-network-theory, by which also nonhuman things are granted agency to the extent that they form part of networks together with humans. "Lifetimes," in our sense, can be likened to any of these networks, in which things, technologies, and humans together bring about a particular form of time. One such network,

49 Michael G. Flaherty, Lotte Meinert, and Anne Line Dalsgård, eds., *Time Work: Studies of Temporal Agency* (Berghahn Books, 2020), 4.

which has dominated Western and indeed global culture for the last 250 years, is "history."

History, Human, and Natural

"History" is the name given to one of the most all-pervasive and all-encompassing projects of synchronization in Western societies — and, from the mid-nineteenth century onward, increasingly in non-Western societies — as the predominant way of organizing past, present, and future. Collective social time has been conceived — by historians and others — as a movement from the past, through the present, and into an open and endless future, at which people direct their hopes and aspirations.[50] At present, however, indications abound that this temporal structure called "history" has lost its ability to assemble, integrate, and indeed synchronize the multiple forms of time that make up the real. Whereas history as the succession of events in causal or noncausal relationships continues to unfold, "history" as a way of organizing knowledge and experiences of past, present, and future — that is, as a way of organizing time on a collective scale — might just have reached the end of the line.

At the end of the eighteenth and the beginning of the nineteenth century, natural history split up and gave rise to the order of disciplines that still populate modern universities.[51] A new order of knowledge emerged, in which the research interests and forms of scholarship that made up the field of natural history were disentangled into different disciplines, among them geology, biology, cosmology, and history.[52] The last became the refuge of events and processes that seemed to belong specifically

50 Reinhart Koselleck, *Futures Past: On the Semantics of Historical Time* (MIT Press, 1985), 255–76.

51 Wolfgang Lepenies, *Das Ende der Naturgeschichte: Wandel kultureller Selbstverständlichkeiten in den Wissenschaften des 18. und 19. Jahrhunderts* (Hanser, 1976).

52 Gianna Pomata and Nancy G. Siraisi, "Introduction," in *Historia: Empiricism and Erudition in Early Modern Europe,* ed. Gianna Pomata and Nancy G. Siraisi (MIT Press, 2005).

to the human world based on a form of time that was singular, homogeneous, and linear. By contrast, the new science of geology organized itself around a deep and multilayered time, going millions of years back and manifesting itself in sediments and strata. The field of geology turned to a field of forces in the evolution of the Earth — Neptunists giving priority to water, Plutonists to fire — whereas history organized itself around nations, cultures, and individuals.

We find ourselves in a moment when the order of knowledge that came about 200 years ago is making increasingly less sense of pressing global challenges. The suggestion of "the Anthropocene" as a new geological epoch recasts humans as "geological agents" on a timescale that outlasts "history" by millions of years.[53] At the same time, populations across the globe are currently outliving the cultural and social structures put in place to care for a much younger population. In Europe, the proportion of people older than sixty-five is approaching 25 percent,[54] and in Japan the average life expectancy of women has surpassed 87 years, the highest in the world.[55] In other areas, "history" is challenged by the projection of radically different, technoscientific futures, emerging both in science and fiction. Genetic engineering, quantum physics, and artificial intelligence all envision multiple possible future worlds that are discontinuous, out of sync with "history."[56] Historical time remains stuck with a timescale of around 6,000 years at the most,[57] organized around

53 Jan Zalasiewicz et al., "The Anthropocene: A New Epoch of Geological Time?," *Philosophical Transactions of the Royal Society* 369 (2011): 835–41, and Gerardo Ceballos, Paul R. Ehrlich, and Rodolfo Dirz, "Biological Annihilation via the Ongoing Sixth Mass Extinction Signaled by Vertebrate Population Losses and Decline," *PNAS* 114, no. 30 (2017): 6089–96.

54 Jim Oeppen and James W. Vaupel, "Broken Limits of Life Expectancy," *Science Compass* 296 (2002): 1029–31.

55 Kaare Christensen et al., "Aging Populations: The Challenges Ahead," *Lancet* 374 (2009): 1196–208.

56 Yuval Noha Harari, *Homo Deus: A Brief History of Tomorrow* (Harper, 2017).

57 Andrew Shryock and Daniel Lord Smail, "Introduction," in *Deep History: The Architecture of Past and Present,* ed. Andrew Shryock et al. (University

periodizations such as "the Middle Ages," "modernity," or "postwar" and temporal concepts such as "growth," "recession," or "crisis" and modeled on events mostly taking place in Western Europe or brought about by Western colonial powers. Thus, "history" in the modern sense is unable to account for what it means to be a "geological agent" or that humankind is growing incessantly older on a global scale. In order to study times emergent in things and events, and indeed engage with some of the most pressing questions of this current moment, a reentanglement and reintegration of these fields of knowledge seems necessary, a new form of natural history based on a theory of multiple times, more specifically multiple "lifetimes."

Theories about how "history" as the dominant paradigm for thinking about pasts, presents, and futures in the Western world can adapt to this moment has also come from the field itself. In François Hartog's *Régimes d'historicité* (2003), probably the most influential work on the theory of history from the last decades, the author evokes a "crisis of time." Crises are moments of acceleration, synchronization, and desynchronization that challenge both clock-time and the past-present-future structure characteristic of what he calls "the modern regime of historicity."[58] The collapse of this "regime" has given way to a condition of "presentism" blocking any meaningful relationship to the past and the future. According to Hartog and others, time itself is in crisis since the modernist vision of a linear progressive movement has come to a standstill. Modern societies are stuck in a "monstrous present," in which both past and the future become the object of guilt and anxiety, rather than spaces for understanding, learning, and planning.[59] Others, such as Hans Ulrich Gumbrecht and Aleida Assmann, along with many postcolonial critics, express relief that the modernist myth of civilization and progress has finally caved in and that other temporal experiences take

of California Press, 2011).

58 François Hartog, *Regimes of Historicity: Presentism and Experiences of Time* (Columbia University Press, 2015).

59 Ibid., 217.

hold, such as memory practices and bodily and affective experiences, in addition to other nonmodernist narratives.[60] In other words, a new set of times is emerging, which is less dependent on capitalist and colonialist myths of eternal growth, both temporally and spatially.

Among the key figures in the "temporal turn" in the historical disciplines is Koselleck, who already in a 1978 essay claimed that history cannot do without *eine Theorie der geschichtlichen Zeiten,* "a theory of historical times."[61] In a series of essays from the 1970s and 1980s, he discusses the theoretical and historiographical implications of this pluralization of time by means of tropes such as *die Gleichzeitigkeit des Ungleichzeitigen* and *Zeitschichten,* "layers or sediments of time." Drawing on Koselleck's work, historians have developed more complex and sophisticated concepts of time, which, nevertheless, have to a large extent remained stuck in a form of "temporal anthropocentrism."[62] History equals the time of social processes, political events, individual decisions and actions, and so on in which humans are the only agents. In the same 1978 essay, Koselleck argues that history is a product of a "destruction of natural chronology" and a "denaturalization of time,"[63] which took place at the end of the eighteenth century. Before that, the process of history was organized according to "natural" categories: the rise and setting of the sun and the moon, the change of seasons, and the birth and death of the members of the ruling dynasties. Then other concepts took over, obtained directly from history itself: "progress, decline, acceleration or delay, the

60 Hans Ulrich Gumbrecht, *Our Broad Present: Time and Contemporary Culture* (Columbia University Press, 2014), and Aleida Assmann, *Ist die Zeit aus den Fugen? Aufstieg und Fall des Zeitregimes der Moderne* (Carl Hanser Verlag, 2013).

61 Reinhart Koselleck, *Zeitschichten: Studien zur Historik* (Suhrkamp, 2000), 302.

62 Jordheim, "Natural Histories for the Anthropocene."

63 Koselleck, *Zeitschichten,* 307.

not-yet and the not-anymore, the before and the after, the too-early and the too-late, the situation and the duration."[64]

In later texts, Koselleck has made a return to a version of natural history. He even had a brief engagement with environmental history, at least on a theoretical level, revising his theory of multiple times to also include the times of nature. Times of human events and actions are reconnected with durations unfolding at the level of microbes, rock layers, or landscapes.[65] In this way, he placed himself in the tradition of another historian of multiple times, Fernand Braudel, who in 1958 argued that history should not only concern itself with the high-speed time of events but also with the slower rhythm of social and economic structures and cycles, and also the *longue durée* of landscapes, geography, and climate.[66] In recent years, other interventions in the discipline of history have tried to reconnect history with natural times. Among the most influential are Dipesh Chakrabarty's series of articles kicked off by "The Climate of History" (2009) and Jo Guldi and David Armitage's *The History Manifesto* (2014), in which our present condition of global warming and climate change is taken as point of departure for reintegrating various timescales.[67] In both cases, however, the ambition is more to renegotiate the role of the historian in the present than to understand the multiple times of historical processes, which is the task we are taking on here.

Although this book does not offer a new coherent theory of history, it does offer suggestions and examples for rethinking the very concept of "historical" time in its modern sense, to account for how times overlap with, distort, and rupture one another, and how timescales and rhythms come in and out of sync. Rethinking what we mean by "history," we argue, needs

64 Koselleck, *Futures Past,* 133

65 Jordheim, "Natural Histories for the Anthropocene."

66 Fernand Braudel, "Historie et sciences sociales: La longue durée," *Annales* 18, no. 4 (1958): 725–53.

67 Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, no. 2 (2009): 197–222, and Jo Guldi and David Armitage, *The History Manifesto* (Cambridge University Press, 2014).

to start by reconsidering the connection between time and life. Climatic, demographic, and technoscientific changes are linked by the ways they disrupt and transform life — in other words, how new and different times emerge in particular life forms and the assemblages they enter into. This book sets out to develop a theory of lifetimes to account for these changes in the temporal configuration of the present. The aim is to break the hold of "history" and "historical time" as these categories have been developed and upheld from the late eighteenth century onward and introduce a new way of understanding pasts, presents, and futures.

Life Forms and Timescales

Inspired by Herder and eighteenth-century natural history, but also by the work of Bergson, Prigogine, and Stengers, the concept of "lifetimes" challenges the distinction between natural and historical, human and nonhuman, and phenomenological and ontological times. An important tool for staging this challenge is the concepts of *scale* and *scaling,* which, according to Dürbeck and Hüpkes in their introduction to their *Narratives of Scale in the Anthropocene,* "have long been acknowledged and widely discussed in the fields of biology, ecology, architecture, (human) geography, engineering, and mathematics."[68] However, these discussions did not take hold in the humanities and many of the social sciences until the advent of the concept of the Anthropocene created an awareness of humans as geological and environmental agents, operating at radically different scales from the ones predicated by their traditional fields and traditions, both spatially and temporally. According to historian of science Deborah R. Coen, global warming must first and foremost be understood as a problem of scale:

68 Gabriele Dürbeck and Philip Hüpke, eds., *Narratives of Scale in the Anthropocene*: *Imagining Human Responsibility in an Age of Scalar Complexity* (Routledge, 2022), 1.

> Yes, climate change is an emergent effect that can be confirmed only at the level of the planet as a whole. But it is also a process shaped by and in turn transforming entire ways of life, from the scale of everyday household decisions to the scale of multinational corporations. It is a disaster at every scale — for the micro-organisms dying in acidifying oceans, for the cities vulnerable to rising sea levels, and for the entire continents whose agriculture may be deprived of seasonal floods. It is therefore imperative that research on climate change and its impacts be able to move across these varied scales.[69]

For Coen, the problem of scale is a methodological one, where ideas about the "incommensurability" of scales and perspectives come up against the need to address the planet as a whole.[70] "The Anthropocene concept transcends discipline-specific conceptions and theories," write Dürbeck and Hüpke. "It emphasizes the entanglement of social, political, ecological, biological and geological processes at multiple spatial and temporal scales."[71]

Already introduced in our discussion of Herder's *Metakritik,* the idea of a scale of life goes even further back, to Aristotelian biology and the medieval *scala naturae,* also referred to as the "great chain of being,"[72] spanning from the nonlife of minerals to the nonhuman life of microbes and bacteria to human life in societies. Today, it still features in evolutionary biology with reference to a "single ladder of evolution," which one can "climb" or "descend," and on which there are "higher" and "lower" species.[73]

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69 Deborah R. Coen, "Big Is a Thing of the Past: Climate Change and Methodology in the History of Ideas," *Journal of the History of Ideas* 77, no. 2 (2016): 310.

70 See also Sebouh David Aslanian et al., "AHR Conversation: How Size Matters: The Question of Scale in History," *American Historical Review* 5, no. 118 (2013): 1431–72.

71 Dürbeck and Hüpke, *Narratives of Scale,* 1.

72 Arthur O. Lovejoy, *The Great Chain of Being* (Harvard University Press, 1936).

73 John M. Archibald, *One Plus One Equals One: Symbiosis and the Evolution of Complex Life* (Oxford University Press, 2014).

In more recent discussions about scales and life, the theoretical physicist Geoffrey West has taken the most expansive route. In *Scale* (2017), he opens with the following claim: "Life is probably the most complex and diverse phenomenon in the universe, manifesting an extraordinary variety of forms, functions, and behaviors over an enormous range of scales."[74] In other words, scale represents "an integrated unifying conceptual framework" that enables us to address "some of the major challenges and issues we are grappling with today, ranging from rapid urbanization, growth, and global sustainability to understanding cancer, metabolism, and the origins of aging and death."[75] Almost "any measurable characteristic of animals, plants, ecosystems, cities, and companies, scales with size."[76] Interestingly, West's theory of scale is itself absolutely scalable, from ants and flies, or even quarks and cells, to what he calls the "science of cities" and the "science of companies," amounting to "a grand unified theory of sustainability."[77] In this sense, it has certain elements in common with the kind of capitalist and colonialist scalability that the anthropologist Anna Tsing attacks in her work on "nonscalability," in which local particularities are exchanged for scalability and growth.[78]

In this book, we draw on another theory of scale based in ecology, summed up by the ecologist Aaron M. Ellison in reference to a lecture given by another ecologist, Simon Levin, in 1989:

> He argued that there is no single natural scale at which ecological systems or phenomena should be studied; emphasized the different mechanisms that operate at different

74 Geoffrey West, *Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies* (Penguin, 2020), 1.

75 Ibid., 4.

76 Ibid.

77 Ibid., 247, 379, 411.

78 Anna Lowenhaupt Tsing, "On Nonscalability," *Common Knowledge* 3, no. 18 (2012): 505–24.

> spatial, temporal, biological, or organizational scales; and focused attention on variability generated both by an investigator's perceptual bias (i.e., the scale at which we choose to observe a system) and the intrinsic variation that is part and parcel of evolution. Levin also suggested that patterns that are unique to a particular scale will have similarly unique causes and consequences.[79]

This argument is valid for both space and time, and thus places ecological phenomena within a diagram, in which spatial extent is represented on the *x*-axis, temporal duration on the *y*-axis. Whereas West aspires to universality, ecologists such as Levin and Allison argue in a more Herderian vein in which all universal concepts such as space and time are confronted with their particular and heterogeneous instantiations.

However, neither West nor Ellison can solve "the problem of scale," or offer an unambiguous, immediately operationalizable definition of the concept. What scale is remains part of the discussion, as summed up by Gabrielle Hecht: "Scale is messy because it is both a category of analysis and a category of practice."[80] In other words, the methodology of scale and scaling will always be confronted with the politics of the same. In her article "Interscalar Vehicles for an African Anthropocene," Hecht insists that scale within the context of the Anthropocene must be treated reflexively. This means, she writes, that the Anthropocene concept "invites scholars to dramatically expand their spatial and temporal scales of analysis" (methodology), while at the same time being aware of and considering "the political and ethical work accomplished by scalar choices and claims" (politics). Scales, Hecht argues, echoing our previous arguments about time, "are emergent rather than eternal. But

79 Aaron M. Ellison, "A Sense of Scale," *The Bulletin of the Ecological Society of America* 2, no. 99 (2018): 174.

80 Gabrielle Hecht, "Interscalar Vehicles for an African Anthropocene: On Waste, Temporality, and Violence," *Cultural Anthropology* 1, no. 33 (2018): 114.

their situatedness and historicity do not detract from their reality. They do work in the world. They are performative."[81]

Coen makes a similar argument when she explores how "scale" in more recent years has acquired a new meaning, inspired by ecological thinking. In this sense, "scale" is understood as "the spatial and temporal extent of interdependence." In ecology, this implies that "each ecological phenomenon has its own 'characteristic scale.'" Because this sense of ecological scale is a measure of relative interdependence, Coen writes, "the most informative scale for the study of a given phenomenon is not an a priori decision but a conclusion to be reached empirically."[82] Coen uses this ecological insight to argue for the necessity of moving across varied and interdependent scales, because, she argues, "the 'earth system science' of recent years demonstrates that we understand little about this planet if we do not understand how *scales interact*."[83] This also grants a specific meaning to the concept of "scaling," which is the activity we engage in when we analyze overlaps and entanglements between forms of life operating at different scales. Scaling, Coen states, refers to "the work of mediating between different systems of measurement, formal or informal, designed to apply to different slices of the phenomenal world — say the chronologies derived from proxy climate data such as tree rings versus those of personal and collective memory — in order to arrive at a common standard of proportionality."[84]

In this book, we draw on all these understandings and notions of scale and scaling, as a category of analysis, a category of practice, and in an ecological sense as a way of thinking about incommensurability and mediation. The scales we are primarily interested in, however, are scales of time. Timescales are implied already in the Newtonian concept of "duration," referring to time as an absolutely scalable quantity. Scales of time span from

81 Ibid., 111.
82 Coen, "Big Is a Thing of the Past," 309.
83 Ibid., 310 (emphasis original).
84 Ibid., 312.

the nano-, femto-, or attoseconds of computer processing in use in cybersecurity and high-speed trading, to the fifteen-minute life cycles of microbes, to the four-year cycles of elections and political power, all the way to the millions and billions of years of rocks and planets. Applied to one life form, the human, around which this book gravitates, these temporal scales radically change what we see: On the geologic timescale, humanity represents but an instant, but in high-speed trading or recently in AI-powered text-production apps such as ChatGPT, human lived experience and the speed of human knowledge processing and communication appears as endlessly slow. In this way, historical or social time, fitted to the human scale, can be reconnected with geological and biological time, which is fitted to the timescales of rocks and genes, respectively. Scale is a way of thinking across life forms and the disciplines that have taken shape around them — history and anthropology around the human, geology around rocks and minerals, chemistry around organic and inorganic substances, cosmology around stars and planets.

However, when timescales combine with life forms to form lifetimes, scale becomes more than quantitative duration. According to the lifetimes framework, timescales are understood as inherent in life forms and as emergent in interdependent temporal ecologies. They manifest themselves at different levels through a "politics of scale" in which hierarchies of lives and times are produced and upheld, including in our own methodological work of scaling. Along these lines, then, we argue that a plurality of lifetimes also entails a plurality of ontologically and epistemologically diverse timescales.

In this book, we point out the continuity of natural phenomena, from rocks and plants to humans, and back. Importantly, there is no cutoff point on the way down after which nature no longer matters for the production of times we live by. Linking scales of time to forms and scales of life, we explore how lifetimes come into being through entanglements and synchronizations and how they change our experiences, our practices, and our orders of knowledge. Scaling — as a method and as an object

of study — enables us to move between knowledge fields and life forms and study their entanglements in particular things and events. Lifetimes are temporal forms that emerge from specific combinations or entanglements of timescales and life forms at different levels of discourse and practice, whether local, national, transnational, or even global. The book explores how various lifetimes combine with social and political concepts to form temporal standards governing human and nonhuman life, and how these standards converge and come into conflict with each other.

Structure of the Book

In this introduction, we have drafted a theory of lifetimes, in which concepts of abstract, universal, psychological, and relative time, including the concept of history, become embedded in a wide-ranging theory of multiple times emergent in things, relations, and events. They exist as forms and entanglements of lives that span the divide of culture–nature and those of human–nonhuman and organic–nonorganic. To analyze how these lifetimes form and operate, the book is made up of individual studies, each of which focuses on an event, a transition, a set of texts, a trip, or a phenomenological or physiological experience. Each of these studies explores the emergence of a set of lifetimes, specific and inherent to this particular object of study, and draws upon fundamental ideas of scale and scaling and also nonsynchronicities and synchronization, accounting for moments when lifetimes interact but also when they come into conflict with each other. In each case — each historical or ethnographic moment — specific lifetimes emerge, form, scale, and interact and synchronize with other times, in harmonious or disharmonious ways.

Part 1, "Life and Death," consists of three chapters that in various ways concern endings and afterlives. In Chapter 1, Stine Alling Jacobsen explores how different histories — geological, industrial, colonial — of a cryolite deposit in Ivittuut in Greenland are connected through the process of melting. Based on

ethnographic fieldwork and historical studies, starting from an observation of the shared physical and optical qualities between cryolite and ice, Jacobsen shows how geological rhythms of the Arctic are becoming more and more intertwined with the industrial acceleration of production and consumption. Whereas the cryolite deposit is depleted, the lifetimes of cryolite continue in other forms and places.

Espen Ytreberg, in Chapter 2, is more directly dealing with death in the history of industrial whaling and whale extinction. Taking as his starting point a collection of amateur photographs, produced for the most part by those who themselves worked in the extractive industry in the 1920s, Ytreberg asks what these images can tell us about how whaling was made sense of and legitimated, based on certain underlying conceptions of time. In addition, whale extinction is discussed as a deferred event, one where fears over extinction have been present since the industrial era, but where other considerations (revenue, jobs, political expansion) have always prevailed, making it an extinction event that keeps on taking place.

In Chapter 3, Laura op de Beke confronts the imaginary of pre- and postapocalypse, the end of world or a civilization. More specifically, she examines two creative responses to what she calls the Anthropocene's unique timescape, "characterized by a deepening of time the further ones goes back into the past, and a temporal compression in the last hundred years, which makes the present feel more eventful and volatile." Through close analysis of two video games, *Heaven's Vault* and *Outer Wilds,* op de Beke discusses how this medium can be an apt space in which to bring together the ambitious temporal scope of big history and the more granular temporality that governs the proper timing of actions in the Anthropocene.

The chapters in Part 2, "Synchronization and Jams," deal with the timing and multiple times of activities and processes that are at the same time everyday and extraordinary: traffic jams, the COVID-19 pandemic, and breastfeeding. In Chapter 4, Helge Jordheim attempts to make sense of the very specific form of time emerging in congested traffic, asking how the times of

traffic jams might be meaningfully different from other times. Through the concrete case of traffic jams, Jordheim discusses what jammed time can tell us about social and historical times more generally, by engaging with two sets of scholarship: critical theory, in which traffic jams are examples of the dialectics of modernity, and nonlinear physics, in which traffic jams are moments of phase transition. "How," Jordheim asks, "would it change our perception of social and historical time if we took the fundamental temporal diagram to be the multilane highway jammed with cars, rather than the single, uniform line, stretching endlessly into the past and the future, iconically represented by the open highway?"

Based on the assumption that social time is synchronized time and inspired by Henri Lefebvre's "rhythmanalysis," Einar Wigen, in Chapter 5, explores the pandemic everyday through a temporal lens, as a temporal phenomenon. In the chapter, three specific concepts are developed and employed: rhythms as joint action, social entrainment, and — inspired by the anthropologist Mary Douglas — temporalities out of place. Wigen is particularly interested in how the everyday temporalities of our lives were handled, organized, and negotiated when social distancing and isolation made each individual's own rhythm more dominant and the times of our lives had to be synchronized in new, often crowded spaces by new means.

Anne Kveim Lie studies, in Chapter 6, a more intimate form of time and synchronization: the multiple times of breastfeeding. She takes as her starting point an ignored dimension in the medical history of this practice, namely, the importance of time and timing in the breastfeeding process. The empirical case studied by Lie is the coming into being of a very successful campaign by second-wave feminists in 1970s Norway to reclaim women's expertise in breastfeeding and develop self-help groups and teaching material, forming an organization that still exists today. Lie argues that this collective uprising was an event where practices, technologies, institutions, and even linguistic structures to a large extent hinged on questions of time, timing, and temporality.

Part 3, "Progresses and Futures," consists of three historically oriented chapters with different geographical and sociotechnological starting points, all dealing with progress and its intended and unintended consequences. In Chapter 7, about nineteenth-century Arabic periodicals, Ingrid Eskild examines how periodicity and progress became interlinked in the material infrastructure of *al-Muqtataf,* a popular scientific journal established in 1870s Beirut. Eskild shows how this journal, through both discursive and technological means, constructed a past-present-future nexus that strengthened a sense of historical contingency, in which the Syrian future was still malleable. The editors of *al-Muqtataf,* Eskild argues, attempted to stabilize a time within which people could meaningfully act, and she shows how a modernist teleology, though seemingly unitemporal in form, in fact was constituted of several rhythms and durations coming into play with each other.

A completely different historical context is the point of departure in Chapter 8, where Leonoor Zuiderveen Borgesius sets out to explore how maps functioned as time tools and temporal infrastructure in the Dutch colonial space of Suriname. Of particular interest is how the temporal practice of history was shaped by cartographic representations and the visual language and technologies they rely on. Although they represented space, these maps were also temporal tools used to plan and bring about a future of extractivism and economic exploitation of Suriname's resources and people. Built on a technological discourse of economic and scientific growth, maps were also powerful rhetorical tools that sustained the colonial dichotomy between known and unknown territory, Borgesius argues. The concept of history, dictated by a progressive linear timeline in which white Dutch civilization was considered superior, played a central part in the formation of those two spatial categories.

Emil Flatø, in Chapter 9 on earth modeling and climate change scenarios, shows how the ambition of meteorologists and climatologists to model and observe the Earth as a system was as much a temporal as a spatial technology. It emerged out of the need to synchronize knowledge production to compute

a model of the weather faster than the weather itself, envisioning a diachronic process of computation to engage with the irreversible temporality of weather. Flatø traces how the idea of a global observatory has been invoked time and again in the evolution from numerical weather forecasting to digital climate modeling. This diagrammatic imagination, he argues, has proven epistemologically and organizationally useful to the big science of climate, but it has obfuscated its complex temporalities of knowledge production and the processes of planetary change it was charged with assessing.

The three chapters in Part 4, "Natural Histories," are all engaged with the historical entanglements between natures and histories. In Chapter 10, Erik Ljungberg unpacks the scientific work of the eighteenth-century British natural historian Gilbert White as a material-semiotic practice that served to bring forth the periodicity of nature in a specific manner. White used inscription technologies to document the daily events of nature: flowering times, weather, birds' migration times. His most important inscription device was his *Naturalist's Journal,* a calendar formatted according to a grid-like structure. Ljungberg argues that these inscription practices were temporal technologies. He shows how White's attempt to map the orders of natural time by making daily written observations in the journal was premised on a specific practice of encoding events. Ljungberg argues that through the incorporation of several scales of time within the journal's grid, in the manner of nested Russian dolls, White could inscribe and aggregate discrete observed events within a temporal system and subsequently read across scales in order to locate regularities and periodicities.

The case studied in Chapter 11, by Sine Halkjelsvik Bjordal, involves two Danish natural history texts documenting and describing the species called the *brugde* (basking shark), written by the Norwegian bishop Johan Ernst Gunnerus in 1765 and 1768, respectively. Bjordal discusses here how the seemingly atemporal, descriptive natural history writing of Gunnerus can be understood as a temporal "bundle" acting as a form of synchronizing infrastructure in the field of natural history in eight-

eenth-century Norway. Bjordal draws on both literary theory and Koselleck's theory about historical time in an attempt to bring theories about the nature of texts and theories about the multitemporal nature of history into dialogue.

Brita Brenna writes, in Chapter 12, on the uninhabited island of *Bjørnøya* (Bear Island), a small, heart-shaped, barren island located south of Svalbard in the Barents Sea. Having done fieldwork on the island twice, in addition to extensive archival studies, Brenna explores the "time landscape" of Bear Island through an examination of the entanglements of natural and cultural histories that can be traced on the island itself and in the archives. She asks how the presence of this place and people in it can help answer historical questions. Through pictures and field notes, Brenna offers a counterpoint to the assumption that times come in different scales. Rather, the attempt is to observe and describe "knots of time," trying out the idea that lifetimes emerge as material-semiotic entanglements.

Part 5, "Embodiments," consists of two chapters that are slightly different from the other chapters in the book when it comes to writing style and personal engagement. In Chapter 13, Rana Issa experiments with using biography as a mode of knowledge generation, exploring the tools inherent in personal history for describing and responding to large historical currents and processes of sudden change. The empirical starting point for this exploration is a concrete attempt at writing a family history in the context of the political and economic collapse that Lebanon is now undergoing. She explores how historicizing by means of the lives of ordinary people can activate temporalities resistant to the modes of organizing time produced by systems of power. By engaging personal history as a response to conflicting temporalities, Issa asserts her right to deliberately activate an asynchronous relation to existing modes of synchronicity.

Hugo Reinert, in Chapter 14, tells a series of interlinked stories about a small white stone that traveled from Kiruna, Sweden, to Paris in the winter of 2015, in the context of Run for Your Life, a climate intervention staged for COP21 and organized as a

continuous, live-streamed long-distance relay race between the two cities. In telling these stories, Reinert offers a case study that takes seriously the sprawling, complex, and entangled multiplicity of time: from intimate modalities such as the biographical vignette or the networked live-feed, to broader patterns of state colonialism, resource capitalism, and climate change, to the stone's own trajectories — before, during, and beyond the race. Ultimately, Reinert's argument circles in on a seemingly simple question: What might it actually *mean* to follow the poetic instruction, issued at the outset of the race, to "take a stone in your hand, and close your fist around it — until it starts to beat, live, speak and move"?

Geoffrey Bowker closes the volume with an afterword, in which he takes a head-first dive into the world of multiple temporalities. In it, scales of time and forms of life continue to overlap, intermingle, and indeed proliferate, until we fear losing our footing, and, thus, the grip of that semilinear temporality that we so confidently refer to as our life.

This book is the product of a five-year-long conversation among the members of the Lifetimes Research Team, based at the University of Oslo, Norway. However, the conversation has not been limited to a single place or to a single time, but has sprawled across multiple times and multiple sites, finding new dialogue partners as it goes, in terms of texts, things, and colleagues. In other words, the result is very much a collective one, to the extent that every single word is always already part of a dialogue, responding to something that has previously been said, and addressing some future issue, in the most Bakhtinian sense. No chapter in this book is thinkable without all the others, no voice would be audible without the rest of the choir.

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PART 1

Life and Death

1

Melting Ice Rock: Cryolite Mining in Greenland, Past and Present

Stine Alling Jacobsen

In late September 1806, the German mineralogist Karl Ludwig Giesecke arrived in Ivittuut, a summer settlement on the southwest coast of Greenland. Giesecke's travels to Greenland in the years 1806–1813 were sponsored by the Royal Greenland Trading Company in Denmark, whose monopoly on all commerce with Greenland had already lasted more than thirty years, and whose interest in Greenlandic mineral occurrences was growing. One day in September 1806, while scouting the area of Arsuk from the ship for any signs of lead deposits,[1] Giesecke observed a strange phenomenon: "I already began to despair of finding lead, when I observed, at some distance, but near the shore, a snow-white spot. At first sight, I suspected it might be a small glacier; but considering that no such thing could exist, at this time of the year, so near to the sea, I landed, and I found, to

1 Charles Giesecke, "On Cryolite; a Fragment of a Journal by Sir Charles Giesecke," *The Edinburgh Philosophical Journal* 6 (1821/1822): 141.

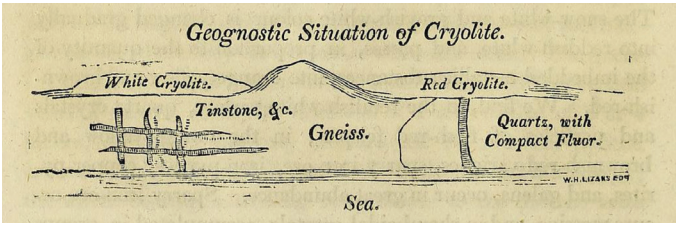


Fig. 1.1. Giesecke's sketch of the cryolite deposit. Source: Giesecke, "On Cryolite," 144.

my great astonishment, a bed of Cryolite, the geological situation of which had been hitherto so doubtful."[2]

Giesecke later observed another bed of cryolite with red nuances, and after a quick survey of the area, he sketched the geological situation of the cryolite deposits in their local surroundings (fig. 1.1). In the quote above, Giesecke describes a bewildering experience of optical deception. The striking visual similarities between the cryolite deposit and a glacier were deceiving his eyes. The sight of a coastal glacier in September caused a moment of visual uncertainty and confusion. Giesecke went ashore and found a deposit of cryolite:

> The purest cryolite is that of a snow-white colour, without any intermixed foreign substance, if I except a few nearly minute spots of galena. Its colour passes gradually into greyish-white, when it approaches to the other bed. The greyish-white variety on the surface very much resembles ice, which has been corroded and grooved by the power of the sun's rays. In these fissures, we sometimes observe the threefold cleavage of this substance beautifully displayed.[3]

Even when observed closely, the visual similarities between the cryolite and snow and ice were striking to Giesecke, and in his

2 Ibid., 141–42.
3 Ibid., 143.

journal he continually underlines how the cryolite's glossy and white appearance resembled snow and ice.

The shared physical and optical qualities between cryolite and ice constitute the point of departure for this chapter, in which I explore how different histories, such as geological, industrial, and colonial, of the cryolite deposit in Ivittuut are embedded in material processes of freezing and melting. My analysis deals with the material transformations of cryolite and the Greenlandic ice cap, focusing especially on physical phase change. Phase changes of matter are rarely isolated events, and in this case the processes of freezing and melting are situated within particular chains of events, political projects, scientific practices, and industrial machineries, and they cause changes to social and natural worlds. Investigating these situated and context-specific processes reveals ways to understand the multiple connections between materiality and the flows of time and connects multiple histories of various scales, such as that of industrial smelting, colonial extractivism, scientific experimentation, geological eruptions, crystallization, and molecular mobility. Though in this chapter I take materiality on a molecular level as a focal point, the larger perspectives involved, such as industrial smelting and the consequential melting of the Greenlandic ice cap, bring forward questions about the linear organization of past, present, and future we often take for granted. When past events are materially inscribed into a landscape or when crystallographic reorganization fuels future climate predictions, material temporalities multiply and become entangled with one another. To grapple with a multitemporal case such as the cryolite mine in Ivittuut and its histories calls for a multidisciplinary method. I present here a study in which my ethnographic observations from my journey to the old mine in Ivittuut function as a starting point for tracing the material histories of cryolite and ice. I situate myself historically and geographically, and from there direct my gaze upon the landscape, Ivittuut, where the old mine itself guides the pathways into the past and future of Ivittuut, of cryolite, and of the cryosphere.



Fig. 1.2. Early morning in Narsaq. Photo by the author.

From Narsaq to Ivittuut

In the early morning of August 18, 2017, I left my room at the local hostel in Narsaq, South Greenland. I went down to the local harbor (fig. 1.2), where I met Aqqalunnguaq, who, together with his wife, Marie, was going to take me to Ivittuut by boat. Marie and Aqqalunnguaq were both in their sixties and used to hunt regularly, especially for seal and reindeer, but Marie told me she recently sold her boat because she felt inclined to spend more time with her children and grandchildren. We conducted our communication in Danish. Marie spoke Danish fluently and although Aqqalunnguaq was not fluent in Danish, he knew enough for us to be able to communicate.

It was estimated the trip would take four hours, and Marie and I quickly struck up a conversation about my project and my motivation for going to Ivittuut. After some general discussion about the history of Danish dominion of Greenland, our conversation turned toward mineral extraction in Greenland today, and I asked Marie about the mining prospects of the rare earth minerals deposit in Kuannersuiut, a mountain close to Narsaq that contained large deposits of uranium and rare earth

minerals. Both deposits have been known of for years. In 1955, the Danish state initiated the prospecting of the uranium to examine whether it would prove suitable for producing nuclear energy in Denmark. The oil crisis of the 1970s further sparked a rise in speculation and optimism regarding Greenland's natural resources and sources of alternative energy.[4] In the last round of test drillings in 1978–1981, 20,000 tons of uranium were extracted and sent to different research facilities in Denmark. However, rising resistance among the populations of Denmark and Greenland against nuclear energy, the Home Rule Act of 1979, and the zero-tolerance policy regarding uranium mining put in place by the Naalakkersuisut, combined with the prevention of Niels Bohr's involvement in any part of the development of a Danish nuclear energy program by the US government, meant that the future of uranium mining at Kuannersuiut remained an imagined one. In 1965, Kryolitselskabet Øresund initiated the prospecting of the rare earth minerals deposits, situated underneath the uranium deposits. Kryolitselskabet estimated that the deposit contained approximately 180,000 tons of beryllium ore, but the plans for the mine were never realized. In 2013, however, the Naalakkersuisut and Danish representatives voted in favor of repealing the zero-tolerance policy regarding uranium mining, and Kuannersuiut regained attention from within the Danish realm and from foreign interests.

Today, the area around Kuannersuiut is licensed to the Australia-based company Greenland Minerals and Energy, whose major shareholder is the Chinese company Shenghe Resources Holding Co. Ltd., for further prospecting and exploration of the uranium and rare earth minerals deposits. Along with the general heightened interest in the possibilities of natural-resource extraction in the Arctic, domestic and foreign media have paid much attention to Kuannersuiut. I asked Marie if it was being discussed among the inhabitants in Narsaq, and she told me

4 Frank Sejersen, *Efterforskning og Udnyttelse af Råstoffer i Grønland i Historisk Perspektiv* (Udvalget for samfundsgavnlig udnyttelse af Grønlands naturressourcer, 2014), 16–17.

that to many of the people living in Narsaq the extraction plan was a topic of some concern, and she described two dominating opinions: "There are people who believe that it would be good for Narsaq and for Greenland if the mining could generate jobs and economic growth and thus economic independence from Denmark. And then there are people who are thinking about the environment and the long-term consequences, especially regarding the radioactive waste."

Marie herself expressed concern about how the mining projects would affect the environment and emphasized that there was a general lack of information regarding the environmental consequences of opening a mine at Kuannersuiut. Furthermore, Marie and Aqqalunnguaq shared a general skepticism regarding foreign involvement in Greenlandic affairs and were unsure to which degree the mining project would actually benefit Greenlandic society as a whole rather than only a few directly involved parties.

The divided opinions expressed by the inhabitants in Narsaq, as described by Marie — the mining project would benefit the economy or damage the environment (and thus the people who depend on it) — represent two dominant temporal understandings that are not particular to the case of Kuannersuiut. Similar lines of concern often show up in more general public discourse regarding the development of large-scale industry. However, in the specific Greenlandic context, the concerns for the national economy and jobs are questions of particular urgency, because the economic situation for many years has been in a precarious condition. Prioritizing these issues means focusing on a short-term solution that, as the argument goes, would kick-start economic growth and quickly generate local jobs. The other temporal understanding is the focus on the long-term damage large-scale mining does to the environment, including local ecosystems on which Greenlandic people have depended for centuries. "This is our home," Marie said. "We want to make sure that we can pass on the nature around Narsaq to many future generations and that they can enjoy it as much as we do."

The long-term and short-term temporal focuses that, according to Marie, dominate the debate around the mining project of Kuannersuiut have been documented by the anthropologist Lill Rastad Bjørst, who has done extensive fieldwork in Narsaq focusing on the local perceptions of the planned mining project. She identifies an additional temporal reality conditioning both the long term and the short term, namely, that of waiting.[5] Two local politicians, Avaaraq Olsen and Karla Bisgaard, from the Inuit Ataqatigiit and Siumut parties, respectively, shared their views on the planned mine with Bjørst. Though they differ in their opinion about the opening of the mine, they both expressed a certain impatience with the uncertainty of the project and a wish for something to happen in Narsaq:

> I have also been among the people who said, "I just think they should start, because something's got to happen." At that point I had not thought about all the risk related to it. Because you just think — that something has to happen in this town. (Avaaraq Olsen, 2013; my translation)[6]

> The population is tired of waiting. Are they going to mine or not? They are only waiting for an opportunity — a job offer. Maybe there will be a need for more buses, renting of boats if it starts. (Karla Bisgaard, 2013; my translation)[7]

The general impatience while waiting for something to happen (or not) is not unfamiliar to the Greenlandic community. On the same day as the zero-tolerance policy toward uranium mining was lifted, October 24, 2013, Naalakkersuisut reached an agreement with the company London Mining regarding a deposit of iron ore located to the north of Nuuk. The company was given a development and exploitation license to mine an iron

5 Lill Rastad Bjørst, "Saving or Destroying the Local Community? Conflicting Spatial Storylines in the Greenlandic Debate on Uranium," *The Extractive Industries and Society* 3, no. 1 (2016): 37.

6 Ibid.

7 Ibid.



Fig. 1.3. On the way to Ivittuut. Photo by the author.

ore deposit in an area called Isukasia. However, the project was delayed by a drop in the market price of iron ore. Not long after, London Mining declared bankruptcy because the burgeoning Ebola epidemic put a stop to the company's mining activities in Sierra Leone. The case of Isukasia and London Mining is not unique. Several other mining projects have either died before the extraction even began or have been shut down shortly after opening because of the decreased market value of the specific mineral or metal, financial issues with the leading company or its investors, or other unforeseen circumstances. It would appear, then, that Greenland has been haunted for many years by the promising narrative of its own mining adventure, yet without ever reaching the point of its realization. The one exception is the cryolite mine in Ivittuut. However, whether Greenlandic society actually gained anything from that project seems questionable, to say the least.

The temporality that really mattered to us on this particular day was that of the tide. We set out on our trip very early in the morning when the tide was low in order to be able to catch the high tide on our way back to Narsaq later on the same day, when the wind would be stronger. In that way we could go back to Narsaq via the systems of large and small fjords that stretch between Ivittuut and Narsaq (fig. 1.3). When the tide was at its peak, it would be possible for Aqqalunnguaq to maneuver the

boat through the otherwise shallow fjords and estuaries. When we reached Arsuk Fjord, bare rocks rose out of the sea on each side of the fjord. Small patches of green peeked from cracks and fissures. The coastal color palette of gray and brown had only changed slightly as the morning had progressed.

Seen through my eyes, this landscape appeared repetitive and often rather desolate, with very few recognizable traces of human or even animal activity. This experience made it almost impossible not to think of how many times in history a gaze like my own had been the foundation for describing this land as empty, unfriendly, and barren. The impossibility of seeing what someone with intimate knowledge of this land and these waters could see challenged my eyes and my mind. The landmarks I would associate with everyday social mobility and connection that characterize one's local environment, such as roads, paths, power poles, or public buildings, were completely absent from the surroundings. It brought about a certain humility to know that my eyes were deceiving me, that what I saw was as much imaginaries of wilderness and emptiness as the surrounding land and sea. Gitte du Plessis takes up issues regarding the unobservable (at least to many people and institutions outside the Sámi communities) social, cultural, and historical connections to the local environment and land of the Sámi peoples in northern Scandinavia.[8] Even if we don't draw any comparison between the Sámi and Inuit traditional or contemporary (if such a division is meaningful at all) ways of living, the issues of outsiders, often former or current oppressors or colonizers, being ignorant of the local population's sense of belonging and historical attachment to the land, are comparable. The lens of the (Western) outsider might often be cut to focus on material structures interfering with the landscape, such as infrastructure and certain material forms of cultural heritage, as signs of habitability, human history, and social connections.

8 Gitte du Plessis, "Invisibility, Colors, Snow: Arctic Biosemiotics and the Violence of Climate Change," *Theory, Culture & Society* 38, nos. 7–8 (2020): 1–22.



Fig. 1.4. Ashore, view toward the old mine. Photo by the author.

We had reached Arsuk Fjord, and the sea was almost clear of floating ice. Only occasionally did Aqqalunnguaq have to steer the boat around lumps of blue, gray, white, and black ice. Aqqalunnguaq told me that the black ice is the most dangerous because it is so hard to see. The ice is not actually black, but semitransparent and glass-like, which means that it takes the color of the surrounding sea (often dark gray or nearly black) and thus is almost impossible for the human eye to detect. Its opacity makes it disappear in plain sight. Aqqalunnguaq pointed out different lumps of black ice to me as we passed by, often just detectable as an optical disturbance on the surface of the sea. While we were scouting the fjord for black ice, Aqqalunnguaq suddenly pointed to a small bay to our right, where the landscape sloped down toward the fjord from the rocky hills behind. About two-thirds of the way down, the slope reached a plateau, and further down another one. A number of decaying wooden houses were organized in what looked like straight lines on the plateaus among the dark green thicket of grass and bushes. It took a few seconds before I understood that we had reached our destination and that I was looking at the remains of Ivittuut.

Instead of a rocky natural coastline, a symmetrical pier stretched along the sea and ended at the old mine (fig. 1.4), which was almost invisible from our viewpoint. Out here from the boat, the coast and the buildings appeared almost two-dimensional, as if the depth of and space between the different elements had been compressed. As we started to approach the pier, I had the impression that the closer we got to land, the more the landscape in front of us expanded and deepened. The transformation of Ivittuut from a two-dimensional picture plane to a three-dimensional space was an overwhelming experience, not least because until then I had only known Ivittuut through maps, photographs, and descriptions on paper and screens. Now, as we got closer to the shore, Ivittuut gradually manifested itself as a physical space. Once ashore, I started walking along the wharf toward the old mine.

Melting Cryolite in the Nineteenth and Twentieth Centuries

When I reached the area that Giesecke had described in 1806, there was nothing left of the cryolite deposit. Instead, I was standing at the edge of a large crater-like hole that had been flooded by seawater from the fjord (fig. 1.5). From mining maps, I knew that the crater had a diameter of approximately 150 meters, and on the opposite side I could see the walls of the old mine rise above the surface of the water. As I looked down into the water, I caught glimpses of old scrap metal, timber, and oil barrels (fig. 1.6). A few meters below the surface the water got murky, but I knew that the depth of the hole was approximately 70 meters. The visual impression of the flooded old mine bore no resemblance to a frozen glacier. The artificial lake, in the middle of the postindustrial viewscape, was dark, and rather than smoothing out the landscape, the water filling the crater manifested the absence of solid ground. Even though the landscape had changed drastically, Giesecke's description of the ice-like mineral occurrence lurked in this material transformation from solid to liquid ground, as if the once imagined glacier had melted.



Fig. 1.5. The old mine filled with sea water. Photo by the author.

The industrial history of cryolite is in fact a history of melting. In the early years, the cryolite industry was based mainly on the production of caustic soda. This chemical process began with the heating and boiling of cryolite with added lime (calcium oxide), leaving fluorspar, alumina, and a sodium oxide ash. Carbon dioxide was then added to the sodium oxide resulting in the aforementioned caustic soda.[9] Early on, the Danish soda factory Øresund in Copenhagen, founded in 1859, was the main manufacturer of soda from cryolite. In 1865, the Danish Cryolite Company signed a contract with the American company Pennsalt, which quickly monopolized the import of cryolite to North and South America and began their own soda production.[10] In 1888, molten cryolite became essential in the aluminum industry and the demand for cryolite grew. Aluminum is one of the most commonly occurring metals in the Earth's crust, but it most often occurs in the sedimentary rock bauxite, which needs to go

9 Helge Kragh, "From Curiosity to Industry: The Early History of Cryolite Soda Manufacture," *Annals of Science* 52, no. 3 (1995): 289.

10 Niels-Henrik Topp, *Kryolitindustriens Historie* (Kryolitselskabet Øresund A/S, 1990), 303–4.



Fig. 1.6. The old mine filled with sea water. Photo by the author.

through different chemical melting processes to release the pure aluminum. Before 1888, the industrial production of aluminum demanded extremely high temperatures, which in turn meant intensive consumption of expensive energy. The high costs of production meant that the lightweight, flexible, shiny metal was rare, but extremely desirable in a variety of industries. Aluminum held promises of future growth in a range of industries from aviation to everyday consumer products. In 1855, objects of pure aluminum were on display at the Exposition Universelle des produits de l'Agriculture, de l'Industrie et des Beaux-Arts de Paris, the heart of European industrial optimism at the time. Here, aluminum was hailed as the metal of the future.[11]

The first step in making aluminum was and still is the production of alumina (aluminum oxide) from bauxite through chemical smelting. This step of the manufacturing process has its own history in which the Bayer process still today plays a significant role. The resulting substance of the Bayer process, and other similar processes previous it, is alumina. Numerous methods for decreasing the costs of producing aluminum from

11 Ibid., 292.

alumina were researched and tested by scientists all over the United States, Europe, and Russia during the nineteenth century. It is therefore not surprising that in 1886 at least two people, independently, came up with the same solution. Charles Martin Hall from the United States and Paul-Louis-Toussaint Héroult from France (one must assume many others were on the same track but were since forgotten) experimented with cryolite and found that molten cryolite with its relatively low melting point of 1012°C could be used as a flux in electrolysis of alumina.

The atomic elements in a crystalline substance are arranged in repetitive patterns in crystalline lattices, forming the substance's crystalline structure. The melting point of a given crystalline substance is the point at which the heat dissolves the bonds between the atomic elements, thus breaking the crystalline structure apart. The force of the bonds between the atomic elements differs from substance to substance and depends on the electrical charge of the atoms making up the structure and the distance between the atoms. Alumina is a compound with strong bonds. Both the two aluminum atoms and the three oxygen atoms forming the compound appear in their ionic state. The temperature needed for these ionic bonds to break is 2072°C. Cryolite is another ionic compound, but because it consists of several more atomic elements and the distance between them is larger, the force holding them together is weaker than that of alumina, and the melting point lower, only 1012°C.

Hall and Héroult both experimented with cryolite in the production of aluminum. Hall received help from his sister, Julia Brainerd Hall, who was also a chemist. They all found that alumina dissolved in molten cryolite at around 1000°C. When electricity in the form of a positive anode and a negative cathode was added, the anode would attract the negative oxygen ions and the cathode would attract the positive aluminum ions. This way, the pure aluminum could be tapped from the boiling mixture. The process was named the Hall–Héroult process and was much less energy-consuming than any process known before. In 1888, Hall founded the Reduction Company in Pittsburgh and signed a deal with Pennsalt, which imported cryolite from

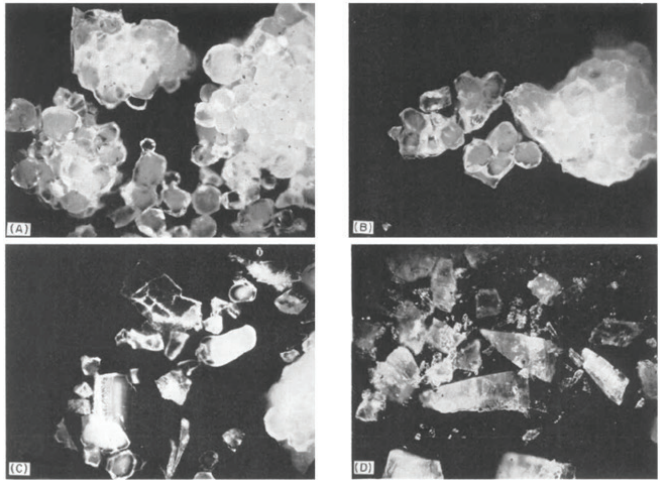


Fig. 1.7. Stages of melting cryolite. Source: Perry A. Foster, "Melting Point of Cryolite," *Journal of the American Ceramic Society* 51, no. 2 (1968): 108.

Ivittuut. With the Greenlandic cryolite as a flux, the Reduction Company (today called Alcoa) began producing aluminum on an industrial scale.

What made cryolite a highly desired mineral was its low melting point, which in turn was based on its unique chemical composition. Although the costs of the production of aluminum had decreased significantly with the employment of cryolite as a flux in the process, manufacturing aluminum was still an energy-intensive operation. Therefore, it became important to study the melting process of cryolite closely to determine exactly at what temperature the phase change from solid to liquid occurred. The melting point of cryolite (and of any crystalline substance) is the point where all bonds between the atomic elements are broken and the elements float around at random. However, if the temperature of the cryolite melt increases slowly, the process of crystal liquefying in cryolite is much more complex (fig. 1.7). It has been studied in depth and has been described in various scientific articles since the early twentieth century, and yet the

explanation for why the ions behave exactly as they do is still questioned. In a study from 1908 called "Ueber die umkehrbare Umwandlung des Kryoliths," it was suggested that the elemental ions, organized in crystal lattices in a monoclinic structure when the cryolite is in its solid phase, slowly change their structure. First, at 570°C, a number of the ions loosen from the structure, causing the cryolite to change into a cubic form. In this new crystalline form, the study suggests, cryolite can interact with sodium fluoride, something that could potentially lower the melting point of cryolite even further.[12]

An article from 1957 describes how cryolite, when heated, expands and splits into ions and ionic compounds, and later those ionic compounds start splitting into atoms and ions.[13] The authors use the term "lattice defects" for when the bonds between the elements break and the structure of the lattices dissolves.[14] Lowering the melting point of cryolite was and still is based around understanding the complex process of the phase change of cryolite from solid to liquid. The goal is to develop various ways of conducting this process (e.g., by adding other chemical elements to the mix) and thus be able to control it.

The studies of melting cryolite show that phase change is a complex process where at times the melting cryolite is at once both solid and liquid. The bonds between the elements and the geometry and lattices of the crystal structure change in different ways at different paces. Some elemental bonds and structures stay in place longer than others. It gets even more complex if after the cryolite has melted the heat is turned down and the cryolite solidifies again. Then it once more changes its structure in the process, slowly solidifying into a hexagonal crystalline form.

Melting is a phase change characterized by motion, a movement or a shift in the fundamental structure of a substance as a

12 Richard Nacken, "Ueber die Umkehrbare Umwandlung des Kryoliths," *Centralblatt für Mineralogie, Geologie und Paläontologie* (1908): 38.

13 G.J. Landon and A.R. Ubbelohde, "Melting and Crystal Structure of Cryolite (3NaF, AlF)," *Proceedings of the Royal Society of London Series A* 240, no. 1221 (1957): 160–72.

14 Ibid., 167.

response to change in temperature. When the temperature rises, the ions in the crystalline structure start to vibrate, the motion of the particles increases, and the bonds between them break. The stage before the ionic bonds burst completely can be viewed as a stage between two phases. While the particles are moving and shaking, the crystalline form can seem more or less intact, even when some of its lattices start to shiver. These various disturbances of the crystalline forms of melting cryolite, such as the shifts between monoclinic, cubic, and hexagonal structures, and the gradual breaking of elemental bonds causing lattice defects disturb the categories of solid and liquid, of still and moving. This process of melting is an in-between phase where the substance responds in unpredictable ways to the temperature surrounding it. The rise in temperature sets parts of the solid crystal in motion on a microscopic level, shifting the form of the crystal substance as a whole. Adjusting the temperature means shifting the basic structure of the substance, which means it can be combined with other substances in ways that are still not fully understood.[15]

Nearly the whole cryolite deposit that Giesecke mistook for a glacier in 1806 did in fact melt, but it melted elsewhere, far from Ivittuut. During the lifetime of the mine in Ivittuut, from 1856 to 1987, the cryolite was exported to industrial facilities around the world, mainly aluminum factories, where it was melted and used as a flux. The whole operation had left the large crater in the ground that I was facing. I knew that this place marked a beginning for the still growing aluminum industry and for the industrial melting of cryolite on a global scale. Yet, what I saw did not resemble a beginning. Rather, the crater in front of me, hollowed out and exhausted of cryolite, looked as if its history had ended. The cryolite was dug out and melted elsewhere, and

15 Halvor Kvande, "3 — Production of Primary Aluminium," *Fundamentals of Aluminium Metallurgy* (Woodhead Publishing, 2011), 49–69, and Bučko Tomáš and Šimko František, "On the Structure of Crystalline and Molten Cryolite: Insights from the *Ab Initio* Molecular Dynamics in NpT Ensemble," *Journal of Chemical Physics* 144, no. 6 (2016): 064502.

the postindustrial landscape of Ivittuut had slowed down and seemed now frozen in time.

The water in the old crater kept reminding me of Giesecke's imagined glacier and how it appeared to have melted. Water, like ice, possesses physical features similar to those of cryolite. The refractive index of water — the way visible white light is refracted when encountering the surface of a body of water — is 1.333. In short this means that the wavelength of light changes when the light encounters the water surface, which in turn causes the light to bend. Cryolite in its solid form has a refractive index of 1.338 and thus is so close to that of water that it is practically identical. Refraction is in itself an optical phenomenon that can cause mild optical disturbances, but the similarities of refractive indexes between water and cryolite play their own game of optical illusion. The similitude of their refractive capacities means that when submerged in water, cryolite becomes nearly invisible. The two substances, one solid and one melted, would merge optically and appear to the viewer as one body.

Ice and cryolite both have the capacity to literally disappear in plain sight when submerged in water. How could I, when standing at the edge of the crater, be certain that what I saw down there in the old mine was in fact only water? Ice, water, and cryolite share optical, aesthetic, physical, and semiotic characteristics, and these entangled similarities become especially clear in moments of melting. What made Giesecke think of ice when he encountered the cryolite deposit was its color and its corroded surface: "The greyish-white variety on the surface very much resembles ice, which has been corroded and grooved by the power of the sun's rays."[16] In fact, Giesecke refers to the cryolite surface as if it had been melted by the sun's rays, and parts of the crystalline face of the cryolite deposit had in fact melted.

16 Giesecke, "On Cryolite," 143.

Flowing Times and Frozen Histories

When Giesecke emphasized the appearance of a melting crystalline surface in his comparison of cryolite and ice, he unknowingly anticipated an epoch in which entangled material conditions of industrial melting and melting ice would play a crucial role, not least in the imagining of deep pasts and futures. The geological history of the formation of cryolite and the industrial history of its extinction are histories of freezing and melting. "History flows. History freezes," Esther Leslie states in *Liquid Crystals*.[17] This is not a metaphor, but rather a reflection of how shifts and transformations of material conditions are essential in understanding historical incidents.

The cryolite deposit's geological history, how the mineral was formed in the Earth's crust, was a question of shifting scientific interest for years, and scientific surveys were carried out irregularly while the body of cryolite was gradually being extracted from Ivittuut. Even though the cryolite mine was depleted in the 1980s, there was still growing interest in its geological genesis and history among geologists from Denmark, Canada, and elsewhere. According to Hans Pauly, a Danish geologist who was committed to the study of the formation of the cryolite deposit, the complex metasomatic and hydrothermal processes of cryolite formation evolved around 1.27 billion years ago. Pauly's work largely relied on old maps, reports, and diagrams from the many years the cryolite mine was in operation. His theory of the formation of the cryolite deposit was published in collaboration with the geologist John Bailey in 1999, two years after Pauly's death. Pauly and Bailey suggested that the unique geochemical composition of cryolite and the surrounding rare minerals was a result of specific geological intrusive processes of melting and freezing taking place over three stages.

The first stage began with brecciation of the granite rock that later came to surround most of the cryolite deposit. The siderite-cryolite and the sulfide formed several layered networks

17 Esther Leslie, *Liquid Crystals* (Reaktion Books, 2016), 19.

between the granite. The siderite-cryolite deposit hardened at around 500°C to 600°C.

At the second stage, gas-driven explosions led to several fluid chemical interactions and resulted in the formation and solidification of minerals, such as weberite and jarlite. Molten cryolite formed new deposits during this stage. Köhler and colleagues describe the movement of the molten cryolite in the second stage as similar to that of a glacier: "Cryolite pockets formed within the breccias due to the plastic, glacier-like movement of cryolite."[18] The comparison between the flow of molten cryolite and glacial movement originates from Pauly and Bailey's monograph *Genesis and Evolution of the Ivigtut Cryolite Deposit, SW Greenland.*[19] The comparison is most likely based on the way internal deformation of ice impacts the plastic movement of a glacier. The deformation happens on a micro scale, within and between snow crystals that break apart, melt, and freeze again and is primarily a result of the weight and compactness of the glacier itself and impurities in the ice. The plastic movement of a glacier is a continuous transformation of its microscopic crystals without changing the crystalline structure itself. The comparison to the plasticity and mobility of molten or semimolten cryolite made first by Pauly and Bailey and then repeated by Köhler and colleagues brings forward yet another material resemblance between cryolite and ice — how it transforms and moves — and also points to a connection between the geological origin of the cryolite in Ivittuut and Giesecke's encounter with the glacier-like deposit here in 1806. It is not unlikely that Pauly had read Giesecke's journal and that Pauly wanted to highlight the similarities between cryolite and ice, as other geologists and mineralogists had done before him.

18 Jasmin Köhler, Jens Konnerup-Madsen, and Gregor Markl, "Fluid Geochemistry in the Ivigtut Cryolite Deposit, South Greenland," *Lithos* 103, nos. 3–4 (2008): 370.

19 Hans Pauly and John C. Bailey, *Genesis and Evolution of the Ivigtut Cryolite Deposit, SW Greenland* (Museum Tusculanum Press, University of Copenhagen, 1999), 1–60.

Stage three of the formation of the cryolite deposit began when the explosions of stage two created pressure from below and cryolite and prosopite crystallized in vertical fissures. Furthermore, the chemical fluids released from the explosion resulted in the formation of secondary minerals, such as thomsenolite, pachnolite, and gearksutite. The formation of the cryolite body was a consequence of change in subterranean temperature and pressure leading to the melting, chemical metamorphosis, and freezing of elements and minerals.

This scientifically hypothesized origin event, inaccessible in time and impossible to observe, tells the story of the geological beginning of the cryolite deposit. Yet, the story itself was mainly pieced together after the cryolite mine was depleted. Pauly's work of piecing together a geologic history of the formation of cryolite from multiple sources is itself an act of socio-industrial and scientific history. The diagrams, maps, and reports he consulted were used as tools in the planning or execution of the mining industry — they were drawn, read, folded, passed along, reread, and refolded (like Giesecke's journal). These physical movements reflected the mobilization of the mind of the reader and spectator, and the flows of documents played a significant role in keeping the mining machinery running in Ivittuut. Later, Pauly turned to the documents to extract information on the cryolite deposit and to write up a history of its formation. Today, the documents are archived, immobile and frozen in layers and piles of sheets and folders. The histories of the cryolite deposit are embodied both in the flow and freezing of these remaining archives and in the flow and freezing of the landscape and townscape of Ivittuut.

The cryolite deposit has melted, crystallized, and melted again. The first melting event was local and took place at the subsurface of Ivittuut 1.27 billion years ago; the latest melting event began in the second half of the nineteenth century and today takes place in closed containers at industrial facilities around the globe. If anything characterized the bright, industrial future imagined by the entrepreneurs who began mining cryolite in Ivittuut at that time, it was the controlled yet con-

tinual melting of minerals and metals for large-scale industrial production. Today, the global aluminum industry is a massive network of large-scale mining operations, factories, and refineries. Aluminum is the metal in second-highest demand globally, surpassed only by steel. The global production of aluminum reached 417,712,000 metric tons in 2015, and electrolysis with a flux of melting cryolite was involved in producing every single ton.

However, today it is unlikely that any of that cryolite is from Ivittuut. Ivittuut was the only place in the world where the mineral was ever mined, but the deposit was emptied and the mine closed down in 1987. Nowadays, all cryolite used for industrial purposes is produced synthetically, and often by the large-scale aluminum manufacturers themselves. The production of aluminum, especially using the Hall–Héroult method, is an industrial process that results not only in aluminum but also in heavy emissions of carbon dioxide and other gases, such as sulfur dioxide, nitrogen oxide, and fluorides, into the atmosphere.[20] The Hall–Héroult process particularly emits large amounts of carbon dioxide, as the oxide ions in alumina interact with the carbon anode and become molecules. In 2009, the polluting emissions of the global aluminum industry were estimated to have an average level of Global Warming Potential (GWP) of 23.96 per ton of aluminum.[21] Moreover, the global need for the refined metal is expected to increase two- to threefold by 2050.[22]

The effect of global warming on the cryosphere at the poles has been thoroughly documented over the last decade, and the large-scale melting of the Arctic and Antarctica is continuously monitored by scientists and widely discussed in both the media and the world of politics. Since the European industrial age, the industrial sector has caused the poles to overheat and their

20 Meenu Gautam, Bhanu Pandey, and Madhoolika Agrawal, "Chapter 8 — Carbon Footprint of Aluminum Production: Emissions and Mitigation," in *Environmental Carbon Footprints Industrial Case Studies,* ed. S.S. Muthu (Butterworth-Heinemann, 2018), 206.

21 Ibid., 212.

22 Ibid., 200.

frozen environments to melt at an alarming rate. The gradual reduction of the massive frozen body that makes up the Greenlandic ice sheet has become a monumental signifier of climate change in the Arctic. The large-scale cryolite and aluminum industries and the gradual decline of the Greenlandic ice sheet are connected through melting. Because ice, snow, and cryolite are made up of repetitive crystalline structures, their melting is a process of internal transformation in which the crystalline connections break, but the lattices somewhat stay in place, depending on the temperature and speed of melting. Crystal melting is not merely a shift from one phase to another, but rather a state of transformation in itself. This transformative state of the Arctic affects the way the area in general and Greenland in particular are perceived as places of change and mobility. "The Arctic — like its counterpart, the Antarctic — is no longer conceived as a realm of eternal freezing but rather holds the prospect of melting without end, the transience of natural form, eliminating space and time and bringing about a vast nothingness, as well as new treasures," writes Leslie.[23] This state of melting without end is a rather recent condition of the Arctic, which, according to Leslie, has long been perceived by non-Arctic dwellers as a static, frozen place.

Arctic landscapes epitomize geological flows of freezing and melting rock and ice. These particular rhythms of deep time are slow but contain bursts of rapid and explosive moments, such as the formation of the cryolite deposit or the calving of a glacier. Yet, the slow geological movements are especially particular to the frozen geographies of the north. Here, old and new archaeological remains are preserved for centuries, and molecular structures stay crystallized for millennia. The slowness of the Arctic landscape is one reason why non-Arctic habitants have long perceived it as a place of stillness and immobility. However, the rise in temperature since the nineteenth century brings about different accelerating processes of melting and change everywhere in the Arctic.

23 Leslie, *Liquid Crystals,* 18.

The demand for aluminum is rapidly accelerating and with it the intensity of melting cryolite for aluminum refinement. The interconnection of the temporalities of the industrial smelting and Arctic melting processes are debated by Michael Bravo, and he asks, "What kinds of temporalities determine how frozen states flow? What does it mean to say that these material flows are consumed and transformed into nonfrozen states with different mobilities?"[24]

Industrial processes have the capacity to turn ice solid and rock liquid, rise and regulate temperatures, and speed up time. The geological rhythms of the Arctic are becoming more and more intertwined with the industrial acceleration of production and consumption. In Bravo's words, "the cryogenic landscapes of the Arctic are becoming much more closely coupled with the high-speed networks of global capitalism."[25] Bravo points to industrial processes of production and to the high-speed mobility of logistics and transport. Both are parts of an imaginary of the melting Arctic as a source of new treasures and new possibilities. Leslie pointed out in the quote above that the melting Arctic brings about imaginaries of new treasures and new possibilities, further linking it to a temporal reality defined by acceleration and growing capital. As with other colonial fantasies, the natives and inhabitants of the north rarely figure, nor do the massive loss of biodiversity such imaginaries are inevitably going to cause if carried out. Arguing for a different future, Bravo calls for a cryopolitics that takes into consideration the lives at the frozen geographies on the planet: "Cryopolitics is arguably nothing less than a struggle over the temporalities of the globe's frozen states and our growing industrial-scale consumption of them."[26] To regulate the temporalities and speed of melting is to regulate the accelerating temperature in order to slow down the

24 Michael Bravo, "A Cryopolitics to Reclaim Our Frozen Material States," *Cryopolitics: Frozen Life in a Melting World* (MIT Press, 2017), 38.
25 Ibid., 32.
26 Ibid., 37.

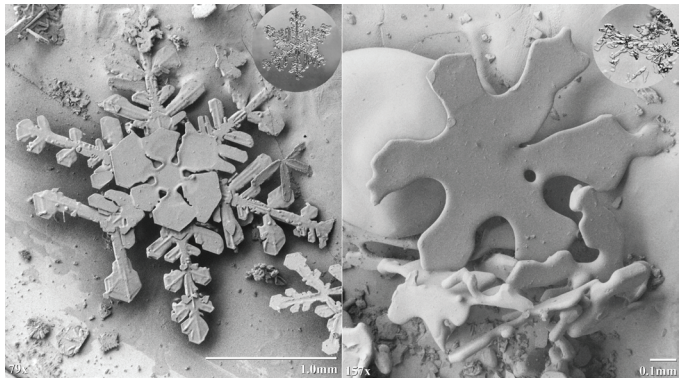


Fig. 1.7. A freshly fallen snow crystal (left) and a melting snow crystal (right). Source: https://www.climate.gov/media/2346.

dissolution of crystals. It is to consider the lives and rhythms of the people and ecosystems in the localities that are affected.

Predictions, Visions, and Arctic Futures

The rising temperatures in the north cause an irreversible alteration of the crystalline frozen environment. As the crystals melt, they exhibit a change in their optical qualities, which in turn causes an acceleration of the polar warming. The crystalline structure of the snowflakes, which permanently or seasonably cover much of the Arctic, have enormous reflective capacity and cause the light to scatter in all directions. Occasionally, the crystals refract the light, causing the white light to break up into colorful reflections. When the temperature rises and the snow starts to melt, the geometry of the crystalline structures starts to dissolve and the crystal lattices break apart (fig. 1.8). This lowers their reflective capacities, and instead of being reflected, some of the light hitting the crystals is instead absorbed by them. Upon absorption, the light energy is transformed into heat energy that further heats up the environment. The crystalline optical change in the frozen environments is therefore locked in a spiral of melting and heating.

In Greenland, the consequences of global industrial acceleration and contamination are visible and measurable in the environment's changing rhythms of freezing and melting. Simultaneously, these changes are often presented as the first signs of climatic changes that are going to affect the rest of the world, such as how the melting Greenlandic ice cap will eventually cause the sea levels to rise globally. In this case, put simply, the speed of the melting ice in Greenland forecasts the speed of climate change in the rest of the world.

Greenland functions as a place from where present and future climate change can be studied and predicted, but the island itself has for centuries constituted a ground for different imaginaries of natural-resource abundance and fairy tales of endless mineral extraction. Imaginaries of the eighteenth, nineteenth, and even twentieth centuries of how mineral extraction projects in Greenland could generate wealth for the nation and fuel the chemical industry in Denmark never seemed to waver among Danish entrepreneurs, geologists, and colonists, but in reality the cryolite mine in Ivittuut was the only really successful mining project during most of the colonial period.[27] In more recent times, the Arctic as a whole has been called "the final frontier" of resource exploration and extraction,[28] pointing toward a future in which the Arctic is not only being more closely coupled with high-speed capitalism (as suggested by Bravo, quoted above) but is also taken over by it.

Surrounded by the colonial ruins of Ivittuut — the decaying buildings and the actual old mining hole — it is hard to think about the future at all. The whole town is to my eyes a distinct and unmistakable embodiment of the past. Yet in the spring of 2021, the Australian exploration company Eclipse Metals Ltd.

27 Axel Garboe, *Geologiens Historie i Danmark 2, Forskere og Resultater* (Reitzels Forlag, 1961), 219–21.

28 Jane Whaley, "The Arctic: The Real Final Frontier," *GeoExPro,* Dece,ber 1, 2018, https://geoexpro.com/the-arctic-the-real-final-frontier/, and Kristina Spohr, "The Race to Conquer the Arctic — the World's Final Frontier," *The New Statesman,* March 12, 2018, https://www.newstatesman.com/world/2018/03/race-conquer-arctic-world-s-final-frontier.

obtained the mineral exploration license MEL 2007-45, which covers a larger area in and around Ivittuut. The company bases their mapping and predictions of mineral and metal occurrences in the area on Danish historical archive material from the colonial era, such as drilling cores, images, maps, and reports. In addition, they have conducted their own fieldwork in and around the old mine in Ivittuut. The preliminary findings include deposits of quartz, rare earth elements, iron, and fluorite, and from these results Eclipse Metals presents their exploration project as the beginning of a new chapter in the history of Ivittuut. The company is drawing up a potential future of resource extraction and wealth generation based on their diverse research. On their website for the Ivittuut exploration project, Eclipse Metals writes that "the Company has a well-qualified board and management team with considerable experience across many commodity types and a track record of developing and bringing projects to the capital markets."[29] With this type of promotion and emphasis on previous success, Eclipse Metals's exploration project points to a bright future of industrial revitalization for the Ivittuut area. In the light of Eclipse Metals's promotion of a new industrial era in Ivittuut, the ruins around me obtain a shimmer of a future in which another industrial project has already been carried out: minerals and metals already dug up, most likely by a foreign work force, and transported and melted elsewhere.

29 See "Company Profile," *Eclipse Metal Ltd.*, https://www.eclipsemetals.com.au/corporate/company-profile/.

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2

The Extinction Event That Keeps on Taking Place: Vernacular Photography from Industrial Whaling

Espen Ytreberg

> The balance between life and death is over-run, and a relentless cascade is piling up corpses in the land of the living.
>
> — Deborah Bird Rose, "Double Death"[1]

Introduction: Extractive Obscenity

Few images show the human destruction of nature more disturbingly (fig. 2.1). The photograph was taken in the 1920s at Deception Island, close to the Antarctic continent. At the rear on the right-hand side of the image lies the harbor and whaling station Hektor, established by a company based in the Norwegian city of Tønsberg. What look like large stones on the beach are whales, entire carcasses and pieces of varying sizes, in vary-

1 Deborah Bird Rose, "Double Death," *The Multispecies Salon,* 2014, https://www.multispecies-salon.org/double-death/.



Fig. 2.1. Carcasses in Whalers Bay at Deception Island. Unknown photographer, 1920s. Source: The Whaling Museum, Sandefjord/Vestfoldmuseene, Fs.02080.

ing stages of decomposition. After removing the valuable outer layer of blubber, the whalers simply dumped them.

Around ten years before this photograph was taken, and after only six years of whaling activity on Deception Island, the carcasses around the whaling station and harbor were counted by British authorities at 6,000.[2] Copious amounts of blood and other fluids flowed out onto the stones of the beach and into the water, covering everything with a film of fat. For those who walked the beach and took pictures, the beach thus presented an entire environment of whale matter. The photograph captures what one may call an "extractive obscenity," but it cannot convey what perhaps struck contemporaries most forcefully: the extraordinary smell. "The likes of the stench one encounters when sailing into the harbor at Deception surely has its equal in few

2 Johan Nicolay Tønnessen, *Den Moderne Hvalfangsts Historie* (Norges Hvalfangstforbund, 1967), 2:404.

other places on Earth," wrote the medical doctor Aage Krarup Nielsen, who visited the island soon after World War I as a crew member on a whaling ship.[3]

The sight of rotting whales was by no means unique to Deception Island. In the rapid international expansion of industrial whaling that took place in the first decades of the twentieth century, this was a common practice. Industrial whaling mostly took place in remote locations with extreme weather and climate conditions.[4] Transportation was highly expensive, profit margins slim, and pressure high. It paid to just go for the blubber, which yielded the most sought-after oil, and discard the rest, on the ground and in the sea around the whaling stations and ships.

The whaling industry differed from its land-based meatpacking counterpart in that it could not move indoors and clean up its remnants according to modern slaughterhouse procedures. The animals were simply too large. The removal of blubber and dismembering had to take place in the open air, on large wooden platforms, before boiling and separation could take place in tanks to make the industry's main product, oil. It was during this process that so much matter and fluid escaped that it covered everything: the whalers, the factories, the ships, and the immediate surroundings. Thus, the image from Deception Island can be seen as the extreme version of a more general phenomenon — the whaling industry existed in an environment that consisted of the by-products of its own extractive processes.

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3 Aage Krarup Nielsen, *En Hvalfangerfærd Gennem Troperne til Sydishavet* (H. Aschehoug & Co, 1921); my translation. I owe the term "extractive obscenity" to Emil Flatø.

4 Concerning the use of the term "industrial," Bjørn L. Basberg and Louwrens Hacquebord have pointed out that commercial catches on a large scale have roots going back to the sixteenth century. They concentrate mainly on what they call "industrial large-scale whaling," which was based on machine technologies and factory processing. See Bjørn L. Basberg and Louwrens Hacquebord, "Industrial Whaling in the Arctic and Antarctic," in *The Cambridge History of the Polar Regions,* ed. Adrian Howkins and Peter Roberts (Cambridge University Press, 2023), 379.

It was covered in the matter and stink of what we now know as the near extinction of the great whales.

Time Moving Toward the Extinction Event

Industrial whaling took place over three relatively distinct if overlapping time periods. Its key technologies were first introduced along the coast of northern Norway in the last decades of the nineteenth century. They included the explosive harpoon, pressure-cooker tanks, and ships, winches, and saws powered by steam and later electricity. The industry's main product was whale oil.

A second period of rapid expansion in southern polar and subpolar waters, where the planet's largest whale stocks were, began in the early twentieth century. Whaling now became industrialized in its catch, processing, and distribution phases. Its whaling stations depended more on machinery for processing, and large factory ships were constructed to enable processing on board. In this period, whaling was spearheaded by Norwegians in terms of technological and professional know-how and by the British by virtue of their sovereignty over key territories, such as South Georgia and the South Shetland Islands, South Africa, and Australia. Through the chemical processes of hydrogenation and deodorization, the oil could be used for foodstuffs, such as margarine, and for a range of other products, including stearin and glycerin. The oil was stored in tanks, bought by international conglomerates such as Unilever, and transported by tankers to Western markets. The whaling industry became an integral part of industrial societies' globalized markets of mass consumption.

In the first half of the twentieth century, global catches rose dramatically. They reached their highest point before and after World War II, by which point whaling in the South Seas had started to be displaced by so-called pelagic whaling in un-

regulated international waters.[5] The whaling industry lived on finding ever-newer areas with exploitable whale stocks, and international waters became their final rescue from attempts to impose quotas and other limitations on catches. As whaling went pelagic, major new actors, such as Japan, Germany, and the Soviet Union, entered the industry, further increasing the pressure on whale stocks. In the end, the international community was faced with either having to terminate the industry or see the great whales be exterminated from the earth. The International Whaling Commission's moratoria for blue whales came in 1966 and for all the great whales in 1982. Since then, some whale species have rebounded, including the minke and humpback whale. The blue whale remains seriously threatened, and several subspecies of the right whale family hover on the edge of extinction.[6]

The moratoria sprang from the fact that global stocks were becoming severely depleted and from rising public fears that an extinction event was looming. Key to the rising wave of conservationism from the 1960s was a dystopic vision of the last whale being killed by the last harpoon. This was extinction as a distinct event that could be experienced directly by the last harpooner and vicariously by media audiences. In 1970, Pete Seeger assumed the voice of the whale in his "Song of the World's Last Whale" and with it plaintively addressed his audience:

> You decide my fate
> . . . . . .
> . . . . . .
> If it's life or death
> For the world's last whale.

5 Robert C. Rocha Jr., Philip J. Clapham, and Yulia V. Ivaschenko, "Emptying the Oceans: A Summary of Industrial Whaling Catches in the 20th Century," *Marine Fisheries Review* 76 (2014): 37–48.

6 Helen Briggs, "'Real and Imminent' Risk of Extinction to Whales," *BBC News,* October 10, 2020, https://www.bbc.com/news/science-environment-54485407.

Seeger's protest song was inspired by a hugely popular LP collection of underwater whale sounds, which was instrumental in building the popular anthropomorphic notion of whales as close to humans and therefore particularly worthy of conservation.[7]

This extinction event was clearly conceived as a disastrous thing, and here it is worth putting the emphasis on "clearly" — it had dramatis personae, a momentary climax, distinct temporal boundaries, and qualities of experience. In short, it was a dystopic event-vision that was easy to understand and easy to mobilize against. Researchers later pointed out, however, that seeing extinction as the final killing of the last animal is far too limited. First, extinction itself tends to play out as a temporal gray zone where the species is "mostly dead, but potentially alive," Dolly Jørgensen has said.[8] Extinction is a processual thing, then.

Also, in the 1960s and 1970s discourse on conservation, whale stocks tended to be conceived as one variable, and surrounding nature — the whale's habitat — was viewed as constant. In a time of pervasive ecological crisis, this clearly does not hold. Extinction studies research tells us that extinction is a pervasive and general phenomenon, both spatially and temporally.[9]

The introduction of industrial technologies and processes into whaling meant infusing it with a new temporality. E.P. Thompson has argued for seeing industrial time as characterized by production rhythms that needed to be extensively subdivided and then synchronized. This required more extensive temporal control over workers and more comprehensive self-

7 Bayard Webster, "Whales Sing Siren Song for Scientist," *The New York Times,* May 26, 1970, https://www.nytimes.com/1970/05/26/archives/whales-sing-siren-song-for-scientist-whales-sing-ululating-siren.html.

8 Dolly Jørgensen, "Extinction and the End of Futures," *History & Theory* 61, no. 2 (2022): 6.

9 See, e.g., Franz J. Broswimmer, *Ecocide* (Pluto Press, 2002); Ursula K. Heise, *Imagining Extinction* (University of Chicago Press, 2016); Elizabeth Kolbert, *The Sixth Extinction* (Henry Holt, 2014); and Thom van Dooren and Matthew Chrulew, eds., *Extinction Studies* (Columbia University Press, 2017).

discipline.[10] Behind this lay capitalism's investments of capital and its constant call to accumulate revenue: "Time is now currency, it is not passed but spent," writes Thompson.[11] One could call the result "compressed time," a form of time that allowed for a faster and more efficient processing. Crucially, this time was also directional and fatal; it implied a conceivable future end when there would be no more whales. A stark temporal conflict emerged between this directional time and the generational and cyclic time of whale biologies. The latter was regenerative, the former final. This conflict between temporalities was unequal, since biological time was always being erased by technological time, and is headed toward what Deborah Bird Rose has called "double death," the point of extinction when life is no longer intertwined with death but becomes finally erased.

That industrial time involves a direction toward extinction is not just a conceptual possibility but very much a part of industrial whaling's history. Suspicions of extinction in fact followed it practically from the industry's inception. One might think that it started off in ignorance about the risks of extinction, that those risks only gradually became known, and that the industry then acted on them through the postwar moratoria. There was, however, no such general progression from ignorance to knowledge, irresponsibility to responsibility. Already in the first period of industrial whaling along the north Norwegian coast, the specter of extinction was apparent after only a couple of decades. The first law limiting whaling to protect stocks came as early as in 1880. It was proposed by the parliamentarian Christian Andreassen, who stated in the Norwegian Parliament that the danger of whale extinction "cannot be unknown to anyone in these chambers."[12] A law prohibiting whaling entirely along the north Norwegian coast was passed in 1903.

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10 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (1967).

11 Ibid., 61.

12 Kristin Asdal and Bård Hobæk, "Assembling the Whale: Parliaments in the Politics of Nature," *Science as Culture* 25, no. 1 (2016): 102–3.

In other words, extinction was already a publicly known and at least in part acknowledged risk when globalized and factory-based whaling started in the South Seas. It would take only a few years to become controversial there too. In 1910, the French explorer Jean Charcot voiced his concern that the excessive catches around Deception Island "will necessarily lead to a reduction in the number of whales and may even cause their extinction."[13] The specter of extinction became controversial in the international press. The Norwegian press, though more industry-friendly, also opened up for discussion.

Still, whale catches kept on increasing steeply. When moratoria were finally imposed, it was not primarily because extinction was now being acknowledged unreservedly. Since it is very difficult to estimate whale stocks, an uncertainty persisted that could be exploited by cynical actors. Also, the benefits had largely gone for the industry, since there was so little left to catch. Soy oil was emerging to replace whale oil as the most attractive raw material for fatty foodstuffs.[14] In short, industrial whaling was never what one today would call sustainable or responsible. The need for revenue and employment always kept tipping the scales in favor of the industry's short-term interests.

The Vernacular Photography of Extinction

As long as whaling catches were rising and were ever-more important to employment, profits, and the Norwegian economy, a serious risk of extinction could not be acknowledged publicly by Norwegian politicians or company owners.[15] They were too invested in the industry's benefits. But neither could the extinction risks be entirely ignored. Too many knew, or at least sus-

13 Jean Charcot, *The Voyage of the "Pourquoi-Pas?": The Journal of the Second French South Polar Exhibition, 1908–1910* (C. Hurst & Co., 1978), 267.

14 See the discussions in Graham Burnett, *The Sounding of the Whale* (University of Chicago Press, 2012), and Kurkpatrick Dorsey, *Whales and Nations* (University of Washington Press, 2013).

15 For an important early exception, see Bjarne Aagaard, *Hvalfangsten og Storhvalens Utryddelse* (Fram Forlag, 1932).

pected, that extinction was a real risk. A need thus opened up for accounts of whaling that might serve to legitimize it without either denying or confirming extinction head-on. It became attractive to articulate forms of temporal representation that pointed somewhere other than a fatal future end.

In the rich material from industrial whaling, vernacular photographs stand out as sites for such articulations. Next, I will examine Norwegian vernacular photography from industrial whaling. These photographs show the everyday life of whaling's skilled and unskilled workers and of professional employees, such as engineers, doctors, and vicars.[16] The advent of industrial whaling coincided with a possibility opening up for so-called ordinary people to photograph their lifeworld. Mobile, portable, and affordable cameras became available from the 1920s, and photography was a popular pastime among many whalers. An interest in everyday culture and social history within Norwegian museology later resulted in these photographs being preserved in rich archives. They have featured in historical scholarship mainly as illustration. As media-historical representations in their own right, these photographs have been strikingly underutilized, however.[17]

Some memories do not find an heir, says Walter Benjamin. At least in Norway, this is the case for the vernacular photographs of industrial whaling.[18] They have become an important part of local heritage in whaling's homeland along sections of

16 By far the single most important source for this chapter is the photography archives of Vestfoldmuseene, formerly the Whaling Museum in Sandefjord. Other significant archives of photographs include the Norwegian Polar Institute, the Norwegian National Library, the Folkemuseet, and the Norwegian Maritime Museum.

17 For a partial exception, see Susan Barr, "Norwegian Antarctic Whaling Seen through the Eye of the Camera," in *Whaling and History: Perspectives on the Evolution of the Industry,* ed. Bjørn L. Basberg, Jan Erik Ringstad, and Einar Wexelsen (Kommandør Chr. Christensens Hvalfangstmuseum, 1993).

18 Walter Benjamin, "Fortelleren," in *Kunstverket i Reproduksjonsalderen: Essays om Kultur, Litteratur, Politikk,* ed. Walter Benjamin (Gyldendal, 1975), 192.

the Norwegian coast but not of national heritage. It seems they have come to appear too gross and depressing, some of them too violent and grotesque. They can be hard to look at squarely, which may be a reason to do just that, particularly in Norway, a leading nation throughout much of industrial whaling's history.

In the analysis that follows, I will emphasize two dimensions of photography: capturing the moment and capturing reality beyond the photographer's intention. In roughly the same time period when the whalers were photographing, theorists pointed to the ability of photography to preserve existences from the past. That ability suggested a certain affinity between photography and history, but their relation could be conceived in very different ways. Regarding this connection, André Bazin has spoken of the ability of photography to "embalm time." Photographs have a particular credibility since they are mechanically captured, but they also show the inexorable movement of time, like an insect in amber displays both its passing and preservation; it is "change mummified," Bazin said.[19]

In some photographs, both the moment and the passage of time seem to take on more gravity, however. Half as a description of what photography was and half as an ideal to be pursued, the photographer Henri Cartier-Bresson famously spoke of capturing the decisive moment in a composition that created balance in a dynamic world. Photographs that do this, he argued, display the momentary so that it comes to stand for something essential and hence lasting. Here, photography becomes something closer to a guarantee that reality has been captured, even conquered. Interestingly, Cartier-Bresson likens the act of catching a photographic motif to catching an animal in a trap.[20]

Because photographs record the world mechanically and automatically, they will record more than the photographer's creative intention, argues Bazin.[21] This was already recognized

19 André Bazin, "The Ontology of the Photographic Image," *Film Quarterly* 13, no. 4 (1960): 8.

20 Henri Cartier-Bresson, *The Mind's Eye* (Aperture, 1999), 22.

21 Bazin, "The Ontology of the Photographic Image," 7.

at the birth of the medium, when William Fox Talbot wrote that "the operator himself discovers on examination, perhaps long afterward, that he had depicted many things he had no notion of at the time."[22] This excess was a recording of more from the external and everyday world than the photographer realized, but also a recording of phenomena beyond his conscious state. Photography has also been argued to document a common "optical unconscious," in Benjamin's famous phrase, that which lies behind what people cannot collectively acknowledge at the time.[23] Some of the vernacular photographs from industrial whaling lend themselves to an analysis of what the whalers were able to document with a camera beyond intentionality and consciousness: the dissolute and grotesque, the fantastic and fatal.

Privileged Moments

Beyond questions of photography's ontology, the photographing activity of industrial whalers needs to be considered in light of the progressive political purposes that photography was being put to in the first half of the twentieth century. In step with the rise of the labor movement, a pride in work and its outcomes became important visual motifs. Addressing a conference of social reformers in 1909, the photographer Lewis Hine argued that "the greatest advance in social work is to be made by the popularizing of camera work, so these records may be made by those who are in the thick of the battle. It is not a difficult proposition. In every group of workers there is sure to be one at least who is interested in the camera."[24]

In the whaling hub of Grytviken at South Georgia, an island between the South Atlantic and the Antarctic Ocean, carpen-

22 Cited in Siegfried Kracauer, "The Photographic Approach," in *The Past's Threshold: Essays on Photography,* ed. Philippe Despoix and Maria Zinfert (Diaphanes, 2014), 64.

23 Walter Benjamin, "A Short History of Photography," in *Classic Essays on Photography,* ed. Alan Trachtenberg (Leete's Island Books, 1980), 207.

24 Lewis Hine, "Social Photography," in *Classic Essays on Photography,* ed. Alan Trachtenberg (Leete's Island Books, 1980), 112.

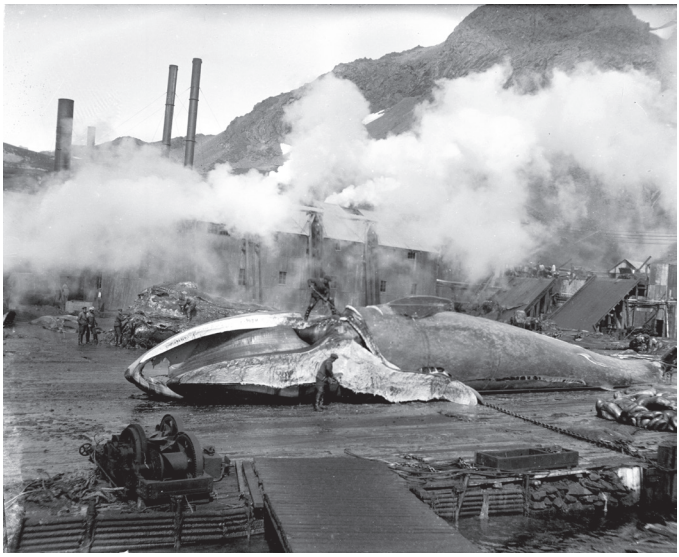


Fig. 2.2. Flensers at work, Grytviken. Photographer: Theodor Andersson, 1922–31. Source: The Whaling Museum, Sandefjord/Vestfoldmuseene, Fs.19163.

ter Theodor Andersson was one such worker. In an industry where vernacular photography was relatively anonymous, he has become the best known to posterity. Andersson has a book dedicated to him, and photographs such as figure 2.2 have been included in selections made from Norwegian whaling archives to UNESCOS "Memory of the World."[25]

This image of daily work demonstrates the Cartier-Bressonian qualities of Andersson that have made him attractive to posterity. Not only was he himself a worker, so that he could give

25 Stig-Tore Lunde, *Grytviken Seen through a Camera Lens* (Institut Minos, 2014), and "Fotosamlingen som dokumentarv," *Hvalfangstarkiver.no,* 2014, http://hvalfangstarkiver.no/fotosamlingen-som-dokumentarv/. The other photographer represented in Norwegian collections who also has a volume dedicated to him is Edward Binnie. However, he was a magistrate, and so his activity cannot easily be called vernacular photography. See Ian Hart, *Antarctic Magistrate: A Life through the Lens of a Camera* (Pequena, 2009).



Fig. 2.3. Harpooneer firing a cannon. Unknown photographer, 1912–1214. Source: Norwegian Polar Institute, np002034.

the kind of firsthand, authentic access to the lives of workers that Lewis Hine spoke of, but he also had a talent for the visually striking, for proportions, volumes, composition, and dramatic action. In the dead center of the image stands the worker who "flenses," that is, uses a knife to strip the whale of its outer blubber layer. Captured on top of the whale, this flenser dominates not only the animal but the whole industrial environment of Grytviken. He is captured in a moment of concentrated action, his long flenser's knife a dynamic diagonal, the forceful leaning of his body an opposite diagonal, his whole apparition a cross — this is the place and the moment of an action that becomes idealized for posterity.

The figure of the male worker was a well-established one in the societal context of Andersson, who was himself a socialist. Any number of statues, posters, paintings, and other images at this time celebrated the worker, the man who united muscle and machine in the service of a better future society. Here, the celebrated work is that of dominating and conquering a whale,

which has to be visualized in spite of the whale's overwhelming dimensions. It is achieved through Andersson's compositional centering of the worker-hero and his dynamic, violent action. A further anchor of meaning lies in the Western iconology of man trampling the beast underfoot, Saint George and the dragon, Saint Michael the Archangel and Satan, and then in the industrial era any number of hunters posing on any number of photos with their boot resting on the kill.

Another favorite photographic motif from industrial whaling was shooters at their harpoon cannon. In figure 2.3, an unknown photographer has captured the moment when harpooner H.G. Melsom fires an explosive harpoon from his cannon. Two shots are actually being taken here: that of the photographer and that of the harpooner. There is a close alliance between the two, since the two are tightly synchronized in time, and closely aligned spatially, the photographer, so to speak, looking over the harpooner's shoulder. The new technologies of the time invited such alignments. Development of mobile and portable cameras became linked to aerial reconnaissance and warfare in the early twentieth century. These technologies needed to work together when airplanes were moving over enemy territory in order to make possible more precise identification and targeting of the enemy.[26]

This is obviously and spectacularly the photograph of a moment, the instant of killing, which is also an instant of heightened action. The harpooner, leaning forward in the moment of pulling the trigger, is having his jacket lifted up by the air pressure and is being enveloped by a cloud of gunpowder. The moment of killing was also one of danger for the harpooner in preindustrial times, when harpooning was done by hand from rowboats. At the time Melsom fired his cannon, the harpooners had become quite safe from the whale. The worker who is waiting in the photograph's lower right side, at a respectful distance

26 Noemi Quagliati, "Training the Eye: Production and Reception of Aerial Photography during the World Wars," *Acta Universitatis Carolinae* 55, no. 1 (2020): 96.

from the action of shooting, is less fortunate. When the whale is dead and winched to the side of the ship, he will have to brave the elements, hauling the whale on board and operating dangerous machinery to process it.

The elevated status of shooters in the industrial era came less from braving danger than mastering the moment. They were trained to predict when and how the whale would emerge, and fire accurately in the decisive moment when the most vulnerable upper front of its body was exposed. In a society of increasing safety and routinization, the worth of men may be defined more in a few exceptional moments and less during the normal run of everyday life.[27] In such a society, fame can be derived from mastering those decisive moments. In Norway, the fame of harpooners could sometimes reach mythical proportions.[28] They became celebrities for their competitive spirit, unerring aim, and relentless quest after record catches.

Insofar as figure 2.3 is geared toward capturing the very instant of killing in all its compressed drama, it affirms the role and status of the harpooner. At the same time, it affirms an underlying logic of production. In industrial whaling, return on the significant capital investments came according to the number of whales killed, the tons of oil rendered and sold. Thus, the act of killing and the status of being a master of the moment was inextricably linked to the capitalist economy. Knut Birkeland, foreman of a whaling company, put it quite explicitly: "If he (the shooter) fires in the right moment, and the whale is caught, then the shooter is in credit. But if he misses, that is marked off as debit. A close account is made of him."[29] In this way, the moment of killing was made to melt together with the permanence of an economic system.

In short, a combination of the momentary and the permanent was established by visual means in these photographs.

27 Erving Goffman, *Where the Action Is: Three Essays* (Allen Lane, 1969).

28 See, e.g., Mirko Stopar, *Lars Faen* (Forlaget Press, 2019).

29 Knut B. Birkeland, *Paa Hvalfangst: Fire Aar Paa Jagt Efter Jordens Største Dyr* (Augsburg Publishing House, 1924), 42.



Fig. 2.4. Whale bones on a beach, Deception Island. Photographer: Magnus Johannessen. Source: Romsdalsmuseet, R.Fot.78390.

They celebrated and idealized moments of dramatic and violent action by shooters and workers, which were exalted and made to stand for more permanent ideals. At the same time, these photographs' relationship to time was somewhat complicated. They were portrayals of a repeatable and repeated act of killing. Their popularity served to reinforce that element of repetition. Along with the comforts of an ideal continually restated came a killing continually repeated, so that the specter of a future extinction still loomed somewhere in the deep background.

The Eternity of Clean Bones

In the postwar era, killing whales became a tougher sell. With rising environmental consciousness and concern with animal welfare, the heroic figures of whaling were no longer as appealing to a wider public, even in Norway. A different visual register was developed, one adapted to a time where it was necessary to speak authoritatively and reassuringly of permanence in the

face of an extinction event that was moving ever closer. Such a visual register was found in whale bones and what they could be made to signify when cleaned up.

When whaling was stopped in places such as Deception Island, the process of decomposition of the carcasses and other discarded whale matter moved into later stages. As bacteria, mildew, fungi, and other microorganisms did their work, soft tissue rotted away, the stench subsided, and only bones remained. Like newly killed or decomposing whales, these bones provided arresting visuals, but here natural processes had disposed of the dirty, rotten, dissolved matter that made so many photographs unpalatable to posterity. Clean bones were ripe for a more sympathetic human symbolism. They could be called "clean," "whitewashed," or, collectively, a "graveyard."

This photograph (fig. 2.4) was taken by Magnus Johannessen, a sailor with the Lincoln Ellsworth expedition. This expedition used Deception Island as a takeoff point for scientific work and explorations of the Antarctic by plane. The bones in the image had no immediate connection to Ellsworth's explorations. Something else is going on in the representation of them, carefully framed as they are against the background of the derelict Hektor whaling station, which had been abandoned for three years when the picture was taken. A certain romantic nostalgia seems to be at work. The transience of human activity and ambition is contrasted with the permanence of these great bones, what would later be popularly called a "whale graveyard." These bones may suggest not so much death as its transcendent cousin, eternity. There is something about the notion of bones being picked clean that suggests time extending out infinitely. In nature, decomposition works much faster for soft tissue than for bone, which makes it possible for bones to symbolize permanence, or the eternal.

When bones are picked clean, they also become visually differentiated as they emerge out of indistinct whale matter, all clean curves, even swells, and striking angles. These clean and pristine visuals are a corollary for authoritative, informational content. The bones are appropriated by science for what they



Fig. 2.5. "Whale jaw." Photographer: Flemming Hofmann Tveitan. Source*: Sandefjord Blad,* June 8, 2011, https://www.sb.no/skulpturbyen/skulpturbyen/hvalkjeve/s/2-2.428-1.6291076.

can tell about anatomy, natural history, and so on, but they also become appropriated for pedagogical display in museums and collections. For many decades, whale bones were displayed at the Whaling Museum in Sandefjord, a traditional center of Norwegian whaling. Until recently, the model skeleton of a blue whale was the first, in-your-face thing an arriving visitor encountered. That skeleton was further promoted to the status of an emblem by being prominently featured on the museum's web pages.[30]

Alongside the uses of clean bones to represent the authority of science, a tendency toward aestheticization also worked to make bones appealing for a postwar society that increasingly found whaling hard to stomach. Walking around the staged whale skeletons in today's museums, one is often invited to admire not only the skeleton's sublime dimensions but equally the

30 "Hvalfangstmuseet," *Vestfoldmuseene.no,* https://vestfoldmuseene.no/hvalfangstmuseet/.

smoothness of the bones, the muted evenness of their off-white color, the elegance and languid sweep of their contours. A similar experience is available today, in the outside public space of Sandefjord. A set of whale jawbones are displayed vertically to form a portal in front of two high-rise buildings: Sandefjord Hotel and the "House of Whaling."

Behind the portal in this contemporary photograph (fig. 2.5) are offices that used to belong to Anders Jahre, who paid for both building and portal. A man who made his fortune in the final pelagic period, Jahre pursued a double strategy of jarringly unsustainable whaling and local benefaction. Today, visitors to the hotel or offices can arrive through the jawbone portal. It was erected in the year 2000 out of bones that belonged to a whale killed in 1956. In other words, this was a trace from industrial whaling that was still seen as fit for public display in the era of conservation and moratoria. The jawbone portal became popular as a genre of public and monumental representation in the era of industrial whaling. The product of leftover skeletons from whaling, these portals stood in a number of locations in Norway.

Someone passing through today may notice that on the Sandefjord arch, the pores and ridges of the whale bone had been painted over in clear white, which moves the bone still further away from its original appearance. The photograph of the portal (fig. 2.5) appeared in Sandefjord's local newspaper, in a report on the municipal "Sandefjord sculpture city" initiative. Here, the arch was placed in the context of modern and contemporary art. Its whiteness, elongated simplicity of form, and tendency toward abstraction lent itself to comparison with the modernist sculpture of, for instance, Henry Moore or Constantin Brancusi, the kind that combines the forms of nature with abstraction. Again a certain appealing permanence seems to be invoked, this time by association with legitimate high culture.

Although abstract modernist art may appear as a separate world of pure form, its history was tangled up with contempo-



Fig. 2.6. On board the Fl/K Vestfold. Photographer: Harald W. Henriksen, 1933–1934. Source: Norwegian Maritime Museum, NSM.3000–897.

rary politics and economics.[31] Today, the aestheticized whale jawbones market hotel stays, and for many decades they also functioned as a visual logo for Jahre's business activities. As someone who got rich in the later stages of industrial whaling, he was a man who needed to work hard on his public legitimacy. This he did by becoming the main public benefactor for Sandefjord and a custodian of its public spaces, so that the road that led to his own offices could be made clean by grandiose, beautified bone. His jawbone portal marks the end point thus far in a rhetorical flight away from the past of industrial whaling, more specifically, away from the dirty and excessive realities of whale matter. This flight was done in part as a process of cleaning bones: hollowing out and separating bone from soft tissue, then cleaning, transporting, washing, polishing, painting, and mounting it on a pedestal.

31 Pointed out, e.g., by Thomas Crow, *Modernism and Mass Culture in the Visual Arts* (Yale University Press, 1998).

Time Running Out

Although photographs with recurring motifs of an affirmative and ideological cast dominate in the archives, some are different. A number of images show whalers immersed, not figuratively but literally, in their work. In these images, no climactic moment can be found, and no reassuring permanence. In that respect they resemble the photographs of rotting and dissolving carcasses in the surroundings of whaling stations, such as Hektor on Deception Island.

The photograph by the laborer Harald W. Henriksen (fig. 2.6) is a disorienting image to the uninitiated. If only the lower half of the photograph had been preserved, it would be very hard for a nonwhaler to make out pretty much anything. This is in fact the deck of a factory ship, and the foreground is practically all animal matter, barely contained by the ship's bridge at the rear and the metal winch up front in the left corner. The rest is a covering muddle of meat, bones, fat, and gristle: whale matter as an environment.

On the flensing planes of land stations and floating factories, whales were first flensed and then cut into pieces small enough to feed into the boilers and separators that extracted oil from solids. Copious amounts of liquid escaped in these processes, so that the flensing plane, railings, machine surfaces, and equipment became covered in a sticky combination of blood, fat, and the oily steam called "glue water." This matter was expunged into the air and sea or dumped nearby on land. The wind then brought particles and odors back to the workplace. In effect, the whalers worked in a constant mess of sticky matter mixed with water and ice, and in the stink of putrefaction. A graphic narrative was provided by the doctor Axel Mathiesen, who worked on whaling ships: "It is hard to keep one's balance from sliding in a layer of black buttery substance that's the thickness of a thumb. Everything one looks at or touches is smeared in this slippery, stinking mess."[32]

32 Axel F. Mathiesen, *Nordmenn under Sydkorset* (Gyldendal, 1945), 61.



Fig. 2.7. Strip of flensed blubber being lifted by winches on a factory ship. Unknown photographer, 1930s.

It all amounted to a strange turn of events. In biblical times, the whale had been a mighty creature that swallowed the helpless Jonah, who needed divine intervention to get out. In the industrial era, the power relations between man and animal became radically reversed. After death, the whales still somehow prevailed by enveloping the humans once again in their matter.

Henriksen's photograph comes from an album where he collected images of his shipmates' daily lives, whales on the flensing plane, and a number showing laborers flensing and lemming whales. Under the photograph, Henriksen wrote, "Hauger av kjøtt" (heaps of meat). To him and his workmates, this photograph could well have been perceived as a normal day on the job. It is also an image of dissolution: When the whale is processed, its body delivers up this strange landscape of matter. Visually speaking, dissolution is not distinct. No striking contours or shapes are cleanly defined against each other. Dissolu-

tion is a movement toward the formless, and Henriksen's image appears a shapeless muddle, somewhere between the firm and the liquid, the hard and the soft, nature and culture, like a candle under a flame.[33] In such photographs, it is difficult to tell what the covering matter consists of. It is also very hard to tell how long anything will last, since whale matter is constantly in movement and transformation, emanating, flowing and sliding, rotting away and dissolving. In these images, formlessness extends both to the temporal and the spatial.

Such images of dissolution could not provide temporal affirmation, but they did provide other kinds of moments and appeals. Some tended toward the phantasmatic, seeming to slip from the whaling world of dirt and stink into another one. They support the claim by Siegfried Kracauer that photography can generate "shapes so fantastic that they seem to have been dreamed rather than found."[34] In some of these images, it is as if the cameraman captures impossible forms that emerge from the dismembered parts of whales. Here, matter momentarily seems to freeze into unconscious vision. Another time and space spectacularly emerges before the work of extraction and the processes of dissolution go on.

Conclusion: Two Oils

The strange images from whaling's visual unconscious attest to the diversity that characterized vernacular photography in the time of industrial whaling. Such images of time running out were in the minority, however. Most were of a more reassuring cast. They routinely idealized the workers and their labor of killing and processing. Acts of domination and systematic violence, such as shooting with the harpoon cannon and flensing the whale's outer layer of blubber, were ingrained, everyday acts,

33 Yve-Alain Bois and Rosalind Krauss, *Formless: A User's Guide* (Zone Books, 1997).

34 Siegfried Kracauer, "Photography," trans. Thomas Y. Levin, *Critical Inquiry* 19, no. 3 (1993): 251.

sanctioned by imagery and made to seem normal in the contexts of whaling communities. At the same time as they provided reassurance, these images may have served as a means of averting whalers' eyes from looming extinction. Even if knowledge of this risk varied among workers on the industry floor, anyone who paid attention to public discussion in Norway would have heard this topic raised, even before industrial whaling started in the South Seas. Extinction was always a known future risk, and the eyes of whalers were always being averted by visuals that offered the comforts of the moment.

Indeed, eyes are averted from ongoing extinction even today. In many ways that act is now even more of a contortion, since the sixth extinction is all around us. So the hunt for comforts is still on, and the last few decades have offered the sight of some species of whales returning to their feeding grounds. In environmental matters, it seems difficult to conceptualize extinction, which cannot be directly and palpably experienced. As terrible as the last whale's death by the last explosive harpoon may be, it is at least fathomable. It connects to human experience, has dramatis personae, clear spatial and temporal limits, and a point of high climax. As conceptualized by research today, extinction is a much harder thing to wrap one's head around. Whale extinction becomes part and parcel of a sixth extinction that can be conceptualized as an event only when it is placed within a much longer natural history. Events at this very largest scale have a highly abstract and somehow ungraspable quality to them, but their causes and effects are real enough.[35]

Meanwhile, the sight of whales returning to their old haunts is less reassuring when one knows they come disoriented by the noise of ships, with plastic in their stomachs.[36] Whale extinction turns out to be an event that keeps on taking place. Fueled by a roaming combination of industry and capitalism, it has been

35 On events at the largest scale, see Espen Ytreberg, *Media, Events and Society* (Polity Press, 2022), 150–58.

36 See Rebecca Giggs, *Fathoms: The World in the Whale* (Scribe Publications, 2020).

going on since the advent of motorized ships and cannons firing explosive projectiles. This processual nature of extinction invites one to think about continuities between the early industrial era and our own. Whaling history tends to be thought of more in terms of contrasts, between irresponsible whaling and today's conservation, between the past misguidedness of whalers and today's more enlightened eco-consciousness. This view is not just simply mistaken; it obscures some important similarities. In the particular case of Norway, there are continuities between the country's two oil ages, that of whale oil and today's dependency on fossil fuels. The whaling industry prioritized revenue and employment over conservation. Competition and the pursuit of new unregulated terra nullius won out over regulation. No point of balance in extraction from nature was successfully found and maintained. Quotas proved too limited a means of controlling the industry. These are all characterizations of the whaling industry that could also be made of the fossil fuel industry that superseded it.

Such uncomfortable continuities may help explain some of the revulsion that documentations on industrial whaling are often met with. Violence, blood, dirt, and stench on this staggering scale, acted out as if it were the norm or even a point of pride, can of course easily revolt those who experience it today. Still, some of the reaction may have to do with a resistance to recognition. As consumers in modern Western societies, Norwegians today might say that they do not hold much power over industry. They might add that they are now working to live sustainably, in a way the whalers did not have as an available life choice. But like the whalers, these consumers are part witness and part accomplice to depletion in nature and to species extinction.

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3

Loops and Timelines: Anthropocene Storytelling in Heaven's Vault and Outer Wilds

Laura op de Beke

"Stories don't have tidy beginnings. The past is always present," says Aliya, the player-character from the video game *Heaven's Vault,*[1] as she climbs a lone hill on a desert moon, looking for answers. She does not know it yet, but the eponymous *Heaven's Vault* is a massive spaceship whose crash-landing about 3,500 years ago created the Nebula in which she lives. Her entire known universe extends no farther than the spillage of water coming from the wreck that makes life possible on a number of otherwise barren rocks adrift in space. Far from being a recent development that can easily be overturned, the crash is an ongoing anthropogenic disaster, one that has entrenched a process slowly moving toward its awful culmination, at the cost of all life in the Nebula.

Epochs do not have tidy beginnings either, least of all the most recent one, for which several names have been suggested, chief among them "Anthropocene." What quickly becomes obvi-

1 Jon Ingold and Joseph Humfrey, *Heaven's Vault* (Inkle Studios, 2019).

ous from the multidisciplinary discourse converging on the notion of the Anthropocene is that trying to pinpoint the epoch's origins has proven both difficult and controversial. Whereas geologists and other scientists are looking for a golden spike — a marker, clearly legible in the physical substrate that evidences a climatic and geological shift that many locate in the 1950s at the onset of the Great Acceleration — historians are more interested in tracing the social transformations, technologies, and economic regimes that condition this intensification of consumerism, economic development, and environmental exploitation. Too great an emphasis on the Great Acceleration risks depoliticizing the history of the Anthropocene, which is not a catastrophe that struck from nowhere, but one that has been in the making for centuries, at the cost of some and to the benefit of others.[2] Consequently, other dates and other narratives have been suggested, pointing to the invention of the steam engine for unlocking the energetic potential of fossil fuels, the colonization of the Americas for initiating a globalized economic system that renders nature "cheap" and exploitable, and the establishment of agriculture over other means of subsistence.[3]

By connecting future concerns with reconsiderations of the past, the Anthropocene introduces a lopsided timescape, one that is characterized by a deepening of time toward the past, and a temporal compression in the last hundred years, which makes the present feel more eventful and volatile.[4] In other words, on the one hand, the average human lifetime now seems dwarfed by the vastness of deep time, the scale at which climate change and species extinctions usually unfold. On the other hand, the nightmarish graphs of the Great Acceleration attest to the destructive power of just a few decades of development, imbuing

2 Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene,* trans. David Fernbach (Verso, 2017).

3 Jason Moore, ed., *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism* (PM Press/Kairos, 2016).

4 Boris Shoshitaishvili, "Deep Time and Compressed Time in the Anthropocene: The New Timescape and the Value of Cosmic Storytelling," *The Anthropocene Review* 7, no. 2 (2020): 125–37.

everyday actions with a new and scary sense of consequence. This new timescape thus pits *aiōn* against *kairos* in a struggle between the irrevocable rhythms of natural cycles with their entropic bent and our potential to affect those temporalities at well-timed moments in the present.[5]

To align the repeating, cyclical temporalities of the solar system, and those by which we organize our lives, people have always told "time stories," myths and epic tales about the origins of the universe, the rhythms of nature, and the circumstances of humankind.[6] Pointing to Latour's return to Gaia and Haraway's use of the Medusa figure, Yuriko Furuhata identifies a "revival of myth within the discourse of the Anthropocene, [following] the search for a new worldview — or cosmology — other than that one inherited from the Enlightenment."[7] Boris Shoshitaishvili also argues that we are in need of a new kind of time story, one that is able to instill the humility and responsibility called for by the Anthropocene. And though he locates some valuable work in the disciplines of big history, cosmology, planetary ecology, and religious science, he holds out for other types of engagement, in other media formats that attend to both the deepening of time and its compression.[8]

I suggest that we look at video games for such Anthropocene storytelling, because, even though video games often enshrine a high degree of individual agency and granularity with regard to the timing of actions, they are no strangers to big history either. The examples I single out in this chapter are *Heaven's Vault* and

5 As explained in John Smith, "Time, Times, and the 'Right Time': *Chronos* and *Kairos*," *The Monist* 53, no. 1 (1969): 1, *Kairos* refers to the qualitative nature of time, specifically, the right or opportune time for an event to occur or a choice to be made. *Aiōn* is the god of perpetual, cyclical time, including yearly cycles, and it is the term from which we have derived the English *eon*, which refers to deep time; see James Hatley, "Aion," *Environmental Humanities* 6, no. 1 (2015): 179–82.

6 Barbara Adam, *Time* (Polity Press, 2004).

7 Yuriko Furuhata, "Weathering with You: Mythical Time and the Paradox of the Anthropocene," *Representations* 157, no. 1 (2022): 73.

8 Shoshitaishvili, "Deep Time and Compressed Time in the Anthropocene," 133–34.

Outer Wilds,[9] two video games in which the player is tasked to reconstruct a timeline of the universe in order to unpack a mysterious looping temporality that has taken hold of the present. In *Heaven's Vault,* Aliya is sent on a quest to investigate a coming "darkness" threatening the Nebula, which has been foretold by an apocalyptic cult that believes in a cyclical, deterministic version of history. In *Outer Wilds,* players find themselves stuck in a more literal time loop that reiterates every 22 minutes, punctuated by the sun's supernova. Both games explore the interplay between linear and cyclical temporality, and between human history, natural history, and the temporalities of entropy, death, and dissolution.

In their exploration of these loops and timelines and their origins in anthropogenic disasters or natural cycles, *Heaven's Vault* and *Outer Wilds* dwell on what Merlin Seller muses are the "dark existential rhythms" of climate history in the *longue durée.*[10] Arguably, these rhythms have become more notable in the age of the Anthropocene, which reembeds human history in a much greater span of time marked by periods of rise and fall, extinction, and adaptation. In the face of these vast, nonhuman spans of time and their obliterating finalities, Heaven's Vault and Outer Wilds both try to carve out a place for the individual. What responsibility do people have for the legacies they leave? And how should people orient themselves to the past and to the future?

New Media — Same Old Story

In "Time in Video Games: Repetitions of the New," Miglena Nikolchina points out that for a purportedly new media, open

9 Alex Beachum and Loan Verneau, *Outer Wilds,* PC (Mobius Digital; Annapurna Interactive, 2019).

10 Merlin Seller, "Lichenia and Climate Crisis: Feeling Dark Rhythms in the Longue Durée," in *Proceedings of the 2020 DiGRA International Conference: Play Everywhere,* 2020, http://www.digra.org/digital-library/publications/lichenia-and-climate-crisis-feeling-dark-rhythms-in-the-longue-duree/.

world video games share some remarkable similarities with ancient epic poetry and myth.[11] Like the *Odyssey* and the *Iliad,* these games depict heterogeneous spaces where humans clash with gods and monsters in scenes of gory, detailed combat. Open world video games also feature the retarding element so characteristic of epic poetry, where the hero's journey is never straight, but always meandering, subject to delays, deviations, and distractions that can add years to a quest that could otherwise be wrapped up in weeks. In addition, Nikolchina emphasizes their preoccupation with the cyclical temporality of myth, since open world video games often detail the vacillations of Manichaean, cosmic forces vying for control.

Without much elaboration, Nikolchina suggests that this preoccupation with the cyclical temporality of creation and destruction should be read as a trait "indicative of the present epoch."[12] I would agree, because the Anthropocene has brought home the realization for many people that human history is embedded in a much longer span of time that includes the natural history of the planet, the evolution of life on Earth, and the development of human civilization. Looked at with some remove, the current climate crisis, although different from the nonanthropogenic disasters of the past, does start to look like it is part of a pattern that features spikes of rapid climatic shift and subsequent extinction events, or (on a smaller scale) the rise and fall of civilizations. Reading too much into this pattern, however, risks a kind of naturalization of world-ending events, such as the Anthropocene, as the tragic but natural and predictable end of any technologically advanced species.

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11 Miglena Nikolchina, "Time in Video Games: Repetitions of the New," *Differences: A Journal of Feminist Studies* 28, no. 3 (2017): 19–43. Open world video games are those that refrain from controlling player exploration too much. Instead of forcing players down one specific path, they allow them to choose their own route, thus forging their own experience of the world. Open world games can still nudge players to make or abandon certain choices by making them more or less difficult or interesting or rewarding.

12 Ibid., 26.

Crucially, this does not need to be the case in video games, which enshrine a high degree of individual agency in the player character, resulting in a tension between the fated quality of the universe and the power of the player to act on the world, and to choose to save it. This same tension pervades discourse about the Anthropocene, which concerns disastrous ecological consequences already well underway (against which all we can do is brace ourselves) and future effects that may yet be diverted through decisive action. Nikolchina remarks that in open world video games, this tension often yields a certain level of critical awareness regarding notions of determinism and agency. "Wavering between the cyclical and the linear dimension of their narrative," open world games increasingly stage the question, "Should we put an end to the cycle? Or, inversely, should we end the cycle's disruption by foiling unpredictable change?"[13] Both *Outer Wilds* and *Heaven's Vault* posit this exact question in order to probe a larger question that concerns the entanglement between human history and natural history: How should we relate to the human effect on environmental, even cosmological processes?

Nikolchina's analysis of open world video games offers a great introduction to the readings I want to perform in this chapter because I too want to demonstrate how video games "weave together cyclical and linear time in an interplay of the mythical, the historical, the biographical, the psychological, and the epiphanic."[14] Video games often discuss the rise and fall of civilizations against backgrounds of cosmic strife and environmental change, with ruins dotting the landscape. Clans and nations may go to war, each seeking to forward their own nationalist histories, and at the center of it all the player-character comes of age; acquires power, knowledge, and reputation; and is faced with difficult ethical choices that could change the course of history.

13 Ibid., 27.
14 Ibid., 24.

The effortlessness with which these temporal scales are crossed and recrossed in *Outer Wilds* and *Heaven's Vault* is in part because they are science-fiction games. Science fiction is interested in the coupling of individual stakes to larger — even cosmic — ones and the genre has developed an entire tool set of tropes and figures that enable it to do so. Moreover, as video games, *Outer Wilds* and *Heaven's Vault* also have the added media affordances of interactivity and duration to play with. James Ash explains that this is how video games cultivate a sensitivity to the much narrower temporal differentiations that govern action.

Writing about temporality in video games from a Stieglerian perspective, Ash argues that they construct what he calls "interface envelopes," which are instances of a kind of looping temporality that is imbued with now-ness, since the player's perception is organized around a continuous series of narrow moments of decision-making (e.g., aim, shoot, reload, repeat):[15] "Interface envelopes do not simply produce a perpetual present tense, but actively modulate the relationship between secondary retention (subjective memory) and protention (anticipation), through which a narrowly differentiated now point emerges."[16] Ash argues that these increasingly tightened spatiotemporal loops prevalent in gaming can shorten our attention span, but he emphasizes that that envelope power is flexible, and that rather than dull our attention to the passage of time, it cultivates a heightened sensitivity to temporal (micro-)differentiation. This is where he locates their power for good:

> Even as envelopes narrow the now, they also stimulate users' capacity to sense the difference between ever more finely distinguished now points. This capacity to sense difference

15 James Ash, *The Interface Envelope: Gaming, Technology, Power* (Bloomsbury, 2015). More design-focused writing on video games also acknowledges the fundamental role of so-called gameplay loops, which are sets of player actions bound by a specific timeframe that are patterned throughout a game.

16 Ibid., 103–4.

> provides the seeds of opportunity to create new economies of protention, whereby the now is opened up rather than closed down, and through which alternative ways of thinking and knowing the future become possible.[17]

In my analysis of *Heaven's Vault* and *Outer Wilds,* I will explain in detail how this ability to discern different temporalities unfolds through gameplay. My argument is that by bringing together this ability to articulate moments of *kairos* — moments of *now* — within processes of deep time, or *aiōn,* these games speak to matters of temporal compression and to temporal protraction in a way that is deeply relevant to our experience of the Anthropocene present, which is a concept I turn to next.

Future Histories of the Anthropocene

> The Anthropocene warps our apprehension of time. It opens vast temporal expanses as it situates even the minutest human choices, such as that between driving a car or walking, in geological deep time. It turns the future into a site of dread and diminishment rather than rapt anticipation. The past is no longer a stable historical ground and morphs into a restive archive of stored actions that may one day prove our undoing as a species. The Anthropocene present, then, is a palimpsest of (often only partly legible) crisscrossing forces that do not provide a clear point of orientation to navigate the complexities of planetary life.[18]

"Palimpsest" is a term that can be used to refer to a manuscript whose lines have been erased — usually scraped away — to make place for new lines. For a literary scholar such as Pieter Vermeulen, quoted above, this metaphor is apt because it immediately recalls his object of study, the novel. But rather than lines of text, video games are constituted of loops and timelines, recurring

17 Ibid., 138.
18 Pieter Vermeulen, *Literature and the Anthropocene* (Routledge, 2020), 107.

sets of player actions grounded in worlds in which environmental, mythological, cosmological, and historical events and processes concurrently unfurl. In my view, this makes video games perfectly suited to reflect on what Vermeulen calls the "Anthropocene present," especially when, as is the case in *Heaven's Vault* and *Outer Wilds,* those games stage future histories.

Geological periods are usually named retrospectively, but the Anthropocene is an exception. It was argued for on the basis of data derived from the Earth system sciences rather than geology proper. And yet, perhaps to make up for its lack of geological roots, discussions of the Anthropocene often start by imagining a kind of speculative archaeological moment, evoking an archaeologist or historian who looks back at the fossilized, rocky residues of humankind with wonder, pity, or judgment.[19] Such future histories create a feeling of estrangement commonly used in science fiction that allows readers to look at society more objectively, thus registering elements that might otherwise have passed unnoticed. Rebecca Evans even declares the term "Anthropocene" "science-fictional" in the sense that it "invokes whole narratives inflected with key features of science fictionality," including a sense of "radical novelty."[20] But the newness of the Anthropocene remains in question. If the epoch is new, how new? And new how? What sets it apart from the thousands of years of human civilization that came before? These are historical and archaeological questions.

Video games are prime spaces in which to indulge the kind of archaeological storytelling that animates future histories. This is because they often resort to forms of "environmental storytelling."[21] For example, in video games, narratives may be pieced together from clues in the landscape planted there to suggest certain events have occurred. In a recent trend dubbed

19 Ibid., 147.

20 Rebecca Evans, "Nomenclature, Narrative, and Novum: 'The Anthropocene' and/as Science Fiction," *Science Fiction Studies* 45, no. 3 (2018): 484–99.

21 Henry Jenkins, "Game Design as Narrative Architecture," *Computer* 44, no. 3 (2004): 126.

"archeogaming," video games are being designed and played more and more with the tenets of archaeology in mind, for example, by not spelling out histories through outright exposition, but by letting environments or artifacts do the talking.[22]

"A key component of archeological thinking is the creation of multiple narratives of the past (multi-vocality) whereby the lives of different ages, genders and classes are given equal weight and no single version of the past dominates," argue Livingstone, Louchart, and Stuart.[23] They continue to emphasize that the most accurate forms of archeogaming acknowledge the fragmentary, even contradictory nature of the historical and archaeological record, and the centrality of practices of revision and refinement. More provocatively, Laine Nooney has called such engagement "speleology" rather than archaeology, since "spelunking, in contrast, is a phenomenologically imprecise encounter" that reflects "the inability to apprehend the historical field in its wholeness."[24]

Groping around in the narrow darkness for signs and pathways is a very different experience from the one afforded by God's-eye views adopted in most big history games.[25] Arguably such an approach reflects more accurately the way in which we engage with the history of the Anthropocene. In *Heaven's Vault* and *Outer Wilds* — both future histories — such careful fumbling forms part of the core gameplay experience. Both games undermine the panoptic ambition of more conventional big history games by dwelling on the instability of records and lan-

22 Andrew Reinhard, *Archaeogaming: An Introduction to Archaeology in and of Video Games* (Berghahn Books, 2018).

23 Daniel Livingstone, Sandy Louchart, and Jeffrey Stuart, "Archaeological Storytelling in Games," in *DiGRA/FDG '16 — Proceedings,* vol. 13 (Dundee, 2016). http://www.digra.org/digital-library/publications/archaeological-storytelling-in-games/.

24 Laine Nooney, "A Pedestal, a Table, a Love Letter: Archaeologies of Gender in Videogame History," *Game Studies* 13, no. 2 (2013).

25 Laura op de Beke, "Big History Games and the Challenge of Deep Time," *CSPA Quarterly Magazine* 42 (2024): 40–47.

guages, and by questioning grand plots of technological "time transcendence."[26]

As future histories, *Outer Wilds* and *Heaven's Vault* are more sophisticated in their engagement with linearity and cyclicality, myth and history than the examples Nikolchina discusses. For her, "mythic temporality in games interacts with time as linear history, and it does so in a catastrophic manner, as a destructive rupture, a breach, an ontological crack. Myth and history touch in a corrosive way."[27] This is not the case in *Heaven's Vault* or *Outer Wilds*. Whereas in Nikolchina's examples mythical temporality creates rifts, or portals that need to be closed by heroic individuals, or destructive cycles that need to be interrupted, *Heaven's Vault* and *Outer Wilds* integrate mythical time — cyclical time, or the time of creation and destruction — within the time of history. In other words, the mythical temporalities in these two games are not so ontologically different that they cannot be plotted on historical timelines, as we will see in the next section. Rather, they are the result of historical, man-made events or natural cosmological processes. In either case, they are not to be rejected, nor do they provide an escape from history. On the contrary, this new mythical time of the Anthropocene is entropic and irreversible, and as such it teaches us both caution and responsibility.

Heaven's Vault

A darkness is coming, threatening the Nebula. Its rivers are slowly drying up, turning formerly lush moons into barren wastelands. At the University of Iox, this is both cause for concern and a confirmation of an apocalyptic, religious belief. On the one hand, Iox is a place where the loopist faith reigns supreme, the belief that history repeats itself and that souls are reincarnated. So the fall of Iox, though it would be a kind of ending, would merely set off a new iteration of a predictable and

26 Adam, *Time*.
27 Nikolchina, "Time in Video Games," 27–28.

holy loop. On the other hand, there is a gnawing sense of doubt that this darkness is somehow different, involving more than just the Ioxian Empire — since it is diverting the course of the rivers that connect the Nebula, which feed all life. What is the darkness and how can it be stopped, if it needs to be stopped at all? This is the mystery at the heart of *Heaven's Vault,* a ruminative science-fiction game about the meaning of history and death in the universe.

The player character is Aliya, an archaeologist employed by the University of Iox charged with the task of uncovering the mystery. She does so by exploring locations where she finds and translates passages of the language "Ancient" inscribed on artifacts, gradually accumulating a larger vocabulary, and slowly adding to the understanding of the past (which may or may not be the future). Having grown up on an impoverished moon under Iox's imperial control, however, Aliya does not believe in the loop. As a firsthand witness to the power of time, which destroys all things, distorts all stories, and leaves nothing intact, she has a more sober understanding of history as a story that can be manipulated to control one's legacy. Yet, as she travels through the Nebula, the evidence she collects does attest to a kind of pattern: imperial control, subjugation, and revolt, after which the wheel of fortune turns and the same dynamic is reinstalled but in a different configuration; the heart of the empire relocates to a different moon; one class of overseers is exchanged for another; the city of Iox falls, and falls again.

Everywhere Aliya goes she feels the presence of ghosts, like she is tracing old footsteps. The ruins on water-starved moons are haunted by the people who used to live there. On top of that, she is following the trail of Janniqi Renba, a roboticist who has gone missing and turns out to be dead. Like her, he hailed from Elboreth, and the robot he left behind is passed on to Aliya. She calls him "Six," since it is the sixth robot the university has bestowed on her (don't ask about the fate of the other five). In her review of the game, Katherine Cross remarks on this sense of uncanny repetition, especially in her second playthrough: "Suddenly, the ghosting effect of Aliya walking about

the world, her cutout avatar leaving traces of where she was moments ago, seems like it might be more than a slightly quirky aesthetic choice."[28] Cross muses whether the loop is in fact real, and whether in starting the game again, she has launched a new iteration of it. But the repetition is never quite perfect, she finds. On the second playthrough, players are allowed to port over their accumulated vocabulary of Ancient, making it easier to translate texts. But as it happens, the second time around, the passages are different, longer, and more complex. Everything is familiar but not quite. *Heaven's Vault* is a "narrative circle that nevertheless [advances]."[29] Something endures between iterations, and that is knowledge. The loop is in fact a spiral. If history repeats itself, that means we can learn from it, and are not destined to repeat it.

Diletta De Cristofaro locates a similar spiraling temporality in David Mitchell's novel *Cloud Atlas,* which offers a helpful parallel reading to *Heaven's Vault*.[30] The novel, De Cristofaro argues, is structured like a concertina, a musical instrument of pleated bellows that you pull apart and bring together again between your hands, expanding and contracting the chambers to produce sound. *Cloud Atlas* is made up of six enfolded cross-temporal narratives. Thus, the novel ends where it began, with the account of a nineteenth-century explorer, even though, crucially, the concertina has also been extended to include the story of Sloosha's Crossin', which is set in the far future, after the fall of civilization. This is important because, for De Cristofaro, the "future worlds of science fiction," like the "New Worlds of the Anthropocene," cannot be divorced from the new world "discovered" in 1492. After all, the colonization of the Americas gave birth to the global economic system that allowed for the exploi-

28 Katherine Cross, "Heaven's Vault Rewards Replays by Forcing You to Live the Theory You're Investigating," *Polygon,* May 13, 2019, https://www.polygon.com/2019/5/13/18535610/heavens-vault-loop-second-playthrough-replayability.

29 Ibid.

30 Diletta De Cristofaro, *The Contemporary Post-Apocalyptic Novel: Critical Temporalities and the End Times* (Bloomsbury Academic, 2021).

tation of people and places, and it formed the nexus of "(neo) colonial power, capital, and conceptions of nature that [lies] at the heart of the Anthropocene."[31]

According to De Cristofaro, *Cloud Atlas's* "concertina-like structure articulates a critical temporality as it resists a telic closure, [and] warps the deterministic linearity of apocalyptic history and of the narrative sense of an ending."[32] Apocalyptic temporalities are teleological. They detail the events leading up to the beginning of a new world, while drawing a line between those who deserve to be saved and those destined to perish. But in *Cloud Atlas,* the apocalyptic ending is enfolded in the middle of the novel and undone by the consecutive endings of the other narratives, suggesting it "can still be averted."[33] In *Heaven's Vault,* multiple playthroughs similarly undo ideas of finality, canonicity, and authenticity by introducing different versions of the story, with different endings.

Moreover, *Heaven's Vault* has its own concertina-like structure in the form of a dynamic timeline that can be consulted in one of the game's interface menus. Timelines are common tropes in big history games, where they usually come in the form of a tech tree: a branching (often historical) timeline that plots inventions or technological developments on a diagram through which the player must progress, unlocking steadily more advanced tech. In *Heaven's Vault,* the timeline works backward, but "unlocking" it turns out to be much more complicated than expected. The timeline starts thousands of years into the past and runs all the way up to the present, and it is divided into different ages, some of which are punctuated by question marks, suggesting that this periodization is uncertain and incomplete: the Ancient Time? the Ancient Empire? the Holy Empire? Over the course of the game, new information will lead the player to revise and add to the timeline, redividing and renaming the periods, and dating events and artifacts, big and small. Aliya's

31 Ibid., 96.
32 Ibid., 107.
33 Ibid., 110.

actions are also plotted on the timeline, every moon she visits, every item she trades, even the conversations she has.

In terms of interface design, the timeline in Heaven's Vault is reminiscent of the big history project ChronoZoom, a digital timeline that spans from the big bang to the present day and that plots both periods like the Late Heavy Bombardment (4.1 to 3.8 billion years ago) and events such as the release of Microsoft Windows (Bill Gates being one of the main sponsors of the project).[34] Of course, it is impossible to fit all of this history on a single graph, so in order to navigate the timeline, both ChronoZoom and *Heaven's Vault* have opted for the same solution. They make it possible to zoom in, stretching out the timeline like a rubber band (or a concertina) in order to make visible what happened just days, hours, or seconds ago. Zoom out again and the timeline snaps back to its shortest length, showing the entire history of the Nebula. In addition to the ability to zoom in and out — expanding or contracting the timeline — the game allows you to switch between different tabs for several different lifetimes: Aliya's, the Holy Empire's, the lifetime of the *Nightingale* (a spaceship), and even the lifetimes of artifacts, such as crowns and brooches. If the timeline can be understood as a rope tethered to the deep past, clicking through these different tabs means fraying the threads of the rope and tracing different actors in the history of the Nebula.

Despite its utility, even as you add to the timeline, some questions can never be answered, and such uncertainty undermines the ostensible exactitude that projects such as ChronoZoom impart. Fan theories proliferate online debating the details of the story. Such speculation sits at the heart of the gameplay experience. You move from site to site, but the bulk of the game is spent in conversation with Six, your robot aide. Six offers prompts and questions based on an algorithm that decides what kind of dialogue is most relevant given your location and how much investigating you have done already. And whereas Six will

34 The Outercurve Foundation, *The ChronoZoom Project,* 2013, http://chronozoom.com.

at times suggest that you return to your ship, you can always defer and continue musing and speculating, bouncing ideas off him, which he patiently tolerates. Such dialogue, though it defers action, performs a crucial function in *Heaven's Vault,* for it is through the reflections that it prompts that you piece together most of the Nebula's history, including the Age of Sail when people lived in ships as large as cities, or the Age of Steel, when the robots were in charge. Some of the insights Aliya has are open-ended, for example, when she ponders that loopism may have been invented by the immortal robots to comfort the tragically mortal humans. The more of these unverifiable speculations you collect, the more incomplete your history starts to appear.

The cave is very deep, and very dark, and spelunkers who have made it to the bottom will discover all this darkness seems to emanate from the *Heaven's Vault* itself. In the final act, Aliya finds out that the vault is a massive spaceship whose crash-landing 3,500 years ago created the Nebula in which she lives. Ever since the ship's waters spilled out of the wreck, forming rivers of ice and with hydrogen connecting a handful of moons (presumably the leftovers of a much bigger planet that collided with the ship), it has been slowly recovering this water, preparing to resume its journey. This is the great "darkness" that is causing the Nebula's rivers to dry up. Obviously, the event can be read as an allegory of the Anthropocene, which can also be understood as "a story of slow-burning disaster,"[35] an accident that, just like modernity, may have momentarily improved life for some, but which is now making its consequences known.

Since Aliya is the first human to access the vault in thousands of years, the ship's AI confronts her with an urgent decision that it (being a robot) is not allowed to take: "Do you wish to vault?" "Vaulting" means launching the ship, leaving the Nebula behind, drained of its water and doomed to die. Aliya balks at the suggestion, but if, as an old forgotten dictum goes, the "Nebula was never meant to be lived in, only sailed," how wise is it to stay? Players who choose to vault agree to pick up the course

35 Evans, "Nomenclature, Narrative, and Novum," 490.

of history as it was planned by their ancestors who were mid-warp when they crashed. These players are no better than the apocalyptic loopists who accept a future already laid out for them because, although it spells death for everyone else, they will be saved — raptured and spirited away to a new star system to pursue what is presumably a new life. Walking away from the decision, however, seems by no means the better option, because we know its years are numbered. "Long-term parameters require a vault," urges the AI. Fortunately, there is a third option, connected to the game's dialogue system. After all, sometimes deferring and speculating does not just lead to more questions, it also leads to more options for action. Defer long enough in some locations and Aliya will think of other things to do.

In the tomblike depths of *Heaven's Vault,* the AI confronts Aliya with a real sense of urgency: "Do you wish to vault?" But why the rush? If working with the timeline has taught you anything, it is that time is elastic, and the game rewards those who linger. Defer long enough inside the vault and Aliya will have the bright idea to turn the ship off, reverting the course of the rivers, essentially causing them to spill out again. In doing so she rehydrates the Nebula, giving it a second life, without having to erase the history of all that has happened. And, who knows, with more water to go around, new political revolutions may be sprung, and perhaps the yearned-for fall of the Ioxian Empire will still be brought about.

In summary, *Heaven's Vault* advocates a politics of lingering by opening up the present and making time for questions, doubts, and speculation. Lingering is the deferral of *kairos,* or action. Engaging in reflective dialogue (fig. 3.1) adds to the understanding of history without repeating it, and without settling historical discourse, since the puzzle pieces never quite click into place. Such uncertainty produces an awareness of the constructed nature of history. In *On Tarrying,* Joseph Vogl writes that "tarrying addresses both the complexity of the situation and the contingency of its solution and keeps both, situation and so-



Fig. 3.1. Aliya and Six debate history at the University of Iox. Source: Heaven's Vault. Screencap by the author.

lution, in suspension."[36] He continues to explain that two temporalities meet in such moments of pause: the temporality of history that is concerned with what happened, and a speculative temporality in which is preserved the "unresolved multiplicity" of the event.[37] In mediations of the Anthropocene, it is especially important to make space for such multiplicity give the epoch's contentious histories.

Outer Wilds

Outer Wilds is a science-fiction mystery game where you explore a solar system stuck in a twenty-two-minute time loop, after which the sun explodes and everything resets, with the player character waking up again where they first set out. Within the main loop, numerous other temporalities exist — planets and other celestial objects revolve around each other causing surface conditions to fluctuate. On the hourglass twins, the sands either rise or fall, exposing caves and passages, while on Giant's Deep

36 Joseph Vogl, *On Tarrying*, trans. Helmut Müller-Sievers (Seagull Books, 2011), 54.

37 Ibid., 54–55.

storms periodically wash over islands, and on Brittle Hollow the Hanging City is always in the process of gradually crumbling apart over the gaping maw of a black hole. At first glance, the universe of *Outer Wilds* seems radically unsettled, disturbed, wobbly, and chaotic beyond comprehension. But the more you explore it, the more you become familiar with its rhythms, and the more you are able to unveil the mystery at the core of the loop.

Why do these 22 minutes keep repeating? In an epic act of time compression, I will try to sum up the plot, giving a linear account of a story that, in the game, you cobble together piece by piece in a completely nonlinear manner. In short, by translating fragments of ancient text scattered across the solar system, players are able to deduce that the solar system used to be populated by the Nomai, a technologically advanced species that warped there in search of what they called the "Eye of the Universe," a kind of wormhole between the present (dying) universe and the next one. But its location remained elusive. They designed a system of teleportation pads to warp around, but the Nomai discovered that it is possible to create a negative time interval when traveling between two places: Stepping onto a warp pad on one moon means arriving at your destination some fractions of a second before you left. The Nomai found out that the more energy you use to power the pad, the longer you can stretch the interval. Theoretically, this means you can create an eternity to look for the Eye of the Universe by stringing together negative time intervals. There is only one problem. To stretch the interval to, say, a comfortable 22 minutes, you need the power of an exploding sun. So be it. Though the plans were controversial, the Nomai built an orbital probe cannon that launches a probe and deems whether it has found the Eye within 22 minutes. If not, it sends a signal to a station orbiting the sun, which fires at it, creating a premature supernova. The energy from the explosion powers a device that turns back time 22 minutes, while saving the probe's data. In the next iteration, the probe cannon launches again but in a different direction, and the process is repeated until the Eye is located. *Et voilà,* with the coordinates

of the Eye finally unveiled, the Nomai can switch off the entire mechanism before the sun station fires again, thus bringing an end to the loop.

Evidently, things did not go according to plan. Time has passed. The Nomai infrastructures are now ruins, and the species itself is long extinct, their skeletons strewn across the solar system. The answer to their demise lies buried inside a comet called the Interloper that is in orbit around the sun. Exploring its insides requires timing your descent so that the comet is closest to the sun and its icy cap has melted. Slipping through an exposed crack, you find out that the Interloper was infected with a lethal gaseous substance called "ghost matter" that leaked out and expanded across the solar system, killing all Nomai almost instantly, while saving a primitive form of life surviving in the subterranean rivers on Timber Hearth (the ancestors of the player character). Gaining access to the Interloper essentially requires you to analyze clues and, crucially, to get the timing right. In fact, a lot of clues are hidden in locations that require you to be not a minute too late or too early, since the continuous, complex, and shifting dynamics of the solar system cause many passages to become blocked for much of the time.

For a game that revolves around felicitous timing, its overall story is a rather tragic one that is about being too late. After all, one question still stands: Why was the time-warping, probe-launching infrastructure triggered eons after the Nomai perished? This is where the game cleverly leads you on. After learning that the Nomai were planning to blow up the sun, there is no reason to believe that they could not. Especially since the Nomai appear to have had access to much more technologically advanced machinery. But in a late-game revelation, you find out that the Nomai did fire at the sun but failed to trigger any response, never mind their sophisticated technology. They were unable to expedite the lifetime of a star. This means that the supernova that ultimately kicks off the mechanism, trapping the player in a loop, has to be a natural one, and what is more, it is one of billions of supernovae occurring all across the universe, which in its old age, is finally coming to an end.

This is an unsettling revelation, plotted deviously near the end of game just when the chaotic rhythms of the solar system are starting to click into place. Part of what makes this revelation so disturbing is the realization that the player character and their people (the Hearthians), who seem so innocent, adventure-loving, and juvenile in comparison to the techno-hubristic Nomai, are tragically unlucky in their timing. They simply evolved in an aging universe that was already on its way out. Moreover, there is a kind of intergenerational conflict present in the game, since the player is left to deal with the confusing afterlife of an infrastructure put in place to serve a much older people. This infrastructure keeps resuscitating the solar system again and again for the sake of the search for the Eye. What is more, the loop has already been repeating itself for thousands of iterations before your character even grows aware of it. The universe has already ended before the story even began, much like the Anthropocene has been gradually locking into place decades (perhaps even centuries) before its effects have started to show.

Just like in *Heaven's Vault,* this apocalyptic situation calls for an individual response. Both games ask players to break the cycle, either by refusing to vault or by interrupting the loop. But the choice is not exactly the same, since refusing to vault gives the Nebula a new life, while breaking the loop in *Outer Wilds* means embracing the death of the universe. However, there is a way out. This is where the Eye of the Universe comes in. Once it has been located, players can traverse the Eye, but they will not personally survive such a passage. By popping out at the other end they seed nothing with something, providing the void with the matter necessary to kick-start a new universe. To achieve this, players first need to dismantle the mechanism responsible for the loop. Doing so is far from easy, since, once the infrastructure has been disabled, you are left with a tight couple of minutes before the sun explodes — for real this time. In these minutes, all of a sudden, everything matters. This time, if you make a mistake, there will be no second chances because the loop has been disabled. The final lap, therefore, requires players to apply without fail all the skills learned in the previous itera-

tions to make it to the Eye on time. There is no room for error. It is now or never. What occurs as a result is a kind of temporal compression. Players have to draw on hours and hours of experience while dealing with an overwhelming sense of urgency and vulnerability. The fate of the universe rests on their shoulders.

What *Outer Wilds* does, during this final act, is engage with cosmic inflation theory, which hypothesizes that during the big bang, the universe expanded exponentially. Even the smallest effects during these initial stages determined the shape of the universe. According to Nancy Ellen Abrams and Noel Primack, you can draw an analogy between this primordial moment and the period of inflation we find ourselves in today: "The smallest events during a period of inflation — whether cosmic inflation or Great Acceleration — result in rippling long-term effects once that period concludes."[38] For Shoshitaishvili, analogies like these provide "hints of possible narrative approaches" that give artistic expression to the timescape of the Anthropocene, which emphasizes both temporal compression and protraction.[39] These approaches find more extensive development in video games such as *Outer Wilds*.

Conclusion

Heaven's Vault and *Outer Wilds* are two games that trace very similar stories. They both build complicated worlds of grand scope and convoluted history and invite players to reconstruct this history and to make sense of the present, whether by completing a timeline or by reverse-engineering what happened to an extinct species. Both games can be understood as future histories that challenge players to excavate the past in order to understand how environmental processes can suffer from long-term, even delayed disturbances because of anthropo-

38 Shoshitaishvili, "Deep Time and Compressed Time in the Anthropocene," 134.

39 Ibid., 135.

genic causes. Pertaining to a more immediate, embodied sense of time, both games also invite players to exploit the dynamic temporalities of their game environments, by stretching the present to make room for doubts, questions, and alternatives, or by exploiting the rhythms and revolutions of the solar system to gain access to various locations. But whereas *Heaven's Vault* advocates a politics of lingering, one that tells the player "not yet," *Outer Wilds* sensitizes players to the time of "now or never." Whereas *Heaven's Vault* emphasizes that there is always time to ask questions to defer the repetition of history and to try to divine the consequences of your actions, *Outer Wilds* argues that although this may be true at times, there will also come a moment when there is no more room for stalling if the future is to be saved.

Through close analysis of these two titles, this chapter has demonstrated that video games are apt spaces in which to look for new "time stories," given their engagement both textually and algorithmically with such themes as determinism, apocalypticism, entropy, urgency, and deferral. Chiefly, I have shown how video games can combine the temporal scope of big history with the more granular temporality that governs the proper timing of actions. In this way they can speak to the deepening of our temporal horizons as we realize that human history is embedded in the natural history of the Earth and the cosmos, subject to its fluctuations, while also paying heed to questions concerning how and when to act in situations of existential crisis.

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PART 2

Synchronization and Jams

4

Times of Traffic Jams: Toward a New Diagram of Social Time

Helge Jordheim

> At first the girl in the Dauphine had insisted on keeping track of the time, but the engineer in the Peugeot 404 didn't care anymore. Anyone could look at his watch, but it was as if that time strapped to your right wrist or the beep beep on the radio were measuring something else — the time of those who haven't made the blunder of trying to return to Paris on the southern thruway on a Sunday afternoon, and just past Fontainebleau, have had to slow down to a crawl, stop, six rows of cars on either side (everyone knows that on Sundays both sides of the thruway are reserved for those returning to the capital), start the engine, advance three yards, stop.
>
> — Julio Cortázar, "The Southern Thruway"[1]

The opening of the Argentine French author Julia Cortázar's 1966 short story "El Autopista del sur," published in English in

1 Julio Cortázar, "The Southern Thruway," in *All Fires the Fire, and Other Stories,* trans. Suzanne Jill Levine (Pantheon Books, 1973), 3.

1973 as "The Southern Thruway," puts the reader in the middle of a traffic jam on one of the highways leading into Paris on a Sunday afternoon when people are returning to the capital after the holidays. Across twelve lanes, "six rows on either side," traffic has come to an almost complete standstill, which will go on for several days. Cortázar's short story is supposed to have inspired the French director Jean-Luc Godard's apocalyptic satire *Weekend* from the following year, in which the couple-protagonists also get stuck in a traffic jam in the French countryside, documented in a famous seven-minute-long tracking shot covering around three-quarters of a mile of civilizational collapse. To this collection of culturally salient representations of traffic jams I add Joel Schumacher's highly underrated film *Falling Down* from 1993, starring Michael Douglas as Bill Foster, who leaves his car stuck in traffic and goes on a rampage through the urban wastelands of Los Angeles.

Indirectly, all these stories are about time, in a phenomenological sense: time wasted, boredom, the inability to move on or progress, and the rhythms of life, such as working, eating, drinking, sleeping, celebrating birthdays. In Cortázar's short story, the effect of the traffic jam on temporal experience is made explicit in the juxtaposition of the girl in the Dauphine who insists on keeping track of time by looking at her watch and the engineer in the Peugeot 404 who has come to see this as fruitless, since "it was as if that time strapped to your right wrist or the beep beep on the radio were measuring something else."[2] Of course, according to a purely mathematical, Newtonian understanding of time, this does not make sense, since time is universal and can be used to measure anything and everything. Time, according to Newton, is "independent of anything external," even a traffic jam. This is where the engineer begs to differ. After a certain while, after every hope of arriving on time and getting on with life is lost, clock-time no longer matters, or rather it matters for other people in other places; in the bluntly anti-Newtonian words of the engineer, it measures something else.

2 Ibid.

Although there are plenty of ways in which this contention found in Cortázar's short story does not make sense, there are also ways in which it does, and those will be the starting point for this chapter. I start from a hunch that the time of traffic jams might be meaningfully different from other times. In this book, we take as our initial presumption that time is embodied in and emergent from things — more precisely, the durations and lives of things, by themselves and as part of ecologies and networks. Many if not all these times are part of "the social," as something that is "assembled" through practices.[3] Times are embodied in networks and assemblages that include actors, objects, tools, technologies, infrastructures, intentions, and affects. Here I will attempt to make sense of the form of time that emerges from the socio-material practice that we refer to as "traffic congestion" or simply a "traffic jam."

First, what kind of time emerges from moments when vehicles that had been driving alongside each other at a fast pace are suddenly brought to a collective standstill, unable to move — or only at a very slow pace — and they stay like that for hours, even days on end? Second, what can these moments tell us about social and historical times more generally? Or with another turn of phrase: How can we understand the temporal fabric of modern industrialized and indeed motorized societies from the perspective of the traffic jam, as if congestion, not progressive movement, was the defining temporal form? Third, how — if at all — would it change our perception of social and historical time if we took the fundamental temporal diagram to be the multilane highway jammed with cars, rather than the single, uniform line, stretching endlessly into the past and the future, iconically represented by the open highway?[4]

3 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford University, 2007).

4 See, e.g., Ron Eyerman and Orvar Löfgren, "Romancing the Road: Road Movies and Images of Mobility," *Theory, Culture & Society* 12 (1995): 53–79.

Traffic Jams: A Phenomenological Look

For people living in or near a city of a certain size, driving a car means occasionally getting stuck in traffic, usually because they find themselves in the wrong place at the wrong time. Heading into the city center in the morning and out again in the evening or returning from a weekend away on a Sunday afternoon are the surest ways of getting caught in a traffic jam. Experiencing standstill, traffic moving at snail's pace or stop-and-go progression is often connected with feelings of regret and self-criticism. Why didn't I get out of bed earlier? Why didn't I wait for another hour before I left the office? These regrets may increase in intensity and transform into desperation and rage, as in the case of Bill Foster, a white, middle-age, divorced man unable to get home to his daughter's birthday, a man whose rage builds up and turns into violence.

In the history of traffic jams, nobody had more reason to regret getting into the car and going out onto the road on that particular day than those who for whatever reason were making their way by car from Jining in Inner Mongolia to Huai'an in Hebei Province, northwest of Beijing, on China National Highway 110, the Beijing–Lhasa Expressway, on August 13, 2010. The traffic jam that formed that day spanned more than 100 kilometers and lasted for two weeks, topping the *Forbes* list of the world's worst traffic jams.[5] Whereas all the other traffic jams on the list were caused by major external events, such as the Woodstock Music and Arts Festival in August 1969 in Bethel, New York, or the snowfall in Chicago in February 2011, this one just emerged, out of traffic flow itself. Many drivers experienced a minimum speed of one kilometer per day and reported being stuck in the traffic jam for five days.[6] They survived on water and noodles

5 Jim Gorzelany, "The Worst Traffic Jams In History," *Forbes,* May 21, 2013, https://www.forbes.com/sites/jimgorzelany/2013/05/21/the-worst-traffic-jams-in-history/#17d5c4f53e1a.

6 Natalie Stechyson, "Bumper to Bumper, All the Way to Beijing," *The Globe and Mail,* August 24, 2010, https://www.theglobeandmail.com/news/world/bumper-to-bumper-all-the-way-to-beijing/article562632/.

sold by local farmers at exorbitant prices and slept in their cars, which slowed down the queue even further.[7] In a wider perspective, the world-record traffic congestion on the Beijing–Lhasa Expressway had several external causes, most importantly the discovery of large coal deposits in Inner Mongolia, the product of which was brought to Beijing by trucks, since there was no other means of transportation. The coal trucks had worn down the roads, which were about to be closed for comprehensive damage repair and maintenance work when the world's largest traffic jam happened. As a result, drivers had been warned before and were not taken completely by surprise. In an interview with *The Guardian,* the coal truck driver Zhang states, "It took me three days last time....I am prepared. I have plenty of water."[8]

As the example from the Beijing–Lhasa Expressway from August 2010 illustrates, the phenomenology of traffic jams goes beyond individual affective responses, such as regret or rage, and also involves forms of communication, exchange, and sociability between drivers and people living along the road. In Cortázar's short story, published more than forty years earlier, social relations emerge, first between singular individuals, like the characters of the engineer and the girl in the Dauphine, then in groups, forming regular communities. As though stranded on a deserted island, drivers need to organize, forage for food and drink, care for the weak, defend themselves, send out reconnaissance expeditions, and take turns looking out for the group. They appoint a leader and distribute tasks according to abilities and resources according to needs. Children in different cars befriend each other, soon after their parents do the same. In short, a temporary social structure forms, only interrupted by the moments when everybody must get into their cars to proceed a few more meters forward.

7 Jonathan Watts, "Gridlock Is a Way of Life for Chinese," *The Guardian,* August 24, 2010, https://www.theguardian.com/world/2010/aug/24/china-60-mile-motorway-tailback.

8 Ibid.

In social sciences, the phenomenological study of what Mimi Sheller and John Urry call "automobility" began around 2000, spearheaded by sociologists such as Urry and geographers such as Nigel Thrift. Automobility, Sheller and Urry state, is "a complex amalgam of interlocking machines, social practices and ways of dwelling, not in a stationary home, but in a mobile, semi-privatized and hugely dangerous capsule."[9] In line with the two meanings of "auto" — referring reflexively to the human self and to machines that possess a capacity for movement — they recognize in the car driver "a 'hybrid' assemblage, not simply of autonomous humans, but simultaneously of machines, roads, buildings, signs and entire cultures of mobility."[10] In a similar vein, Thrift, drawing on the works of the French historian, philosopher, and Jesuit Michel de Certeau, argues that what he calls "the system of automobility" has produced "its own embodied practices of driving and 'passengering.'" Quoting Jeffrey Katz, Thrift moves beyond the phenomenological and entertains the idea that driving a car involves a "metaphysical merger" between driver and car "that generates a distinctive ontology in the form of a person-thing, a humanized car or, alternatively, an automobilized person."[11] Katz's analysis of this ontological merger also goes a long way in explaining Bill Foster's rage:

> Driving is a rich, indeed driven, stew of emotions which is constantly on the boil, even though cars prevent many routine forms of intersubjective expression from taking shape — indeed the relative dumbness of driving and especially its lack of opportunity for symmetrical interaction may be the key aggravating factor.[12]

9 Mimi Sheller and John Urry, "The City and the Car," *International Journal of Urban and Regional Research* 24, no. 4 (2000): 739.

10 Ibid.

11 Nigel Thrift, "Driving in the City," *Theory, Culture & Society* 21, nos. 4–5 (2004): 46–47. See also Jeffrey Katz, *How Emotions Work* (University of Chicago Press, 2000), 33.

12 Ibid., 47.

Sheller and Urry called their study of automobility "The City and the Car," whereas Thrift's path-breaking text is titled "Driving in the City." Both signal the extent to which the study of driving has emerged from and remains embedded in the study of urban space. In other words, the phenomenology — even the ontology of traffic — belongs in a phenomenology of space, or, in Sheller and Urry's words, how "changes in communication media are also linked to changes in the spatiality of the urban environment and public space."[13] That does not mean that time and temporality is ignored, rather that forms of time are always subjected to forms of space, even in their discussion of "timeless time" specific to cars and their drivers. As the example from the Beijing–Lhasa Expressway shows, however, traffic jams are not reserved for the "urban environment," which might not even be their primary location, unless by city or "urban environment" we mean the endless industrial and postindustrial wastelands around and between the planet's largest cities. However, my point here is not to question the spatialities of traffic jams, but rather to disentangle the connection between traffic jams and space somewhat, in order to ask a different question: What are the times of traffic jams?

The Paradoxical Times of Traffic Jams: Synchronization and Presentism

In general, time studies thrive on paradoxes.[14] Usually formulated in the language of physics, this genre of scientific thought was pioneered by the Greek philosopher Zeno of Elea in support of another philosopher, Parmenides, who famously claimed that neither motion nor change really exists.[15] Today, we know Zeno's

13 Sheller and Urry, "The City," 751.

14 See Robin Le Poidevin, *Travels in Four Dimensions: The Enigmas of Space and Time* (Oxford University Press, 2005); Ryan Wasserman, *Paradoxes of Time Travel* (Oxford University Press, 2020); and Carlo Rovelli, *The Order of Time* (Penguin Random House, 2018).

15 Nick Huggett, "Zeno's Paradoxes (2018)," in *The Stanford Encyclopedia of Philosophy,* ed. Edward N. Zalta, https://plato.stanford.edu/entries/

nine paradoxes — most prominently his story about Achilles and the tortoise — from Aristotle's *Physics*. Despite their long reception history, there is something deeply unsatisfactory about these carefully crafted stories. They do not feel real. Instead, they appear playful and stimulating, but also contrived and inconsequential. They take us into a world of willful abstractions and intellectual contrivances that fail to grant purchase on actual events.

I will start my analysis by arguing that traffic jams are temporal paradoxes taking on real-life qualities that go to the heart of social and historical existence. In Zeno's paradox, the fastest man in the Greek world, the demi-god Achilles, never catches up with the tortoise, but remains pinned to the spot because of the impossibility of change and movement. In the — more or less inverse — case of the traffic jam, an increasing number of people moving through the world at increasing speed end up in a gridlock, a congestion, a jam. For more than a century, the production of cars and building of roads have been speeding things up, as part of the historical process the geographer David Harvey called the "space-time compression" and for which sociologist Hartmut Rosa some years later coined the term *Beschleunigung,* "acceleration." Traffic jams occur when these processes accelerate to the point where they become gridlocked, jammed.

However, they are not the only example. In the space of a few days and weeks in February and March 2020, the world jammed. On January 30, Tedros Ghebreyesus, the director-general of the World Health Organization, declared "a public health emergency of international concern over the global outbreak of novel coronavirus."[16] After the declaration, borders immediately started to close and curfews were announced. Legal restrictions on movement and traveling were implemented, which under

paradox-zeno/.

16 Tedros Gebreyesus, "WHO Director-General's Statement on IHR Emergency Committee on Novel Coronavirus (2019-nCoV)," *World Health Organization,* January 30, 2020, https://www.who.int/news-room/speeches/item/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov).

normal circumstances would have taken years to even consider, let alone to adopt as legislation. For a few weeks, it felt like society was changing at an unprecedented speed — until suddenly everything just stopped. People all over the world still ask themselves whether the COVID-19 pandemic has ended, or just slowed down, awaiting the next mutation. All the while, the slow but steady buildup of climate emergency continues, approaching a future "tipping point," after which things will accelerate and go out of control.[17] The COVID-19 crisis, climate emergency, and traffic jams are all paradoxes of time, or rather of multiple times. These times, however, are not abstractions. Nor are they homogeneous, universal, and empty. They are embodied in things, in assemblages of things, in relations between things.

In a spatial sense, the main context for understanding traffic jams is the city, the "urban environment," in Sheller and Urry's phrase. From a temporal perspective, I will point to two possible contexts: synchronization and presentism. Every society bases itself on practices of synchronization, when multiple different and even conflicting times, inherent in lives and also in social and historical processes, are aligned and calibrated to form the *syn-chronos,* the "together-time." If we want to understand what Barbara Adam and others generally refer to as "social time,"[18] what needs explanation is not the fact that times are multiple, but rather the moments of synchrony, which can be more or less durable, even solidifying into temporal arrangements, institutions, modalities, or, as some will have it, "regimes."[19]

Discussions of these practices of synchronization often tend to gravitate toward questions of power. On the one hand, practices of synchronization evoke questions of control and discipline, even "governmentality," to use Michel Foucault's term:

17 David I. Armstrong McKay et al., "Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points," *Science* 377, no. 6611 (2022).

18 Barbara Adam, *Time and Social Theory* (Polity, 1994), 42–44.

19 For "regimes," see François Hartog, *Regimes of Historicity: Presentism and Experiences of Time* (Columbia University Press, 2015). See also Helge Jordheim and Espen Ytreberg, "After Supersynchronisation: How Media Synchronise the Social," *Time & Society* 30, no. 3 (2021): 402–22.

who controls whom, and who wields power over whom, by means of certain temporal standards or regimes.[20] On the other hand, some of the most intense moments of synchronization, historically speaking, are moments of disruption and revolution, in which synchronization emerges as a means of gaining political agency, as theorized by Marxists and post-Marxists, from Ernst Bloch to Slavoj Žižek.[21] In the following, I would like to suggest that we explore synchronization from another vantage point, one less steeped in human intentionality and agency, that is more hybrid and entangled, and explore what kind of critical purchase that could grant us on social, political, and moral issues. How would it change our view of social time if we perceived synchronization not as something that is being done, achieved, or imposed, but as something that happens as a result of inherent properties of the social that we have yet to understand? This is where traffic jams come in, which are at the same time moments of complete synchronization and of complete disruption of the productive and progressive rhythms of modern society.

If we scale up from social to historical time, many of the same ideas reemerge in discussions about "presentism." Again, the question raised is what happens when all forms of social energy, all past experiences and future expectations, come together in a present moment, a "now." This present is not turned toward the past, or to the future, but only inward toward itself. Whereas synchronization mobilizes the now to bring social and natural processes into the same rhythm, presentism produces a moment of stagnation and standstill, a moment when past and future disappear and the only temporality left is the present, al-

20 Michel Foucault, *Security, Territory, Population: Lectures at the Collège de France, 1977–1978,* trans. Graham Burchell (Picador, 2009). See also Sarah Sharma, *In the Meantime: Temporality and Cultural Politics* (Duke University Press, 2014), and Elizabeth Freeman, *Time Binds: Queer Temporalities, Queer Histories* (Duke University Press, 2010).

21 Ernst Bloch, *Erbschaft dieser Zeit* (Suhrkamp, 1985), and Slavoj Žižek, *The Fragile Absolute, or, Why Is the Christian Legacy Worth Fighting For?* (Verso, 2009).

beit a "broad" one, to use the literary critic Hans Ulrich Gumbrecht's term.[22] Theorists of presentism have offered contrasting normative framings for their analysis. Whereas French historian François Hartog perceives the presentist present as "monstrous" since it entirely swallows up the past and the future, Gumbrecht celebrates the end of the modernist fetishization of the future, which releases the affective and emotional intensities of the now.

Both these analytical frameworks, synchronization and presentism, are put to the test by the traffic jam. Every vehicle adheres to the same speed and rhythm, but only in the moment when all forward movement has been halted, and hence any meaningful relationship to the past and the future has been suspended. The only time that exists is a seemingly never-ending now. One aim of this chapter is to explore whether these two temporal forms, so dominant in current analysis of social and historical processes, can be better understood if we choose to approach them from the perspective of traffic jams. To achieve this, I am going to engage with the two traditions that have made traffic jams the center of attention for larger theoretical discussions: critical theory and nonlinear physics.

Traffic Jams in Critical Theory: Dialectics of Acceleration and Standstill

From Paul Virilio to John Urry and Robert Hassan, traffic jams have emerged as emblems of a specific dialectics of modernity, first formulated by Virilio as the law of "dromology," which states that an increase in speed increases the potential for gridlock.[23] Virilio controversially linked time, acceleration, and control of time to war and oppression. Speed, he argues, reduces every kind of spatial extension and multiplicity to a homogeneous, ever-accelerating "speed-space." Space dwindles and shrinks, compressed by instantaneous time.

22 Hans Ulrich Gumbrecht, *Our Broad Present: Time and Contemporary Culture* (Columbia University Press, 2014).

23 Paul Virilio, *La vitesse* (Flammarion, 1991), 65.

Drawing on the work of the Frankfurt School, scholars such as Hartmut Rosa, Ben Agger, John Urry, and Judy Wajcman analyze speed and acceleration as inherent to capitalist cultures and economies, with detrimental, even catastrophic, effects. According to Marxist dialectics of history, social, political, and economic features turn into their logical and ontological opposite: rationality into irrationality, civilization into barbarism, progress into reaction and reversal, acceleration into deceleration and standstill. In his theory of "social acceleration," the sociologist Hartmut Rosa analyzes traffic jams as an "unintended consequence of acceleration and dynamization" and as a "dysfunctional and pathological form…of deceleration."[24] However, Rosa's theory is not limited to cars and traffic. The dialectic of acceleration and standstill also pertains to a whole range of other social phenomena. Rosa recognizes comparable instances of slowdown and stoppage in human "depression" when "time stands still or turns into a toughened mass," "undesired unemployment," and "economic recession."[25] This is the "desynchronized high-speed society," in which both life and history are detemporalized. Individuals are unable to look beyond the present moment, to make decisions that transcend the current situation, and thus to plan for the future, whereas societies experience "the end of politics" when progressives want to conserve and conservatives want to move on.[26] In this way, the traffic jam is reduced to a physical instantiation of a Marxist dialectics of commodification and alienation, which leaves very little room for the temporal complexity signaled in the passage by Cortázar, the specific temporal and social productivity of the traffic jam.

Echoing Hartog's metaphor about the "monstrous present," British sociologist John Urry likens "automobility" to a "Frankenstein-created monster, extending the individual realms of

24 Hartmut Rosa, "Social Acceleration: Ethical and Political Consequences of a Desynchronized High-Speed Society," *Constellations* 10, no. 1 (2003): 15. See also Rosa, *Social Acceleration: A New Theory of Modernity* (Columbia University Press, 2013).

25 Rosa, "Social Acceleration," 15.

26 Ibid., 20–21.

freedom and flexibility whereby inhabiting the car can be positively viewed, but also constraining car 'users' to live their lives in spatially stretched and time-compressed ways." For his other metaphor, he retraces the steps of his Frankfurt School predecessors, suggesting that the car is in fact "really Weber's 'iron cage' of modernity, motorized, moving and privatized": "People inhabit congestions, jams, uncertainties and health-threatening city environments being encapsulated in a domestic, cocooned, moving capsule, iron bubble."[27] However, exactly this idea of "inhabitation," which Urry treats as a neutral durational term, opens up the traffic jam to a multiplicity of different lifetimes. In Cortázar's short story, the people who "inhabit" the several-day-long traffic jam outside of Paris have different ages and belong to different generations. Their work lives and private lives, along with their backgrounds, experiences, plans, hopes, and anxieties, differ radically from each other, but are brought together aligned and synchronized by the event of the traffic jam. These multiple times of traffic jams remain invisible when these highway events are reduced to a dialectics of speed, to collateral effects of the universal acceleration of modern society. If traffic jams, as I will claim in the following, are indeed some of the most important temporal diagrams of our time, we need a broader understanding of them, both in a social and historical context. For this, we must look elsewhere than the post-Marxist dialectics of speed. The other comprehensive theoretical body of work dealing with traffic jams is found in elementary, nonlinear physics. This is where I move now.

Traffic Jams in Nonlinear Physics

Traffic jams are moments of absolute synchronization — everyone doing the same thing at the same time — and simultaneously moments of absolute disruption of the productive and progressive rhythms of modern society. Thousands of people move, or, rather, try to move, absolutely in sync, with the un-

27 John Urry, *Mobilities* (Polity Press, 2007), 120.

intended and disruptive consequence that they come to a complete standstill. They cannot get anywhere. My suggestion in this chapter is to understand traffic jams less as emblems of a "dialectics of modernity" and more as surprising and indeed intriguing moments of synchronization, examples of temporal self-organization, and pattern formation, operating, so to speak, at the heart of the social time of human societies. On this note, we turn from critical theory to physics, more specifically, to the body of work that is often referred to as vehicular physics or simply traffic physics.

Traffic physics as a field was pioneered in the 1960s by the Russian physical chemist Ilya Prigogine, who received the Nobel Prize in 1977 for his work on complex systems and irreversibility, and who many outside of the field of physics will know for his cooperation with Isabelle Stengers, mainly in *The End of Uncertainty* (1997), subtitled *Time, Chaos, and the New Laws of Nature*. In this book, Prigogine and Stengers put the concept of temporal irreversibility front and center of their interest in physical systems, thus paving the way for what they term a "new science," dealing with nonequilibrium processes, self-organization, and dissipative structures. For Prigogine, many of these ideas came from his work on traffic jams.

In the 1960s and 1970s, Prigogine, together with the physicist Robert Herman, head of basic science at the General Motors Research Laboratories in Warren, Michigan, developed what they termed a kinetic theory of vehicular traffic.[28] In the simplest possible terms, Prigogine and Herman applied a kinetic theory of gases to vehicular traffic to describe how changes — so-called phase transitions — occur, from a gas to a liquid to a more solidified state, and back. The premise for this transfer of methods from one field to another is as obvious to them as it is stunning to readers geared more toward the humanities and social sciences. All one needs to do is to conceive of every car or vehicle as an elementary particle constrained to moving along a one-

28 Ilya Prigogine and Robert Herman, *Kinetic Theory of Vehicular Traffic* (American Elsevier, 1971).

dimensional trajectory, in other words, a road, or, more precisely, along one of the lanes on multilane highway. Building on Norbert Wiener's work on cybernetics, Prigogine and Herman open their book with the following consideration about how the new science of statistical, nonlinear physics can be applied to society at large:

> During the past few decades we have witnessed the growth of the branch of physics that deals with the behavior of large numbers of atoms or molecules. This type of physics is generally called "statistical physics." The first form of statistical physics was probably the kinetic theory of gases as formulated in modern times. On the whole, however, classical physics was mainly concerned with systems involving only a few degrees of freedom, as exemplified by the study of planetary motion or the motion of a pendulum. In recent years, the development of many body systems has led not only to a better understanding of conceptual features, such as the meaning of irreversibility, the organization of macroscopic system, and the approach to equilibrium or to steady states. We now ask: Is it possible to conceive a statistical physics in which the "objects" would be human beings instead of molecules?[29]

It follows a discussion of individual and collective behavior, in both physical and human systems. In passing, Prigogine and Herman address the problem that unlike particles, humans have both "microgoals" and "memory," which need to be included in the model, ideally without making it "so cumbersome that it loses all powers of prediction."[30] This is why they chose traffic-flow theory as what they call "a testing ground for the construction of a more general theory of human behavior": "Traffic flow can be measured…as any flow of fluid," since "each driver has in general only one single purpose" — to get from A to B as quickly

29 Ibid., xiii.
30 Ibid., xv.

as possible.[31] Furthermore, in what they call "collective flow," the "flow patterns become largely independent of the will of the individual driver; they express directly the overall behavior of the collectivity."[32] For a physicist — and maybe even for a historian — the real challenge consists in accounting for the lack of homogeneity and stability in these systems; thus any theory needs to be "sufficiently flexible to incorporate the nonlinear effects that describe 'adaptive behavior' of the driver population." At first, the reception of the book was rather dismissive, or skeptical, at best, objecting — much in the way a social scientist would — that the "analogy" of "vehicles as particles," as the reviewer in *Science* calls it, does not necessarily hold, and furthermore that the theory has not been and cannot be tested.[33]

My interest here concerns neither statistical prediction nor experimental testing, but rather what kind of time emerges from this flow of vehicle-particles in the moment it stops flowing and instead produces congestion, jams, and gridlock. Among the most influential and long-lasting outputs of the kinetic theory of traffic is the so-called fundamental diagram (fig. 4.1), which defines the relationship between flow rate and density of vehicles, or velocity (v) and concentration (c): $v = v(c)$. That mathematical models operate with linear time as an unquestioned premise should not come as a surprise. However, the gap between this mathematical, statistical model and what is happening in actual traffic, when small local perturbations might cause complete congestion both upstream and downstream, or, indeed, when the same thing can happen without any perturbation at all, actualizes the question about social time, or rather about time as an assemblage of various social factors, from human intentions, memories, and affects to infrastructure and weather.

In order to understand traffic flow, one needs to understand the spatiotemporal phenomenon of synchronization. The fun-

31 Ibid.

32 Ibid., xviii.

33 Frank A. Haight, "Vehicles as Particles," *Science* 173, no. 3996 (1971): 513, and Jan Chaiken, review of *Kinetic Theory of Vehicular Traffic,* by Ilya Prigogine and Robert Herman, *Physics Today* 25, no. 2 (1972): 56–57.

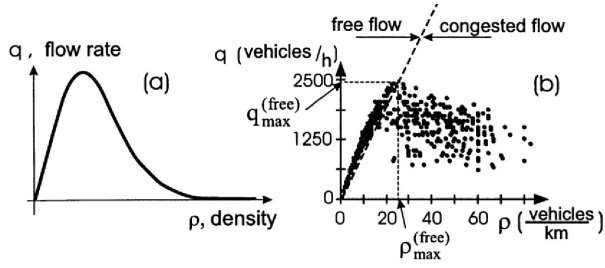


Fig. 4.1. Boris S. Kerner's fundamental diagram. Source: Boris S. Kerner, "Synchronized Flow as a New Traffic Phase and Related Problems for Traffic Flow Modelling," *Mathematical and Computer Modelling* 35 (2002): 482.

damental diagram with its linear understanding of time, by which density of traffic increases and velocity goes down, cannot explain or predict why traffic flow suddenly breaks down, seemingly for no reason. A scientist who made it his career to show the insufficiency of the fundamental diagram was the Russian physicist and engineer Boris S. Kerner, who emigrated from Russia in 1992 and started working for Daimler in Stuttgart. Since then, he has emerged as the world's foremost traffic physicist. In the second half of the 1990s, Kerner and his colleague Hubert Rehborn organized a series of experimental observations on a busy section near Frankfurt in Germany of the Bundesautobahn A5 connecting Giessen in Germany with Basel in Switzerland. Using a network of sensors underneath the highway, they measured the speed of every vehicle, and a computer calculated the average vehicle speed and the flow rate in one-minute intervals for each lane of traffic. They found that although bottlenecks are the most frequent, they are certainly not the only cause of congested traffic. Different self-organizing processes are responsible for features of real traffic congestion. To account for the many strange and unexpected congestion events and processes taking place on a multilane road, such as breakdown, hysteresis, and stop-and-go phenomena, the transition from free to congested flow in the fundamental diagram was too simplistic. Based on his and Rehborn's empirical obser-

vations, Kerner introduced a new, third traffic phase in order to account for the complex effects of synchronization, what he calls "synchronized flow."[34]

Kerner observed striking contrasts between phase transitions of traffic and what he calls "actual" phase transitions, between the solid, liquid, and gas states. Whereas the gas state, for example, is an equilibrium state, Kerner says that "the various phases of traffic are not in equilibrium and can exhibit a wider range of behavior," which includes "the spontaneous formation of spatial-temporal patterns that are, in a general sense, similar to those observed in low-temperature plasmas, chemical reactions, lasers and other non-equilibrium systems."[35] According to the work of Prigogine, Herman, and others, traffic was thought to have two states: "free flow" and "congested flow."[36] Revising the theory, Kerner introduced a third phase: "synchronized flow." Synchronized flow occurs, he argues, when there is a tendency toward synchronization of vehicle speeds across different lanes on a multilane road in a continuous flow of traffic, since density of traffic makes overtaking impossible. All cars across all lanes on a multilane road drive at the same speed, in absolute and complete synchrony. In *Sync,* the mathematician Steven Strogatz studies statistical patterns of synchronization in nature and in human societies, from the congregation of fireflies to people clapping after a concert, in order to understand "how order emerges from chaos in the universe, nature, and daily life."[37] In a way, what Kerner and his colleagues study is the opposite — how "chaos," in the sense of societal and indeed individual disruption, emerges from "order." "Synchronized flow" represents the most efficient and orderly use of the road to transport people from A to B. However, it constantly borders on total congestion and gridlock, which in a society absolutely

34 Kerner, "Synchronized Flow as a New Traffic Phase and Related Problems for Traffic Flow Modelling," 481–508.

35 Boris S. Kerner, "The Physics of Traffic," *Physics World* 12, no. 8 (1999): 27.

36 Ibid.

37 Steven H. Strogatz, *Sync: How Order Emerges from Chaos in the Universe, Nature, and Daily Life* (Hachette Books, 2012).

based on transportation and communication is analogous to chaos. That explains why Godard begins his film about the collapse and disintegration of capitalist bourgeois society with a seven-minute-long tracking shot of a traffic jam. In many ways, Schumacher's *Falling Down* deals with the same topic, centered on the figure of Bill Foster, who feels a lot like a Greek tragic hero, straddling the border between cosmos and chaos, before he succumbs to the second.

On the basis of experimental observation, Kerner documents that synchronized flow — different from free flow — shows very complex dynamic behavior. For one thing, there can be many different steady speed states. The speed of a vehicle in a state of synchronized flow may be related to an infinite number of vehicle densities, and, the other way around, a given density may be related to an infinite number of speeds. Even more complex are the possible transitions between different traffic phases. Phase transitions can happen spontaneously, because of what Kerner calls "some intrinsic nonlinear properties of the flow" and without the intervention of external factors such as on-ramps, off-ramps, or bottlenecks.[38] In other words, at the core of human communication and transportation, there is a phenomenon that can be seen to escape all kinds of intentional meaning or agency and instead is governed by the self-organization and pattern-formation properties of nonlinear physics. For Kerner and his colleagues, and for mathematicians and physicists in this field, the next challenge is "to develop new mathematical and theoretical concepts to explain these features." For me, the next challenge lies elsewhere.

A New Diagram of Social Time

Traffic jams can be understood in different ways, as symptoms of an inherent dialectics of modernity or as statistical patterns describing forms of synchronization, free flow, and gridlock. In both cases, a familiar model of time is queried: on the one hand,

38 Kerner, "The Physics of Traffic," 29.

the historical time of progress, on the other, the clock-time of capitalist work-discipline. Schumacher's *Falling Down* is a representation of the violent consequences when linear time, the steady rise to power of the white male and the equally steady increase of productivity in capitalist societies, is brought to a halt. The affective response is rage, the pragmatic response violence. In the final part of this chapter, I will invert the perspective in order to ask how we might analyze traffic jams not as deviation from free-flowing linear time, but as a kind of social time in its own right, a temporal assemblage in the form of a diagram.

Since the beginning of the nineteenth century, the road, and increasingly the highway, has been one of the most effective and widespread diagrams of linear, homogeneous time, visualizing endless movement into an open future, epitomized by the genre of the road movie. However, a 100-kilometer-long traffic jam, spanning as many as fifty parallel lanes, packed with unmoving cars, presents us with a very different diagram of time, which in the case of Godard produces a very different kind of road movie. In general, our human relationship to time is dependent on diagrams: the clockface, the calendar-grid, the timeline. All of them visualize the passing of time by means of spatial form. These forms constitute some of the most prevalent spatial standards for assembling, comparing, and synchronizing different durations, or lifetimes. All claims for universal, absolute, and homogeneous times rest on such forms. In other words, they are diagrams of temporal singularity and homogeneity, rather than temporal multiplicity and heterogeneity, at least on the face of it. Whereas clockfaces and physical calendars are made increasingly obsolete by other technologies of time-mediation, the timeline only increases its dominance over the Western temporal imagination. Along it, events can be plotted at regular or irregular intervals, at specific paces and rhythms, even though they belong to completely different lives, narratives, fields, cultures, or geographical areas.[39]

39 See Helge Jordheim, "Mending Shattered Time: 22 July in Norwegian Collective Memory," in *Heritage Ecologies,* ed. Torgeir Rinke Bangstad and

Many histories have been written about how these exact spatial forms became the dominant tools for measuring and managing time in Western and global culture.[40] The clock represents the circular movement of the sun, adapted from the sundial, whereas the timeline reproduces the linear trajectory of objects or people — or indeed vehicles — moving through space, from A to B. To presume that these diagrams are abstract tools for visualization, and thus belong squarely in the realm of epistemology, might be too hasty a conclusion. All of them come with strong and diverse ontological presuppositions, brought out by sciences such as astronomy and physics, or in the early modern period by natural philosophy.

The traffic jam presents to us a very different diagram of time, a different way of organizing the relationship between temporal multiplicity and temporal uniformity, and not least another ontology. According to Kerner, traffic is a self-synchronizing system, which at any moment can suddenly shift from flow to congestion, from cosmos to chaos, and back, without any obvious causes except for those internal to the system itself. These shifts lie beyond human control or even human agency. This means that social time has a strangely nonlinear element in its midst, one that cannot be approached with the usual theories of human behavior and social structure. Traffic jams, then, are moments of complete synchronization and complete disruption at the same time.

As temporal assemblages, such as the ones represented by Cortázar, Godard, and Schumacher, traffic jams involve much more than vehicle-particles moving along a straight line from A to B. It is not just the driving itself that is synchronized but more specifically the speed and movement of the vehicles, along with the lives and lifetimes of the people who drive them. Before getting into their cars, most people stuck in the morning

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Þóra Pétursdóttir (Routledge, 2021), 185–207.

40 David S. Landes, *Revolution in Time: Clocks and the Making of the Modern World* (Belknap Press, 2000), and Daniel Rosenberg and Anthony Grafton, *Cartographies of Time: A History of the Timeline* (Princeton Architectural Press, 2012).

rush have had breakfast, perhaps a cup of coffee, and before that they got out of bed, got dressed, and so on. After arriving at their destinations, most of them will enter a building and start their workdays, more or less at the same time, depending on the speed or lack of speed of the synchronized flow of traffic. In E.P. Thompson's analysis "Time, Work-Discipline and Industrial Capitalism" (1967), the English historian describes the shift from preindustrial, "natural work rhythms," which are task-oriented and continue till the task is completed, to early industrial ones, in which "time is money" and there is a synchronization of labor, in order to maintain discipline and to avoid idleness.[41] The combination of industrialization, industrial capitalism, and large-scale machine-powered industry involves a minute subdivision of labor to facilitate larger-scale production and cheaper goods, which again leads to time-thrift, new labor habits, new time-discipline, clear demarcation between work and life, and so on. The time-discipline of industrial capitalism demands that workers all appear at their workplaces at the same time, and at the same time every day. Historically, the demand for industrial labor also meant that people moved to areas in and around cities, thus bringing about the socio-historical precondition for the traffic jam and the flow of synchronized life.

Industrial capitalism created the social, technological, and economic conditions for the traffic jam. Even though the industrial age in some parts of the world has been superseded by the postindustrial one, in which the service and information sectors generate more wealth than the manufacturing sector, there are no signs that traffic jams will disappear. After a small slump during the COVID-19 pandemic, traffic picked up. In other words, gridlock and congestion are as much an inherent part of modernity — often used as a catchphrase for these developments — as progress, growth, and innovation. At the center of modernization is another diagram of social time that does not prioritize the fastest possible movement of singular individuals from A

41 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (1967): 56–97.

to B, so singular and so detached from their surroundings that they can count as particles, but instead the convergence of innumerable people in their cars at the same place at the same time. Thus, the question arises as to what extent the diagram of speed and acceleration should rather be interpreted as a diagram of communication, and possibly even community, brought about by gridlock.

My point is an analytical one: to analyze what happens if we replace the diagram of time upheld by the infrastructure of the road and the linear motion of the vehicle-particle with another, more complex, assemblage-like diagram based on the infrastructural ontology that dominates most of the metropoles of the world today, the congested multilane highway. To change the diagram, we start with the question of agency. As long as the vehicle-particles have speed and direction, and even a defined goal, the drivers will keep their eyes fixed on the road in front of them; the higher the speed, the further ahead the drivers will need to direct their gaze. Other "microgoals" or elements of "memory," which Prigogine and Herman were worried about, will only be allowed to the extent that they help in navigating the car and accelerating the forward movement. As soon as traffic congests and the vehicles no longer move, however, the attention of the drivers changes. Microgoals and memories return, and the mind starts to wander. The driver changes from a forward-moving particle to a point of convergence between pasts, presents, and futures, an asymmetrical interface between "spaces of experience" and "horizons of expectation," to use the phrases of the German historian Reinhart Koselleck.[42] Forward movement is still the primary vector, caught up by experiences of the past, both the immediate and the longer term. Conversations at the breakfast table, childhood memories, and even the deep time of climate change followed by pangs of regret for fossil fuel emissions. In the "broad present" (Gumbrecht) — the "wide traffic jam" (Kerner) — futures are planned, prognosti-

42 Reinhart Koselleck, *Futures Past: On the Semantics of Historical Time,* trans. Keith Tribe (MIT Press, 1990), 267–88.

cated, and projected. Some are immediate and involve making phone calls and writing emails — what is going to take place at work that day, what the dinner plans for tonight are. Others are longer term, such as financial worries, health problems, bucket-list plans. In this way, the present of linear forward motion, in space and in time, is turned into a complex phenomenological and historical time structure, bringing together pasts, presents, and futures.

Furthermore, the singularity of the vehicle-particle, the mathematical representation of the individuality of the driver, is suspended as soon a traffic congests and stops. Eyes fixed on the far horizon of the next curve or off-ramp are free to roam. Drivers start studying people in the vehicles at their sides, in adjacent lanes, or in front of them. As long as traffic flows at a reasonable pace, all people are drivers, and they only exist through their behavior as drivers, keeping the vehicle in the lane and keeping up with the traffic in front of them. They are like elementary particles, on a one-dimensional trajectory, defined by a certain position and speed. As soon as the cars are brought to a halt, however, when traffic jams and congests, they transform from mere drivers, defined alone by their practices and abilities as drivers, to humans, persons, individuals, with innumerous other characteristics and qualities. In other words, their lifetimes, that is, the entangled durations that make up their lives, can no longer be reduced to one-dimensional, linear movements through space. People in their vehicles live their separate lives, which have their own specific directions, durations, speeds, and rhythms. These lives become synchronized by the time-discipline of industrial or indeed of postindustrial capitalism as part of the synchronized flow of traffic that might any time become a traffic jam.

To peek into someone else's car is to peek into someone else's life. Some drivers are young, others old; some are male, others female; some are dressed to impress, others sport dirty overalls; some are daydreaming, some talking on the phone, or writing emails; some are eating, drinking, listening to the radio, and so on. These multiple times unfolding in the multiple lives making

up traffic on any regular day in almost any city worldwide rarely catch our attention until traffic is jammed and the forward movement, both spatially (on the road) and temporally (in the day), is brought to a halt. The loss of any reason to keep our eyes on the road prompts us to look sideways. Just as the forward-directed gaze is linked to a forward-moving, linear, homogeneous time, the sideward glance, out of any of the windows of the car, produced by the experience of physical standstill and loss of direction, transforms time into something heterogeneous, individual, and multiple, distributed across the space of the lanes of traffic. At this point, the diagrams of traffic physics, documenting flow, synchronized flow, and congestions, become diagrams of social time. Cars transform from elementary particles moving along one-dimensional lines to vehicles of human lives and lifetimes, moving from the past through the present and into the future, stacking up experiences and entangling durations on the way. The single timeline and its main cultural representation, the open, endless road, is replaced by another diagram: the multiple, parallel lines of the traffic jam, getting entangled with each other by the cybernetic laws of traffic physics.

Conclusion

In Cortázar's short story, the traffic jam as a diagram for multiple lifetimes, which forms on the highway as a result of some inherent nonlinear properties of the movements of cars and the lives of their drivers, comes into view in the moment it dissolves, when the cars start moving again:

> The line got moving again, slowly for a few minutes, and later as if the thruway was completely free....There was nothing to do but give in to the pace, adapt mechanically to the speed of the cars around, and not think. His leather jacket must still be in the soldier's Volkswagen. Taunus had the novel he had been reading the first few days. An almost empty bottle of lavender water was in the nuns' 2CV. And he had, there where he touched it at times with his right hand, the teddy bear

> Dauphine had given him as a pet. He clung absurdly to the idea that at nine-thirty the food would be distributed, and the sick would have to be visited, the situation would have to be examined with Taunus and the farmer in the Ariane; then it would be night, Dauphine sneaking into his car; stars or clouds, life.…And on the car's antenna the red cross flag waved madly, and you moved at fifty-five miles an hour towards the lights that kept growing, not knowing why all this hurry, why this mad race in the night among unknown cars, where no one knew anything about the others, where everyone looked straight ahead, only ahead.[43]

Traffic jams are not just assemblages of materials, technologies, and affects. Rather, they present us with a diagram of temporal multiplicity, visualizing how different durations unfold in parallel, but also how they affect and come entangled with each other. Too often turned into an emblem for the dialectics of modernity, we learn more about traffic jams and indeed about social and historical time by analyzing them as diagrams of multiple lifetimes. Inspired by perspectives from nonlinear physics, the traffic jam emerges as diagram visualizing times in plural as parallel lanes, thus replacing the diagram of the singular timeline of progress. Multiplicities of time and processes of synchronization and desynchronization can be observed in all parts of human life, on the micro-level of the traffic jam and on the macro-level of history. Studying traffic jams can help us in finding answers for three questions that come up several times in this book, and, indeed, in critical time studies more generally: Where should we turn to look for new diagrams of social and historical time, which have the potential to complement or even replace the clockface, the physical calendar, and the timeline? What kinds of diagrams have the potential to represent temporal multiplicity, allowing for various durations to be included in the same spatial configuration? How do we discuss diagrammatic forms that bring together, assemble, and entangle radically different,

43 Cortázar, "The Southern Thruway," 28–29.

even incompatible times and durations, such as the nonequilibrium, cybernetic times of nonlinear physics, the phenomenological times of the everyday, and the collective times of history?

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5

Temporalities Out of Place: Social Entrainment in a Pandemic

Einar Wigen

Introduction

We live our everyday lives according to rhythms, regular patterns of repeated actions over time.[1] Some of these are like Herder's rivers and elephants, each with their own pulse that is irreducible to any other's and unaffected by the world around. Others are shared. This sharing is a key aspect of socializing, since social time is synchronized time. In a polyrhythmic world, much effort is expended in bringing temporalities together and making social rhythms to common beats.[2] This is the work of synchronization, which takes place both at a macro scale — in history books, novels, and works of scientific inquiry — and in the everyday.[3] These everyday synchronizations are often spe-

1 In addition to the Lifetimes group, I would like to thank Jan Martin Smørdal for the conversations that sparked the chapter idea.

2 Stephen Kern, *The Culture of Time and Space, 1880–1918,* 2nd ed. (Harvard University Press, 2003).

3 Helge Jordheim and Espen Ytreberg, "After Supersynchronisation: How Media Synchronise the Social," *Time & Society* 30, no. 3 (2021): 402–22.

cific to sites, where individuals synchronize with the social time in a place and a group when they go there physically. Physically segmenting is a way for individuals to relate to many different rhythms, zoning in and out of them according to where they are. During the COVID-19 pandemic, the physical sites where this everyday synchronization took place became inaccessible. Individuals were sent home in what may be seen as an act of explicit *a*socialization. "The everyday micro-practices that normally sequence and materialize the multiple, competing, and entangled temporalities of the everyday came to a standstill," writes Tine Damsholt.[4] The whole point was to avoid socialization that could disseminate the virus, but in doing so it closed established physical arenas for joint actions. In one way, the situation made each individual pulse more important in people's lives, while relying more heavily on technological mediation for synchronization. When authorities closed schools, workplaces, and places of leisure in March 2020, social interaction was increasingly mediated via communication technology. Except for "critical" workers, who continued to go to work in the physical sense of the word, individuals increasingly did everything from their homes.[5] In other words, the pandemic's "social distancing" — withdrawing from most physical aspects of social interaction — brought all the rhythms together into the same physical space. As the distinctions between the sites evaporated, rhythms were no longer separated but often coexisted or competed for individuals' attention.

This, I will argue, provides a new perspective on how we can understand the pandemic everyday as a temporal phenomenon. Social distancing made everyone's own pulse more dominant in their lives, but communication technology also brought about hypersynchronization to a high-paced stream of crisis news.[6]

4 Tine Damsholt, "Selv tiden står stille: Hverdagslivets mange tidsligheder under en nedlukning," *Tidsskrift for Kulturforskning* 1 (2021): 23.

5 Ibid., 23–24.

6 For the synchronizing work done by crisis, see Helge Jordheim and Einar Wigen, "Conceptual Synchronisation: From Progress to Crisis," *Millennium: Journal of International Studies* 46, no. 3 (2018): 421–39.

Moreover, people tried to synchronize through technological means that did not have the rules and etiquette established for coordinating such elaborate interactions. The pandemic experience, then, is a fertile field for reflection upon the temporalities of the everyday, and the interactions between individual and collective temporalities. In this chapter, I develop some analytical tools to make sense of pandemic everyday experience and use these to inform our understanding of social time more broadly.

Using Henri Lefebvre's concept of the *everyday* and William McNeill's *embodiment* to analyze pandemic temporalities, I develop three concepts. The first is that of *rhythms as joint actions,* created neither by you nor by me, but emerging socially in the dialogical interaction between us. The point is to further develop Lefebvre's *rhythmanalysis* to account for those social rhythms whose origins are unclear, aggregate, and collective. The second is to take the biophysiological concept of *entrainment* — where an organism makes some external pulse dominant in its functioning — into analysis of these socially constituted rhythms. There are many rhythms that have a natural or biological origin, but entraining to them in a metaphorical dance that involves other humans is a social act, even if it is not conscious or voluntary. This, and the social bonding that collective bodily entrainment engenders, is what William McNeill's *Keeping Together in Time* is about.[7] Third, I paraphrase Mary Douglas to make the claim that disturbances are *temporalities out of place* and argue with Lefebvre and Jacques Lafitte that the colonization of everyday life by information technologies makes possible ever-more such out-of-place temporalities.[8] This is all brought together in an analysis of the paradoxical pandemic experience, which amounted to a form of temporal intensification while being isolated at home at a safe distance from other people.

7 William H. McNeill, *Keeping Together in Time: Dance and Drill in Human History* (Harvard University Press, 1995).

8 Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (Routledge, 1966).

Joint Action

The rhythms in our lives have many origins, both social and natural. They are varied, multiple, and change over time. Many of these have their own beats that are out of sync with one another. Without some level of synchronicity, the social aspect disappears. Some of these social rhythms have a clear origin in the role of a single conductor, drill sergeant, work foreman, or metronome, providing the beat to which many others are made to play, march, or work. In these cases, it is often an explicit distribution of power and roles that makes one person a drill sergeant and the others "marching" to their beat. More often, it is unclear where exactly the rhythm emerges from, not because the drill sergeant is hidden, but because the rhythm has many origins and emerges as a *joint action*.[9] Joint action was originally developed by John Shotter as a concept that explains how people engage in a conversation, but I argue that it works also for nonverbal social interaction. The point of departure is that instead of looking at what someone speaks *out of,* Shotter asks what rhetorical situation someone speaks *into*. Since these rhetorical situations are not of a particular speaker's own making and the conversation that ensues is the result of more than one participant, the conversation that unfolds is a process of joint action, with neither side's intentionality directing the conversation. So it is also with social rhythms that emerge as joint actions:

> Joint action has two major features: It gives rise to *unintended consequences,* that is, outcomes which are not intended either by *you* or by *me,* but which are in fact *our* outcomes. However, as they cannot be traced back to the intentions of any particular individuals, it seems *as if* they have a "given," "natural," or "externally caused" nature, that is to say, they are *real* in the sense of being independent of the desires or opin-

9 John Shotter, *Cultural Politics of Everyday Life: Social Constructionism, Rhetoric and Knowing of the Third Kind* (University of Toronto Press, 1993).

> ions of any of the particular individuals involved. Also, as human activity, joint action still has *intentionality,* that is, at any one moment in time the outcomes people construct between them have a meaning or significance, such that only certain further activities will "fit" and be appropriate, while others will be sensed as unfitting and inappropriate and will be ignored or even sanctioned. In other words, as an outcome of the joint action between them, people find themselves "in" a seemingly "given" situation, an "organized" situation that has a "horizon" to it and is "open" to their actions. Indeed, its "organization" is such that the constraints (and enablements) it makes available influence, that is to say, "invite" or "inhibit," people's next possible actions.[10]

This is also how mathematician Steven Strogatz argues that in nature, order emerges out of seeming chaos, through the timing of movement in relation to immediate surroundings.[11] This timing of actions in relation to others produces a new socially constituted rhythm. Examples include the academic calendar, the meetings and events in a research collective, and the sporting calendar, all of which have rhythms within them and also repetitions between the duration of one and the start of the next.

Although joint actions require coordinations, and Strogatz argues that these coordinations emerge through movement timed according to our immediate surroundings, they are deeply enmeshed in power relations. "The temporal operates as a form of social power and a type of social difference," writes Sarah Sharma. "Focusing on the issue of fast or slow pace without a nuanced and complex conception of the temporal does an injustice to the multitude of time-based experiences specific to different populations that live, labor, and sleep under the auspic-

10 Ibid., 47. Italics original.

11 Steven Strogatz, *Sync: How Order Emerges from Chaos in the Universe, Nature, and Daily Life* (Hyperion, 2003).

es of global capital."[12] Most of these temporalities are lived out in the everyday. As theoretically developed by Henri Lefebvre,

> "everyday life" refers to the dull routine, the ongoing go-to-work, pay-the-bills, homeward trudge of daily existence. It indicates a sense of being in the world beyond philosophy, virtually beyond the capacity of language to describe, that we know simply as the grey reality enveloping all we do. In this sphere of nonwork relations we live out our lives with our acquisitions, compulsions, and fears.[13]

The everyday is by definition uneventful. As soon as something can be classified as an event, it is extraordinary. Lefebvre talks of three kinds of time that together make up the everyday:

1. free time (leisure time)
2. required time (work time)
3. constrained time (traveling time or time for bureaucratic formalities)[14]

The basis for this is what Jordheim and Ytreberg call "the dream of supersynchronization,"[15] where all parts of a nation are supposed to be synchronized to one another, and in Lefebvre's case idealized the union-negotiated eight hours of work, eight hours of leisure, and eight hours of sleep. But these are not *times,* nor are they temporalities. They are allotted intervals of the day and week, into which certain activities may be classified. For E.P. Thompson, this particular rhythm is the cultural outcome of

12 Sarah Sharma, *In the Meantime: Temporality and Cultural Politics* (Duke University Press, 2014), 9.

13 Philip Wander, "Introduction to the Transaction Edition," in Henri Lefebvre, *Everyday Life in the Modern World,* trans. Sacha Rabinovitch (Continuum, 2002), vii–viii.

14 Stuart Elden, *Understanding Henri Lefebvre: Theory and the Possible* (Continuum, 2004), 115.

15 Helge Jordheim and Espen Ytreberg, "After Supersynchronisation: How Media Synchronise the Social," *Time & Society* 30, no. 3 (2021): 417.

the imposition of power, where industrialized societies organized time in a very specific manner in the service of capital.[16] Although probably sympathetic to Thompson's take, Lefebvre seems to take the tripartite scheme as more or less total for his contemporary society, but in so doing leaves out many social groups, such as farmers, academics, students, and occasional workers, for whom the division between the three different kinds of time was not necessarily as predictable. Moreover, as a burgeoning literature on time shows, this appears to be increasingly the case for more segments of society.[17]

Entrainment

All this means that except through some active effort, either individually or collectively, the various unsynchronized rhythms of everyday life only occasionally add up. It takes effort to time our movements appropriately, maintaining and keeping up with the various rhythms in our lives. As with dance, it is sometimes as if the rhythms *move us,* even in more mundane activities.[18] In biomusicology and chronobiology, synchronization of an organism to an external pulse is known as "entrainment." Entrainment occurs when rhythmic physiological or behavioral events match their period to that of an environmental oscillation. What is crucial here is that an external pulse becomes the pulse of the organism itself. Once given, the entrained organism maintains that pulse and does not necessarily need the external pulse to keep going. It also does not imply becoming the only pulse available, because the surrounding world is still one of Herderian polyrhythmicity. As biological beings, one obvious such rhythm is the circadian one: regular repetitions of darkness and light, night and day, and our movements and behaviors

16 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (1967): 56–97.

17 Sharma, *In the Meantime*; Judy Wajcman, *Pressed for Time: The Acceleration of Life in Digital Capitalism* (University of Chicago Press, 2014).

18 Jonna Katariina Vuoskoski et al., "Feeling Moved by Music: Investigating Continuous Ratings and Acoustic Correlates," *PLOS ONE* 17, no. 1 (2022).

timed accordingly. Related to this, but with longer cycles of repetition, is the rhythm of the seasons. However, we are not only entrained to natural rhythms. We entrain also to socially constituted rhythms. Whereas McNeill emphasizes the bodily feeling of becoming subsumed into a greater whole by moving in a synchronized manner, I would argue that this is crucial also at a more generalized level of social interaction. Socializing, then, is to some extent synchronizing our actions with someone else's. The workplace is a social arena *because* we go there at the same time as others and follow more or less synchronized routines through the working day in a manner that takes into account the movements of others. This may not be the primary intention behind going to work, but in practice synchronization and socialization are often two sides of the same coin.

Our everyday lives may sometimes seem a matter of routine — as they do in Lefebvre's conceptualization — and in addition to natural repetitions of seasons, day and night, and drill instructor-like power relations, there are laws and regulations. Nevertheless, most individuals live their everyday lives by negotiating and fitting these various rhythms together in a patchwork that is both the basis and the product of much social interaction. To illustrate this point, I will take Immanuel Kant as an example of someone who limited such negotiation:

> His behaviour was such a model of regularity that some called him "the Königsberg clock." On teaching days, when he emerged from his house, people knew it was exactly eight o'clock. At ten to, he had put on his hat; at five to, he had picked up his stick; and at dead on eight he stepped out of his door. He said of his watch that it was the last possession he would part with....His life was as exactly ruled as music manuscript paper. He was awoken each morning at five o'clock, never later. He breakfasted on a couple of bowls of tea, then smoked a pipe, the only one of the day. On teaching days, he would go out in the morning to give his lecture, then resume his dressing-gown and slippers to work and write until precisely a quarter to one. At that point he would dress again to

> receive, with enjoyment, a small group of friends to discuss science, philosophy and the weather....Then it was time for his walk. Rain or shine, it had to be taken. He went alone, for he wanted to breathe through his nose all the way, with his mouth closed, which he believed to be excellent for the body. The company of friends would have obliged him to open his mouth to speak. He always took the same route, so consistently that his itinerary through the park later came to be called "The Philosopher's Walk." According to rumor he only ever altered the route of this daily constitutional twice in his life: to obtain an early copy of Rousseau's *Émile,* and to join the scramble for hot news after the announcement of the French Revolution. On returning from his walk, he read until ten o'clock, then went to bed (he only ate one meal a day), falling asleep immediately.[19]

This presentation of Kant's everyday life stands out by how it shows him limiting the temporal joint actions that produce social rhythms. Even those we imagine living lives almost entirely free of social obligations still do synchronize with others. Sharma has coined the concept "power-chronography" to make visible the entangled and uneven politics of temporality, where people pace themselves to someone else's requirements.[20] She is right about the power aspects, but there is also the skill that is required of individuals to handle the multiplicity of rhythms — some of them enforced directly, some of them fainter — which is the key to agency. If social time is synchronized time that often emerges through joint action, then social skill (or at least part of it) is the ability to time oneself appropriately — to do the right thing at the right time, knowing when to be where and do what. A key aspect of Sharma's power-chronography is what she calls "the expectation that one must recalibrate. To recalibrate is to learn how to deal with time, be on top of one's time, to learn when to be fast and when to be slow. Recalibration…accounts for the

19 Frédéric Gros, *A Philosophy of Walking,* trans. John Howe (Verso, 2014).
20 Sharma, *In the Meantime.*

multiple ways in which individuals and social groups synchronize their body clocks, their senses of the future or the present, to an exterior relation — be it another person, pace, technology, chronometer, institution, or ideology."[21]

Kant did have a servant, but one crucial aspect of master–servant relations is that the servant has to time his actions to fit the master's rhythm. The lecture is another such occasion where there is social interaction, but the lecture as a genre and a format is a one-way form of communication, where the lecturer does not have to take the listeners' rhythms into account.[22] Then there is meeting friends at quarter to one. This may have been negotiated at some point, but it seems more likely that this is a case of others fitting their everyday rhythms into Kant's schedule. Apart from these two world-historical events mediated into Kant's life from afar — and we can assume there were others — it seems Kant lived his everyday life entrained mostly to his own pulse.

Kant is not the only example of someone living his everyday life according to a very regularized rhythm. Another example of this are monks, who often live the same regularized everyday in synchrony. The Benedictine monk's seven prayer times of lauds (dawn), prime (sunrise), tierce (midmorning), sext (noon), none (midafternoon), vespers (sunset), and compline (retiring), to which one can add the midnight office (matins), create a rhythm that can and has been repeated with little variation over the centuries.[23] These prayer times sound very familiar to someone often working with Islamic materials, since the principle of prayer times being used to both provide social rhythm and to tell the time of day is something that is still present in public space in most Muslim countries. It is also the basis of Avner Wishnitzer's excellent book on the cultural history of social time in the Ottoman Empire, where the change from clocks based

21 Ibid.

22 University pedagogics courses will now tell lecturers to do so.

23 *The Holy Rule of St. Benedict by Saint Benedict, Abbot of Monte Cassino,* trans. Rev. Boniface Verheyen, ed. Jon Van Hofwegen. See also Gerhard Dohrn-van Rossum, *History of the Hour: Clocks and Modern Temporal Orders,* trans. Thomas Dunlap (University of Chicago Press, 1996).

on changing prayer times to clocks based on equally long hours was a prolonged negotiated process.[24]

Time out of Place

Since Lefebvre's death in 1991, the interconnections created by communication technologies have transformed not only the quantity of information available to us but also how many impulses may call upon our attention at any given time. These technologically mediated impulses upset our rhythms by taking up our attention. Judy Wajcman's *Pressed for Time* shows how Lefebvre's idealized division of the everyday[25] into free time (leisure time), required time (work time), and constrained time (traveling time or time for bureaucratic formalities) breaks down in actual practice.[26] Technology mediates work-related impulses whether we are at work or not, thus allowing the rhythms of the workplace to invite or call upon us to synchronize and entrain to them even when we are not at work. Likewise, the distinction between work time and family time (the latter is oddly absent from Lefebvre's typology) tends to break down also when the needs of one's children are mediated into work meetings.

Lefebvre's tripod may still serve as a typology of what we spend our time on, but the segmentation and repetition between the three is no longer as dominant in the rhythm of everyday life. There is a large literature of time studies devoted to studying how people use their time, from how people spend their time at work, in the tradition of Frederick Taylor, to the public health effects of different ways of organizing their activities.[27] One thing this literature clearly demonstrates is how historically and culturally specific time use is, at least in and between highly dif-

24 Avner Wishnitzer, *Reading Clocks, Alla Turca: Time and Society in the Late Ottoman Empire* (University of Chicago Press, 2015).

25 Elden, *Understanding Henri Lefebvre,* 115.

26 Wajcman, *Pressed for Time.*

27 Adrian Bauman, Michael Bittman, and Jonathan Gershuny, "A Short History of Time Use Research: Implications for Public Health," *BMC Public Health* 19 (Suppl. 2), no. 607 (2019).

ferentiated societies. There is also a class aspect here. Whereas some are constrained by others to stick to the beat of the factory during "work time," some actively shield their "work time" from other tasks and activities, with their attendant rhythms and temporalities. Paraphrasing Douglas, we may say that a disturbance is a temporality out of place. Technology plays an important role in mediating what Lefebvre saw as unrelated rhythms into a setting where they "do not belong," creating a disturbance that needs to be accounted for through some bodily or social adjustment in attention, focus, and possibly movement. In Lefebvre's time, events happening far away used to reach people at regularly scheduled intervals, through news broadcasts (typically at 7 or 9 p.m.) or their publication in the newspaper (and thus available in the morning or afternoon edition). There was a geographic and technological filter, and only things that had been thoroughly filtered through social means that took into account proximity, personal relevance, and magnitude would reach individuals instantaneously through the telephone. Even for the most important and relevant events, if someone was away from the phone, the main thing to do was call back later or leave a message.

With the possibility of availability has come the expectation of the same. The social expectation of availability opens the possibility for any sequence of events, processes, or temporalities to be mediated into one's everyday at almost any time and demand movement to their beat. Rather than time being out of joint, there are ever-more temporalities out of place. How one deals with this is perhaps a matter of personal time management, and the prioritization of a particular beat and moving to it for any duration of time means having to be unavailable. When Lefebvre wrote about the technological production of space, he implied the colonization of everyday life by information technologies:

> A theorist of technology named Jacques Lafitte also glimpsed the possibility of a unitary theory of space. Lafitte, a writer too often forgotten, proposed what he called a "mechanol-

> ogy" as a general science of technical devices and systems, and made this science responsible for exploring material reality, knowledge and social space....He did not have all the essential elements and concepts at his disposal, because he knew nothing of information science and cybernetics, and consequently of the distinction between information-based machines and machines calling for massive energy sources; but he did give effective form to the unitary hypothesis. To this project he brought all the "rigour" of technocratic-functionalist-structuralist ideology; characteristically enough, this led him to the most outrageous propositions, and to conceptual links worthy of science fiction. In short, Lafitte produced a technocratic utopia.[28]

Lefebvre's point was more about the technological production of space through communications and information science, but this also has consequences for everyday rhythms, not just in how people move (from the suburbs to the center) but also how they are instantly interconnected. Building upon this, I argue that the quantity of information, the speed of transmission, and the number of interconnections give this gradual "colonization" a qualitative aspect. What we have is a transformed everyday rhythm. To strain the colonization metaphor, at some point information technologies went from having a few settlements in our everyday lives to declaring sovereignty over them. This is of course not universal, but also no simple matter of the Global North or West, nor of middle classes in the Global South.

Both a monk's life and Kant's life are meant to serve as examples by which to contrast some crucial aspects of contemporary life — its polyrhythmicity. In the highly structured factories of the early twentieth century, temporalities were set to a strict schedule. The optimal production process was one that was designed by breaking it down to the level of workers' movements — how they moved their arms and hands, and where the

28 Henri Lefebvre, *The Production of Space,* trans. Donald Nicholson-Smith (Blackwell, 1990), 20.

raw materials and finished products were placed — and then reassembling these in the most efficient manner by eliminating as many unnecessary movements as possible. This is the basis of scientific management, as pioneered by Frederick Taylor. This micromanaging of movements through the working day turned out to have negative effects on workers' morale, and so the academic field moved away from it. However, it has set the baseline for factory rhythms, with the ideal of workers moving in sync with the machines.[29] Yes, there are usually multiple machines, with different rhythms, but with production processes involving multiple operations, the production line tends to either clog or experience times of idleness if the various stages are not synchronized to one another. In this setting, the idea of foreman-as-metronome has something going for it, but, in my own limited experience from a sheet metal factory in Norway in the early 2000s, more as an ideal type than an actual practice. Even on the factory floor, which served as a basis for idealizing modern society as supersynchronized society, things are not quite synchronized in practice.

Schools are places where bringing hundreds of pupils into the same set of rooms at the same time requires enormous efforts of synchronization. If such synchronization is done as a matter of course, as rhythm and routine, repeating strictly every working day, week after week, year after year, it requires less clarification and less new joint action than deciding every day or week when and where to meet. Imagine the amount of emails and messages involved in bringing twenty-five pupils and a teacher into the same room for a class if no schedule had been predetermined. In a very concrete sense, this is synchronization work. In our case, it is *synchronization work already done* — where all involved, annoyed as they may be by having to get up and go to school, benefit from having a predetermined schedule synchronize their movements, or, rather, a schedule for them to synchronize to. Why is this relevant for the pandemic experience? In short, because this is what had to be renegotiated as everyone moved into

29 Thompson, "Time, Work-Discipline, and Industrial Capitalism."

their homes, and it had to be renegotiated against all other such rhythms that had been thrown into question.

As management studies evolved over time, the field increasingly concluded that autonomy over how to complete tasks was crucial to employee motivation. Prescriptive studies of organizational behavior now tend toward a less regimented organization of work life. According to Arlie Hochschild's argument, organizations that provide and promote more flexibility and accommodate for childcare and other family needs end up with more committed employees, who then prioritize the company over the family.[30] For Hochschild, the point reflected in her subtitle is that the home becomes the obligation and the workplace the haven. For me in this chapter, the more crucial aspect is how the two are fitted together rhythmically. Take the life of a working father or mother with smaller children. When the alarm goes off in the morning, it does not take long before the parent will need to wake the children up — at least if the children are small — and this is the work of synchronization, the synchronizing of family time. Unlike Kant's servant, children who wake up in the morning rarely do what they are told, and so there must be adjustments, negotiations, and temporal joint actions. Having sent the children off to school, or walked them to the nursery, there are other pulses that need to be entrained to. Departmental meetings, conferences, emails, students turning up for advice — these are just instantiations of other pulses. Students may not be exactly like Herder's elephants. They have their own pulses, but as social beings, they need to engage in rhythmic joint actions, often entraining to the academic calendar and weekly schedule. Their requests therefore appear in a professor's life at times that are already synchronized with the professor's own. It would be tempting to say that these rhythms were tied to particular roles, but this may be too simple. The rhythm of conferences — deadlines for abstract and paper submission, booking tickets and hotels, presentation, dinner and expense reimbursements — are all

30 Arlie Russell Hochschild, *The Time Bind: When Work Becomes Home and Home Becomes Work* (Metropolitan Books, 1997).

part of the same role, and the institution of "the conference" can be said to be a tool to assemble academics through the work of synchronization. When academics from around the world time their actions to be in a given hotel in New Orleans at a specific time, having prepared papers on a specific (or not-so-specific) topic weeks or months in advance, it is a key example of synchronization as the creation of a particular social rhythm for a specific interval. It may repeat annually or biannually, but it also brings each individual out of sync with other pulses for the same interval of time. As technology makes it possible, and therefore also to some degree expected, that "home" temporalities are mediated into the place they are now in, departmental meetings suddenly have to be attended at 4 a.m. New Orleans time, and the academic has to call home to say good night to their children in the early New Orleans afternoon, everyday rhythms become more clearly at odds. Still entrained for an interval to the diurnal pulse in Europe, or perhaps not clearly entrained to any such pulse, the participant experiences jetlag. It is not that every rhythm was somehow magically adding up before, it is just that going across the Atlantic for a conference requires a synchronization effort that makes the multiplicity of rhythms more visible.

The Pandemic Everyday

Momentous events, such as the COVID-19 pandemic in 2020, do two things. First, they bring about an intensification of the polyrhythmic situation. When there are many rhythms going at the same time — in the same piece of music or the same social situation — it results in a feeling of intensification. There are moments where there is confusion as to which pulse is dominant and provides the rhythm of the piece. At least, this was the effect of lockdown, where all activities, with all their pulses, were to take place in the same house or flat, and often in the same room. Second, the pandemic event shifted our attention from one "metronome" to another. Suddenly, we make a pulse that we were hardly aware of, or at least just one out of many, the

main one for setting the rhythm of our lives. By adopting "social distancing," we muted many of the pulses that had until then been competing for our attention. The first and most immediate response to the pandemic was to desynchronize and to desocialize. Going home and staying away from others meant moving at a different rhythm from before, and "if you must, please travel outside of rush hours" meant moving in a way that was deliberately desynchronizing from others.

Hochschild made the point that a very flexible workplace had the effect of reversing the meaning of workplace and home, with the former becoming a haven and the latter an obligation.[31] What she either misses or has happened since her fieldwork in the mid-1990s is the increased blurring between work and nonwork. It is this blurring of times that Damsholt points to in her research on the pandemic everyday.[32] With flexible working hours comes increased need for synchronization: keeping the various rhythms in their place and managing to move to them when needed and ignoring them when able. Put simply, if a colleague calls at 10 p.m., do you interrupt what you were doing to divert your attention to the task they are proposing? If you have an urgent task that comes up at 10 p.m. (and you are off work), do you make a call to a colleague? In some roles and some situations, it is appropriate. We may argue with Pierre Bourdieu that there is a logic of practice that governs such situations, or we may argue with Sharma that it is an issue of power-chronography.[33] Learning what is appropriate to a situation requires socialization.[34] More to the point, not only did the social distancing of the early pandemic create a lot of new situations, it also made many rules of appropriate rhythms temporarily obsolete. Rather than "work becomes home and home becomes work," it made the home the site of everything. It cre-

31 Ibid.

32 Tine Damsholt, "Times of Corona: Investigating the Temporalities of Everyday Life during Lockdown," *Ethnologia Europaea* 50, no. 2 (2020): 137.

33 Pierre Bourdieu, *The Logic of Practice,* trans. Richard Nice (Stanford University Press, 1990), and Sharma, *In the Meantime.*

34 Bourdieu, *Logic of Practice,* 75.

ated a focal point where everything came together, and though there were physical boundaries erected, so much of the effort to synchronize was displaced to technological platforms that the rules and logics for appropriately managing social boundaries became more difficult.

Whereas some experienced the pandemic as a time of loneliness and isolation, and others experienced it as a time of coming together with family — a kind of forced prioritization of family time — others again experienced it as a temporal intensification, as the rhythms that were usually dispersed and kept separate in distinct sites of everyday life came together in a single space. By removing students from classrooms, and making them physically more distant from their teachers, social distancing made it more difficult for teachers to check up on students. It also shifted more responsibility to parents, and with it the rhythm of the school day, week, and indeed semester into the home. The research that has been done on this primarily used teachers as informants: "I can to a lesser extent make quick shifts and give short breaks," said one teacher. "It also means that I can to a lesser degree plan and complete group and pair work as part of the session. It is also not easy to check…whether the students have understood the academic content or the instructions for an exercise."[35] In the conceptual framework of this chapter, I would say that the teacher identifies the difficulty of synchronization, concretized through not being able to make rapid shifts and be responsive to developments in the session. Moreover, technology may have made it possible to complete the teaching session, but pedagogics that relies on joint action, where the teacher senses whether the students have understood and respond appropriately to that situation, was made more difficult. I can only present evidence from the teachers' side, but the experience from the parents' side was that responsibility for some of this was shifted onto parents, and hence the rhythm of schooling

35 Øystein Gilje, Frida Thuen, and Bjørn Bolstad, "Hjemmeskolen under korona-pandemien — hva forskningen kan fortelle," *Bedre skole* 3 (2020): 15.

became part of the pandemic everyday in a way that was not segmented to a specific place (the school) or time (when the student-child was doing homework in the evening). Instead, it played out concurrently with all other rhythms: "To the question 'how is communication and dialogue with the students?' a teacher answered the following: 'A lot less communication when you don't see the full setting. Yes, video meetings are okay, but you don't know whether the student is tuned into the teaching or not.'"[36]

One study of work life during the pandemic concluded that many, especially those with younger children, reported less stress, because children did not have to be somewhere early in the morning. In other words, families did not have to synchronize to the rhythm of the nursery or other childcare facility. However, those with older children reported that these often did not understand that their parents were still "at work" while sitting in the kitchen when the children came home from school around 2 p.m. Yet others were reporting that they were unable to take breaks, and that there was no point in calling in sick (if they were sick), because they could still work. In one of the responses, an informant said:

> If I had been very on sick leave [*sic*] while I could only work at the office, someone else would have had to do [my tasks]. But I have experienced that with sick children too, that since we have home office I can work a bit when I am able. I feel that I prolonged my problems quite a bit, because I never got completely off when I needed. That many days were just…a soup of almost-work. I got some done, but not everything. And I couldn't relax properly either, because I felt that I should have worked some.[37]

36 Ibid.

37 Mari Holm Ingelsrud et al., *Hjemme–Borte–Uavgjort,* AFI-rapport 2022:04, 178, https://www.regjeringen.no/globalassets/departementene/aid/bilder/pensjon-trygd-og-sosiale-tjenester/r2022_04-hjemme-borte-uavgjort-25042022.pdf.

This does not speak directly to the multiple rhythms being negotiated in the work setting itself, but it amply illustrates the sequel to Hochschild's *Time Bind,* namely, that the crumbling boundaries between work and home when the rhythms of someone else (whether associated with care for the self or for some family member) are mediated into the rhythm of the workplace. Not being able to sequentialize tasks, this informant speaks of everything turning to "a soup of almost-working" — neither being able to work nor being able to relax. If asked specifically, my hunch would be that this person would not be happy with their parenting either, because "a soup of almost-work" rarely offers sufficient attention to children. By being unable to keep rhythms separate, they piled one upon another in a cacophony that made it impossible to focus attention on one task at a time. The experience was one of temporal intensification, despite being "socially distanced" in the home.

Conclusion

The social distancing imposed by the early pandemic was experienced in different ways dependent on life situations. Social medicine has dealt with the obvious points about class, race, gender, and profession. Here, I argue that one main difference had to do with how various rhythms suddenly came together (or not) in a single site — the home — as work, family, school, and entertainment all had to take place in the same location. With the blurring of the three types of time that Lefebvre laid out — leisure, constrained time, and work time — the *Time Bind* of Hochschild became even messier. It was no longer a matter of struggling to balance work and life, but keeping them apart. Whereas Damsholt writes about how the "home turned into a contested space that had to accommodate home-schooling, working from home, meals, housework, family time, me-time and leisure,"[38] my point would be that it is not so much the competition between different activities that was the problem, but

38 Damsholt, "Times of Corona," 137.

that the pandemic everyday was one where temporal joint actions were made difficult. Moreover, all the work of synchronization that individuals and communities had put in over years and decades to *keep together in time* was invalidated. Hence, in this very messy situation where rhythms could not be compartmentalized, they came together in a single site and a single life, creating the kind of disturbances I have called "temporalities out of place." It is this polyrhythmic situation that the informant quoted above called "a soup of almost-working." Social rhythms became messy, difficult to figure out — out of place — and impossible to move appropriately to.

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6

The Timing of Milk

Anne Kveim Lie

Breastfeeding gives and nurtures life. It is shaped both by biological processes and cultural and social dynamics, and it is one of the most intimate and relational social processes we know of. Everyone who has breastfed a child knows that this is simultaneously a material, embodied, and relational experience. It involves strong feelings of guilt or of happiness, milk that is flowing too much or too little, a crying baby or a baby emitting cheerful sounds, and at best a feeling of connectedness and enjoyment. And although breastfeeding is considered something intensely private in many parts of the world, it is also inevitably anchored in larger social, political, and cultural processes.

Breast milk contains all the nutrients that an infant needs: proteins, minerals, vitamins, water, and even antibodies against infection. Breastfeeding is a deeply biosocial process: the close physical proximity of skin-to-skin contact during breastfeeding stimulates the release of hormones that not only trigger the production of milk in the milk-secreting cells in the small sacs called alveoli in the breast but also directly foster feelings of love, trust, and emotional connection. But breastfeeding is also a profoundly temporal relation, physiologically and socially. It

synchronizes two physiological rhythms — the breastfeeding parent's and the infant's.

Historical research by feminist scholars has shown how breastfeeding changed because of industrialization, urbanization, and medicalization over the last two hundred years. This chapter will explore an ignored dimension in the medical history of breastfeeding, namely, the importance of time and timing. The empirical point of departure is the creation of a very successful campaign by second-wave feminists in 1970s Norway to reclaim women's expertise in breastfeeding and develop self-help groups and teaching materials. The organization that was born through this still exists today. I will argue that this collective uprising was an event where practices, technologies, institutions, and even linguistic structures to a large extent hinged on questions of time, timing, and temporality. In this way, experience of different and conflicting temporal understandings and practices becomes visible in everything from the production of milk in the breast to the caring practices in the hospital via the day-to-day practices within the home sphere, all the way to larger social movements.

Breastfeeding at a Turning Point

The backstory to my narrative is the profound changes that happened to the practice of breastfeeding during the twentieth century. During this century, the number of women choosing to breastfeed their children declined rapidly,[1] something that was first registered in the United States during the interwar period.[2]

1 A note on the use of personal pronouns here. In the first section, I tried to use gender-neutral language, replacing "mother" with "parent," in the acknowledgment that transmen and nonbinary persons also breastfeed. However, when I come to my historical narrative, I have decided to keep the female gender of the breastfeeding person. That is simply because breastfeeding men were for all practical purposes inconceivable at the time, and I don't want to hide that this discourse was extremely gendered, since this genderedness is relevant and important to the story I try to tell.

2 Jacqueline H. Wolf has argued that already in the late nineteenth-century United States, mothers weaned infants customarily at or before their

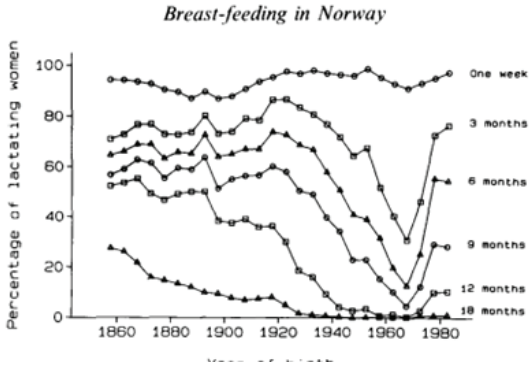


Fig. 6.1. Distribution of durations of breast-feeding, 1860–1980, for all children born in subsequent five-year groups. Source: Knut Liestøl, Margit Rosenberg, and Lars Walløe, "Breast-Feeding Practice in Norway," *Journal of Biosocial Science* 20, no. 1 (1988): 49.

In the immediate postwar years, the decline started to accelerate. Whereas 38 percent of women had been breastfeeding in 1948, only 21 percent chose to do so in 1956.[3] Similar numbers can be found in Europe. In the UK in 1961, only 12 percent of mothers still breastfed at six months, and 40 percent of all babies had been weaned by the age of two weeks.[4] Breastfeeding also decreased dramatically from the 1930s in Norway (fig. 6.1).

This figure shows that in Norway, although the majority was breastfeeding during the first week throughout the period

babies turned three months old, and argues that a number of external factors led to changes in breastfeeding patterns, including cultural and socioeconomic factors, the sexualization of breasts in the period, and physicians' counseling on breastfeeding schedules; see Wolf, *Don't Kill Your Baby: Public Health and the Decline of Breastfeeding in the Nineteenth and Twentieth Centuries* (Ohio State University Press, 2001).

3 H.F. Meyer, "Breast Feeding in the United States: Extent and Possible Trend: A Survey of 1,904 Hospitals with Two and a Quarter Million Births in 1956," *Pediatrics* 22, no. 1 (1958): 121.

4 L. Bryder, "Breastfeeding and Health Professionals in Britain, New Zealand and the United States, 1900–1970," *Medical History* 49, no. 2 (2005): 193.

shown here, the number of women breastfeeding (at three, six, nine, and twelve months after birth) declined steadily from the 1920s, until reaching a trough in the late 1960s, when it started to steeply rise again. It is a (temporal) artifact, of course, like all tables and figures trying to make sense of the past in quantitative numbers. It was constructed retrospectively, as part of a PhD dissertation in the 1980s by a gynecologist who was herself an activist working to promote breastfeeding.[5] But it is nevertheless a witness of a material change, a substantial decline in the flow of liquid from the breast to the mouth of a baby over the years, to be replaced by a substantial increase from 1968 onward. How can this curve be explained?

A wide range of primarily American, interdisciplinary scholarship on gender, sexuality, women's studies, and the history of medicine has been devoted to relating the social history of infant feeding and has shown how in the United States, bottle-feeding almost replaced breastfeeding in the course of the 1950s.[6] Historians such as Rima Apple have argued that this change can be attributed to what she and others have called "scientific motherhood," the process by which women increasingly relied on (male) medical expert knowledge for advice in childrearing, including breastfeeding.[7] Pregnancy, birth, and motherhood were increasingly supposed to be carried out in light of expert knowledge provided by (mostly male) doctors who had not given birth themselves. Bottle-feeding, this research has shown, was widely supported by medical advice and the normative ideals of scientific motherhood, or the idea that pregnancy, childbirth,

5 Knut Liestøl, Margit Rosenberg, and Lars Walløe, "Breast-Feeding Practice in Norway, 1860–1984," *Journal of Biosocial Science* 20, no. 1 (1988): 45–58.

6 Lynn Y. Weiner, "Reconstructing Motherhood: The La Leche League in Postwar America," *Journal of American History* 80, no. 4 (1994): 1357–81; Rima D. Apple, *Perfect Motherhood: Science and Childrearing in America* (Rutgers University Press, 2006); and Elisabet Helsing and Anna-Pia Häggkvist, *Amming: Til deg som vil amme* (Fagbokforl, 2008).

7 Apple, *Perfect Motherhood,* and Rima D. Apple, *Mothers and Medicine: A Social History of Infant Feeding, 1890–1950* (University of Wisconsin Press, 1987).

and childrearing required expert advice to be considered sufficient and good enough.

The social histories of scientific motherhood, of medicalization of hospitals, of male supremacy, of expertise, of power,[8] are of course one part of the picture. But these grand narratives are not necessarily very precise. Hegemonic medicine, at least in Norway, was never arguing against breastfeeding. On the contrary, mother's milk has always been considered by physicians physiologically superior to all infant formulas. In Norway, the (mostly male) physicians' advice was never to stop breastfeeding. They consistently argued in favor of the extraordinary qualities of mother's milk, which Kristin Asdal has shown.[9] So why did the number of women breastfeeding decline so significantly? I will argue that timing and a reliance on clock-time and regularity (and discipline in enforcing this regularity), and, on the other hand, an emphasis toward what was perceived as natural, physiological, psychological time are all essential if we are to understand this history.

Herein I will discuss the different ways that breastfeeding was temporally managed and how the different times of breastfeeding were synchronized in Norway throughout the twentieth century. I will show how modern industrial temporal logics and schemes came to dominate breastfeeding after World War II, and how such schemes were increasingly resisted by activist groups by the end of the 1960s, ultimately creating new cultural logics and rhythms and forms of synchronization. Taking my departure from the Norwegian context, I will argue that timing is crucial in the biosocial history of breastfeeding, a relational practice involving intimate contact between the feeding mother and the suckling child, and the milk that flows between them.

Underlining my argument is a conviction, inspired by Barbara Adam, that breastfeeding, a practice that is at the same

8 Weiner, "Reconstructing Motherhood"; Apple, *Perfect Motherhood;* and Helsing and Häggkvist, *Amming.*

9 Kristin Asdal, "Versions of Milk and Versions of Care: The Emergence of Mother's Milk as an Interested Object and Medicine as a Form of Dispassionate Care," *Science in Context* 27, no. 2 (2014): 307–31.

time deeply social, biological, and emotional, has always been characterized by multiple temporalities that affect each other in different ways. And yet, the many studies that have been devoted to infant feeding (primarily in the US context) have failed to take the inseparability of biological, social, and cultural rhythms and times into account. I argue that time has had a role in coordinating relations among people (the parent and the infant, the parent and the healthcare provider), their bodies (hormone production, reflex pathways, milk production, and nipples), and their social environments (cultural and political change, social privilege, hierarchies of power, etc.).[10] In the following, I will trace the entanglement of times and temporalities at different rhythms and scales, from the fast, everyday rhythms of bodies, unfolding in the microsocial environment of mother and child, to the more long-term historical, political, scientific, and technological changes that can be observed at the macrosocial levels of national and even global communities. However, I will start with the chemical and physiological processes taking place in the bodies of mother and child.

The Physiological Times of Breastfeeding

The infant's hunger and satiety cues are responded to by the parent when the baby is laid to the breast. When the baby starts to suckle, sensory impulses pass from the nipple to the brain. In response, the pituitary gland in the brain secretes two hormones into the blood: *prolactin* and *oxytocin.* Prolactin is necessary for the secretion of milk in the breast; when the level of prolactin in the blood increases, milk is produced in small sacs containing milk-secreting cells within the parent's breast, the alveoli. The more a baby suckles and stimulates the nipple, the more prolactin is produced in the parent's brain and the more milk is produced in the alveoli in her breasts. More prolactin is produced at night, so breastfeeding at night is particularly helpful

10 Barbara Adam, *Timescapes of Modernity: The Environment and Invisible Hazards* (Routledge, 1998).

for increasing milk production. Prolactin also probably makes the parent relaxed and sleepy.

The baby's suckling also affects the release of oxytocin from the brain into the blood (often called the milk ejection reflex). Oxytocin makes the muscular cells that surround the alveoli in the breast contract, making the milk flow along and fill the ducts that carry it to the outside. As the baby suckles, the action of the baby's tongue compresses the breast against its hard palate, making milk stream out from the ducts into the baby's mouth.

This reflex becomes conditioned to the mother's emotions and sensations, so that after a while oxytocin can be released even before the baby starts to suckle. It can be enough that the parent hears the baby cry, or touches or smells them, or even thinks of them. Oxytocin also induces a state of calm and reduces stress and can improve the bond between mother and child. On the other hand, if the parent is emotionally upset or in pain, the reflex can become inhibited, and the milk can stop flowing.

The baby also has their own physiological rhythm. Their stomach will empty at regular intervals, and they will start showing signs of hunger by sucking hands or smacking their lips. They have a series of physiological reflexes that regulates eating. If a baby is being touched on their lip or cheek, it will turn to find where the stimulus came from, open their mouth, and stretch out their tongue. If something touches their palate, they will suck it. If the infant has milk in its mouth, it will swallow it.

In order to work, these physiological rhythms and reflexes — the mother's and the infant's — have to be synchronized. But breastfeeding is also conditioned by different kinds of social, cultural, and historical factors, which come with other, competing, rhythms. Parents acquire breastfeeding knowledge and skills from observing others, getting support from social networks, cultural norms, and traditions. Such practices are passed down from generation to generation, reflecting the cultural values and beliefs surrounding infant care and nutrition.

Medicine and Mother's Milk

Toward the end of the nineteenth century, public health experts, feminists, and physicians started worrying about the high infant mortality rate, particularly in the "lower classes." This concern also reached Norway, although Norway in the international literature had been cited as an exception, and the relatively high breastfeeding rate was cited as one explanation for the lower infant mortality rate.[11] Infant mortality, infant feeding, and the breastfeeding behavior of mothers became the subjects both of scientific research and public health campaigns. Epidemiological studies revealed that the death rate of infants fed on milk substitutes was much higher than that of breastfed children. As a result, social pediatrics (in part promoted by the newly educated female physicians) declared a high-quality infant diet and in particular breastfeeding as the centerpiece of their infant welfare movement in the early twentieth century.[12]

In Norwegian counseling literature at the time, breast milk was recommended over other foods, such as cow's milk or other substitute products.[13] The children of unmarried mothers had a higher mortality rate than other children, and one explanation was that working-class women had to bottle-feed their children. Activists such as the women's advocate and social and health politician Katti Anker Møller started the first centers for unmarried mothers, mobilizing pediatricians to gather support.[14] From 1911 onward, mother and child centers were opened in Oslo, Trondheim, and Bergen, started by idealistic doctors, inspired by Møller and the European *gouttes de lait* movement. Aiming

11 Anne Løkke, *Døden i barndommen: Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920* (Gyldendal, 1998).

12 Cecilie Arentz-Hansen, *"Kvinder med begavelse for lægevirksomhed": Norges første kvinnelige leger, og tiden de virket I* (Cappelen Damm, 2018).

13 Liestøl, Rosenberg, and Walløe, "Breast-Feeding Practice in Norway," 55.

14 Aina Schiøtz and Maren Skaset, *Folkets helse — Landets styrke, 1850–2003* (Universitetsforlaget, 2003), 242.

to reduce infant morbidity and mortality, they gave unmarried mothers nutritional advice and assistance in breastfeeding.[15]

These centers got support from the new nutritional science. Theodor Christian Brun Frølich, professor of pediatrics, famous for having pointed to vitamin C deficiency as the cause of scurvy, believed that mother's milk was key to the infant's growth and development, not least because it was virtually sterile.[16] For him, understanding the role of breastfeeding in infant development was indispensable for every pediatrician, as it was essential both for treating sick children and for advising their families.[17] Frølich was deeply skeptical of the various forms of artificial nutrition for infants that existed on the market, mostly in the form of various types of flour-based mixtures. Through his own research, he demonstrated that scurvy in children occurred practically exclusively in those who had received one of these replacement products over a long period of time,[18] and he believed that future research would reveal that several other conditions were also caused by artificial nutrition. Linda Bryder has shown that in New Zealand and the UK, experts were strongly supportive of and promoted breastfeeding throughout the twentieth century. They were often aligned with eugenic ideologies related to the quality of the population overall.[19] According to Wolf, it was actually the childbearing women themselves rather than the male physicians who inaugurated the move from breastfeeding to bottle-feeding, the doctors inadvertently contributed to it.

However, milk is not only — as the physicians in most of the texts from this period seemed to believe — a product, a decontextualized matter without activity or process. Although they were in general advocates of breastmilk, and regarded it as the superior infant food, doctors failed to recognize the

15 Liestøl, Rosenberg, and Walløe, "Breast-Feeding Practice in Norway."
16 Theodor Frølich, *Pædiatri: En veiledning under studiet av den første barnealders sygdommer* (Steenske, 1924), 69–70.
17 Ibid., 17.
18 Asdal, "Versions of Milk and Versions of Care."
19 Ibid., and Bryder, "Breastfeeding and Health Professionals."

many relations milk was entangled with. They related to milk as a finalized product of nature — as an externalized outcome of milk-producing glands, a decontextualized physical phenomena without activity or process. However, this focus on milk as a product, as an external framework for human activity, failed to take account of the immanent forces that gave rise to it. They excluded the energy and the (re)productive and (re)generative capacities of the milk-producing glands, the hormonal reflexes that operate irrespective of and even in opposition to conscious human activity.

Industrialization and the Time and Place of Breastfeeding

In the first part of the twentieth century, where and how breastfeeding took place changed dramatically, affecting both the timing and practice of breastfeeding — and the flow of milk — through two major developments: urbanization and the hospitalization of childbirth.

Most women in nineteenth-century Norway lived in rural societies, but they increasingly moved to urban centers toward the end of the nineteenth and beginning of the twentieth centuries. In rural societies, birth was a social, cultural, and traditional process, taking place at the home but assisted by many in the wider community — grandmothers, neighbors, friends, and other relatives — who had time to support and help take care of the mother and the newborn child. Experiential knowledge on how to breastfeed was passed on from generation to generation, or by a neighbor or a wise woman nearby. The many birth visits by women in the neighborhood and extended family shared experiential knowledge on how to let the milk flow, or what to do if the nipple was sore, if the child was crying, did not gain weight, or did not want to suck — how to temporally manage the flow of milk. In the countryside, the baby could join the mother out working in the fields, and breastfeeding could take place while at work. If a woman for some reason could not breastfeed, another breastfeeding woman could take over for a while, or if the family had the means, it could hire a wet nurse.

In the industrialized urban setting, however, women with low incomes often had to work to make ends meet, in workplaces with few possibilities to take care of a baby, let alone breastfeed (factory settings, for instance). According to E.P. Thompson in his path-breaking article on industrialization and time, factory work came to discipline all aspects of life thanks to the introduction of clock-time and strict time management.[20] In a modern industrialized environment, no one was able to make a living unless they subjected themselves to the time regimes of automated factory work. The time of the machine also entered the lives of breastfeeding mothers.

Mothers' social networks also changed. The extended family network had been left behind in the countryside, to be replaced by a more differentiated social structure, oriented toward a plurality of temporalities. This made synchronization of the time of breastfeeding much more complicated. Life in a modern industrialized city also brought with it accelerating rhythms of social and cultural changes along with the plurality of technological and communicative temporalities in the city. In other words, the synchronization between mother and child because of breastfeeding became entangled with both the empty homogenized and mechanized time of modern factory lines and the multiple, desynchronized temporalities of life in an urban center.

The Hospitalization of Childbirth

Another massive social and temporal transformation following World War II, which came to have profound influence on the timing of breastfeeding, was the transfer of births from homes to hospitals. Most physicians in hospitals were men, and few of the nurses or midwives had children themselves, and thus they had little or no own experience on breastfeeding and its challenges. They had never had sore nipples, never worried they had too little milk to nurture their children, never struggled with

20 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38, no. 1 (1967): 56–97.

finding a good position for the child to suckle, and never observed an infant's hunger or satiety cues.

The hospitals had their own institutional, spatial, and temporal logics related to the functioning of the hospital. They were dominated by a temporal scheme that focused on discipline, professional hierarchy, regularity, and social order. The temporalities of the hospital, and of the workplace of the different professions, constituted the temporal measure against which breastfeeding had to be synchronized. The woman and child, and the room, were to be cleaned at regular intervals, and there was little time left for health personnel to instruct or support the women in taking care of their children. Indeed, in the 1950s healthcare personnel argued that would be too much to ask for.[21] As in traditional societies, women were supposed to rest, but whereas before it had been a neighbor, an older child, or a grandmother who assisted alongside the woman, in the hospital it was a new health professional — the children's nurse — who should take care of the infant. The architecture of the hospital favored the separation of children and mothers, so that the discipline, routines, and regularity of the hospital could prevail. The (often crying and thus unorderly) infants would be taken to special infants' rooms, where they would be cared for by the children's nurses, whereas the mothers were supposed to take time to rest in quiet rooms, together with other women who had just given birth. The hospital's role was to facilitate time to rest for the mother, healthcare personnel argued, referring to their observation that mothers were tired, passive, and needed rest.[22] Mothers would be given their infants at regular intervals to be fed. A few hours a day were set aside for breastfeeding, and at night the women were supposed to rest, while their infants were bottle-fed if considered necessary by the infant nurse. The health personnel rarely had experience of their own in breastfeeding, so there was little practical help to be had.

21 Åse Gruda Skard, "Barnets første leveuke: Rapport fra en arbeidsgruppe," *Mentalhygiene og folkehelse* 35, no. 5 (1955): 79.

22 Ibid., 80.

The advice the mothers received at the hospital and the informational material they were given emphasized regularity and discipline in breastfeeding. A pamphlet distributed to women who had given birth in the hospitals in Norway from 1948 to 1967 recommended that the child should be put to the breast for the first time after "mother and child have rested after the strenuous labor of birth." The request that a woman should rest for a certain time after giving birth was certainly part of life in the countryside in Norway in the decades before. However, the pamphlet goes on to describe a feeding regime that divides the day according to clock-time. In the days following birth, the child should be laid to the breast at "regular intervals," six to seven times a day, and "possibly" once a night: "Normally, the child can be given breast at 7, 10, 13, 16 and 19 hours."[23] This temporal discipline, it was argued, was justified since "children thrive better when they are adapted to a regular regime with fixed times for feeding and for sleep."[24]

In order to keep the regular clock-time schedule, however, parents were advised that it was normal that infants cried "a considerable amount," and that crying did not always mean that the child was hungry: "It is necessary to get used to hearing crying without taking the infant up or carrying it around."[25] In this case, quantitative, homogeneous clock-time is introduced as an absolute standard for breastfeeding, reducing physiological and phenomenological rhythms to deviations that needed to be aligned with the temporal standard of the clock. To again follow Thompson, we are also observing a shift from traditional rural time, in which the order and succession of events were governed by the inherent times of the events themselves, in this case the digestion and feelings of hunger in the child, to a modern, industrialized time, in which the durations and succession of events are decided by a mechanical timekeeper. This shift from

23 Arne Njå, *Veiledning i spedbarnsernæring og spedbarnstell* (Oslo, Directorate of Health, 1952), 4.

24 Ibid., 3.

25 Ibid.

"time in events" to "events in time"[26] led to conflicts between the regular clock-time of the hospital, the physiological times of the breast, and the experiential times of the baby's hunger. The embodied time in the infant, signaling hunger, collided with clock-time. The regular clock-time of the hospital, the physiological times of the breast, and the experiential times of the baby's hunger were out of sync and found themselves in competition and conflict. When newborn babies were sent to nurseries instead of staying with their mothers most of the day and during the night, less oxytocin was released from the pituitary gland, and milk was produced at a slower speed.[27]

The next step was to coordinate time and space. Clock-time also implied weighing, which had to be performed at regular intervals, in order to measure how much nurture the baby received. The pamphlet devoted no time to how to deal with breastfeeding problems, such as a sore nipple or if the child would not suckle, but much space was given to knowing when a child did not get enough milk — they become unsatisfied, cry more than they used to, or suckle on the knuckle. Whether time was managed correctly or not was linked to the question of whether the child put on weight or not. In other words, time and scales became closely linked.

The Decline in Breastfeeding

Starting from the 1920s, and with increased speed from the 1950s, urbanization, hospitalization, and medicalization led to a sharp decline in breastfeeding in the Western world. The change of temporal practices in homes, hospitals, and maternity wards aggregated into societal and historical processes. The work of synchronization performed by health personnel and policy-makers succeeded, with the (unintentional) effect that the time spent on breastfeeding plummeted. In the United States in 1955, just under a third of mothers were breastfeeding when they left

26 See the introduction to this book.
27 Wolf, *Don't Kill Your Baby,* 240.

the maternity ward,[28] whereas in Norway almost all mothers were breastfeeding when they were discharged. But there was a significant decline, including in Norway, in the proportion of mothers who were still breastfeeding after three months in the first decades after the war,[29] which gave reason for concern. A study found that 50 percent of mothers had breastfed their babies at three months in 1940, but only 28 percent did so in 1963.[30] In the meantime, the quality of supplementary feeding products had improved. Instead of discouraging bottle-feeding as they had previously done, health personnel at hospitals and maternal and child health clinics gave advice on how to disinfect bottles and add vitamins and iodine to the substitute, in addition to advice on breastfeeding. In the 1950s and 1960s, massive marketing of factory-produced infant formula took place all over the Western world, including in Norway. Although Norwegian authorities were extremely skeptical of the marketing of pharmaceuticals, industry representatives of infant formula were allowed to enter hospitals and maternal and childcare units, and left marketing material bags for women to take home. Infant formula not only allowed fathers to take a larger part in infant care, it also made timing easier, because parents were no longer dependent on the physiological rhythm of the breast.

In the absence of practical support and advice on breastfeeding, and with increased availability, many women switched to bottle-feeding during the first months of an infant's life. When artificial nutrition in the form of processed, dried cow's milk came on the market in Norway in 1963, it was strongly marketed, in the form of free materials and samples both to mothers and hospitals.

Both in the United States and Norway, the sharp decline in breastfeeding led to concern from the medical establishment, which in Norway had always promoted mother's milk as the best

28 Weiner, "Reconstructing Motherhood."

29 Liestøl, Rosenberg, and Walløe, "Breast-Feeding Practice in Norway."

30 Eyvind Ek, *Beretning fra avdeling for mor og barn for året 1965* (Oslo Helseråd, 1965).

form of nutrient for infants. In Norway, members of a working group[31] studying challenges related to infants' first week of life on breastfeeding, set up in the winter of 1954–1955, argued that the seeming passivity of mothers was not because they were tired, but because hospitals were places characterized by hierarchy and expert knowledge that enforced passivity and slowness on them, rendering them insecure and afraid to take the initiative. They argued that women should be allowed to stay with their children as much as they wanted and should receive education and guidance in breastfeeding and infant care so that they got the confidence they needed. They argued that another temporal arrangement was necessary, which was synchronized not to the clock-time of factory-like hospitals, presided over by midwives and doctors, but to the physiological and phenomenological realities of new mothers. The working group's report did not receive much attention at the time, but their arguments — that the strict discipline and regularity were hostile to breastfeeding and the flow of milk — would in the late 1960s be taken up by the Norwegian breastfeeding support group, Ammehjelpen.

Ammehjelpen — Feminism, Activism, and Natural Motherhood

Ammehjelpen was initially a small but vocal minority of young mothers who were drawing upon both scientific and cultural ideas and knowledge about topics such as infant development, pituitary hormones, environmental activism, and new-wave feminism to promote their cause: that mothers should be freed from the temporal form imposed on breastfeeding from the outside and learn to believe in their own capacity to nurture their child. Ammehjelpen is historically important in a Norwegian context because it grew to become a significant force in Norwegian society during the 1970s. But it is also important to my story because it offered a way of synchronizing different

31 Organized by the Norwegian Association for Early Childhood Education and the Oslo Mental Hygienic Association.

times and different scales, and Ammehjelpen argued for the political nature of breastfeeding. In their work, they attempted to synchronize what had previously been diverging and partly opposing times and times at different scales — the time of the workplace, the time of the hospital, the time of the pituitary, the time of the milk-producing glands, the time of the baby — into one. The watchwords for this different set of synchronizing practices were "nature" and "the natural." They argued strongly for a practice of breastfeeding that was more in sync with the rhythms of natural motherhood, both physiologically and socially. I will next explore the mobilizing of a "counter-time," an alternative temporal regime that wanted to give more room to the real events taking place in the life of a mother and child, but at the same produced a very specific idea about what "traditional" motherhood should be like, both in time and space.

Ammehjelpen drew on important societal transformations that had already taken place. Social and behavioral scientists such as Anna Freud, Melanie Klein, John Bowlby, Margaret Mead, Niles Newton, and, in Norway, the child psychologist Åse Gruda Skard had stressed the importance of psychological and emotional influences of breastfeeding and the necessity of its continuation. The increasing environmental activism, promoting a reversal of industrial, modern processes and a return to natural ones, was also an important source of inspiration. The Norwegian breastfeeding activists would promote breastfeeding as the "natural" and "traditional" way of nurturing the child, promoting an "original" and thus evolutionary state of health, and a "natural" way of providing infant nutrition. Jessica Martucci has called this movement as it took place in the United States "natural motherhood," contrasting it with the scientific motherhood provided by medical science.[32]

32 Jessica Martucci, *Back to the Breast: Natural Motherhood and Breastfeeding in America* (University of Chicago Press, 2015).

A New Pamphlet

The activism that would become Ammehjelpen started with Elisabet Helsing, one of the founders, reading the pamphlet she was given at the hospital when she gave birth to her first child. She believed it was too rigid, an external framework not adapted to the realities of breastfeeding as it was happening in people's lives, what Åsa Gruda Skard had called a "form posed from the outside."[33] She started reading up on breastfeeding and soon found out that she was not alone in negatively reacting toward the guidance literature, recognizing that the recommendations were not only inflexible and rigid but also outright counterproductive, enacting the opposite of their intended result. A lot of this concerned how the time of breastfeeding was managed.

Where the old pamphlet recommended that the mothers should try to skip one feeding if they had little milk in order to "save" the milk, Helsing argued, based on her own experience, that the more milk the mothers could give, the more milk was produced in the mammary glands. The pamphlet emphasized that it was important to have regular meals, adhering to a stable chronological rhythm, and to let the child scream a little now and then, but Helsing was concerned that both the relationship between mother and child and milk production would be better if the infant instead could control when they wanted to eat. Her argument, albeit not framed this way explicitly, was one of timing and temporality, both in a historical and a more practical and everyday sense. On the one hand, she propagated a break with the forces of so-called progress and a return to the more event-regulated breastfeeding practices of the past — the traditional experience-based knowledge acquired in the countryside. On the other hand, she wanted to improve the relationship between mother and child by allowing and even encouraging the mother to fill the biological needs of the child, even at times

33 Martin Seip Åse Gruda Skard, Alex Brinkmann, and Erling Slaatto, *Lykkelige barn: Rådgiver for foreldre og lærere om barn og ungdom* (Teknisk forlag, 1960), 2:613.

that were not prescribed by the clock-time regimes of modern breastfeeding.

Helsing wanted to share this information with other young women who had given birth in Norway and counteract what she perceived as the destructive biopsychosocial effects of the disciplinary regime based on clock-time. Together with another young woman, she wrote a new pamphlet on the kitchen counter while taking care of her newborn. Then she, a woman without education or contacts, wrote a letter to the Norwegian Directorate of Health asking for help with printing and distribution.

At the Office of Hygiene at the Norwegian Directorate of Health, she was lucky enough to find the young Gro Harlem Brundtland, later to become the first female prime minister of Norway and in 1998 the first female director-general of WHO. Brundtland, who was herself pregnant with her fourth child when the request came, thought it was a good idea to promote breastfeeding at a time when maternal and child community health centers were "packed with good advice on the importance of sterilizing bottles and correct mixtures of formula." Also, Brundtland had just returned from Harvard University with her master's thesis on the public health aspects of breastfeeding.[34] Because of Brundtland's engagement, Helsing's more backward-looking advice about breastfeeding was scaled up from her kitchen table to national campaign. Brundtland proposed that no fewer than 10,000 copies of the pamphlet should be printed and that it should replace the old pamphlet and be distributed to health institutions.

However, Brundtland was to meet resistance within her own institution. In her autobiography, Brundtland describes it as her "feminist political awakening" when she discovered that many of her male colleagues laughed at her suggestion. They did not have a clue, simply because they had never breastfed a child and considered it a private phenomenon. Brundtland's conclusion

34 Gro Harlem Brundtland, "The Status of Breastfeeding: Epidemiological, Demographical, Sociological and Psychocultural Aspects" (Master's thesis, Harvard University, 1965).

was that women and men have different preferences, and women have to be in places where decisions are made.[35]

Her superior at the time, Frederik Melby, however, did not laugh. He supported her proposition and decided that the pamphlet would be distributed by the Directorate of Health in the spring of 1968. It did not take long before the Directorate of Health received criticism that they had made themselves the mouthpiece for two unskilled mothers. Melby had by then left the Directorate and brought Brundtland with him, and there was little resistance when it was decided to commission the childless midwife Berta Berg to write what was regarded as a more professional breastfeeding brochure to replace Helsing's pamphlet. Young mothers, however, where shocked to see the new one. They considered it completely out of date compared to Helsing's, which they had been given when in hospital with their previous child. They wanted the pamphlet back.

Therefore, Ammehjelpen, when it was established, decided to produce and distribute the pamphlet on their own account. They did that from 1973 to 1979, when the Directorate of Health again took over responsibility. The pamphlet has been printed in an incredible 1 million copies, had a lifespan of more than forty years, and was translated into more than ten languages. A new temporal order, in the form of advice to young mothers, had proven itself highly scalable, in a spatial sense, now reaching readers across the entire Norwegian nation. Even though this temporal regime, which branded itself as both more "traditional" and more "natural," had its origin in the countryside, the transferability of temporal practices brought young urban mothers of Norway into the fold. In the following years, this work to scale up continued.

35 Steinar Hansson and Ingolf Håkon Teigene, *Makt og mannefall: Historien om Gro Harlem Brundtland* (Cappelen, 1992).

Starting an Organization

In 1968, Helsing was interviewed by the weekly magazine *Alle Kvinner* (All women). She spoke about the new pamphlet and expressed interest in getting in touch with other women who had experienced similar frustrations as she had. Helsing received a stream of inquiries and decided to start an organization. On November 6, 1968, fourteen women met and started the "Breastfeeding Mothers' Aid Association," which shortly after changed its name to Ammehjelpen. During the first year, the activity was limited to the Oslo area, the most urbanized area of Norway, and by the end of the year the support group consisted of seventeen helping mothers, two of whom were from other cities. The following year, they started publishing a newsletter, which was distributed free of charge. The target group was mothers of infants and health personnel. The motto for the newly started group was that in order to give advice to others, the embodied experience of breastfeeding was crucial. They started educating each other and developed a qualifying test that all women who wanted to function as assistant breastfeeders (*Ammehjelper,* a neologism that they constructed) had to pass. It was supposed to be a professionally based counseling service from mother to mother. They also engaged in activism on several arenas: writing letters to patients organizations, associations of housewives, and the Norwegian mass media, and organizing and taking part in demonstrations. Not least, they created a people's movement.

The first idea the young women had was to create a Norwegian chapter of the American association La Leche League, an example of Jessica Martucci's argument that despite the sharp decline in breastfeeding in the United States, there was a subgroup of mothers who remained dedicated to breastfeeding as an alternative. La Leche League was founded in 1956 by seven Catholic women who wanted to reclaim childbirth and childbearing from medicine and male expert advice. They organized discussion groups and provided individual counseling and argued that the babies should decide when they should be fed and when they should be weaned from the breast, instead of

letting the clock and calendar rule as had been customary until then. The organization was named La Leche League because the founders believed that the word "breast" would inevitably create associations with sexualized film actresses.[36] The movement grew large, especially in the 1960s and 1970s. Fifteen years after its foundation, there were 1,260 chapters, with branches across the rest of the world, and around 17,000 women had been trained to be La Leche League leaders. It has been argued that La Leche League was a contributing factor to the increased frequency of breastfeeding in the United States from 20 percent in the 1950s to 60 percent thirty years after.[37]

In the middle of the 1960s, Helsing became aware of La Leche League, through which she would discover information that helped her build up Ammehjelpen. Like the women in La Leche League, the members of the Norwegian Breastfeeding Support Group also placed emphasis on information sharing and peer assistance in various ways. They drew inspiration from La Leche League to publish newsletters and provide guidance to mothers by telephone. In the 1960s, the women behind La Leche League collected the newsletters they had written in a manual, *The Womanly Art of Breastfeeding,* which Helsing got hold of when she was breastfeeding her second child, and which was to become important both for her and for her peers in the Norwegian Breastfeeding Support Group. When Helsing decided to publish a book about breastfeeding, she originally had a translation of this book in mind. She joined the organization and had a lot of material sent to her. However, she found the book unsuitable for Norwegian purposes and decided to write the book herself. The book she wrote, *Boken om amming* (The book about breast-

36 Martucci, *Back to the Breast.* There were similar organizations set up in other countries at the same time: for instance, the Natural Childbirth Association in New Zealand 1951, and the British equivalent, the National Childbirth Trust, in 1957. See Bryder, "Breastfeeding and health professionals."

37 Weiner, "Reconstructing Motherhood."

feeding), sold a total of 76,000 copies and was translated into Swedish and Danish.[38]

Conclusion: A New Time of Breastfeeding?

To scale up what started as advice from experienced mothers for new mothers to a movement encompassing the whole of Norway took an immense amount of organizational skill and work. However, these women were helped by the scalability and universality of time itself, in its modern, homogenized form. Since the clock-time regime promoted in the 1950s had presented itself as universal, based both on the alleged universality of the female body and of time itself, the more situated, localized, and traditional time practices propagated by the Norwegian Breastfeeding Support Group could appeal to the same ideas. In this way, the idea of a general clock-based time-management practice for all mothers became a vehicle for more phenomenologically situated, event-based routines, branded as more "natural." Of course, the argument of the activists in the breastfeeding support group that they were returning to the "natural breastfeeding" of the nineteenth century is not accurate. Their breastfeeding was also bound up with a particular time, place, and physiology. The scaling up of their efforts from the kitchen table to a large social movement is intimately bound to their own time — to the new feminist awakening, to the founders' different places in society, and a range of other factors binding them to the times they were acting in.

But this scaling up also ultimately enabled a change in biology: an increased flow of milk from the breasts. Breastfeeding in the third and ninth months increased from an all-time low in 1968 to almost nineteenth-century levels (see fig. 6.1). This was not by, as the breastfeeding support group claimed, going "back to nature," but by changing nature through actions involving not only biology but also natural, historical, social, and personal relations. The physiological production of milk is active

38 Elisabet Helsing, *Boken om amming* (Gyldendal, 1970).

and changing, and milk production contingent upon contexts: the specific time and place and particular relations — interpersonal relations, conditions at the workplace, and political and policy decisions play crucial roles. In the production of milk, the complexity and interpenetrations of rhythms — biological, social, political, and cultural — are entangled in formations that are not reducible to the output, that is, the breastmilk alone. The rhythmicities, timings, tempos, change, and contingencies of breastfeeding by necessity hinge on the interplay of all these factors.

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PART 3

Progresses and Futures

7

Making Progress Legible: Historicity and Materiality in the Nineteenth-Century Arabic Periodical

Ingrid Eskild

> When we see and consider the conditions of the East — its people and languages — sorrow comes upon us, especially when we compare ourselves to Europe and America, who practically fly out of this world, while we are like a deaf, motionless stone.
>
> — "Mustaqbal al-Mashriq" [1]

This quote is from an 1882 article, "The Future of the East," in the Arabic literary-scientific journal *al-Muqtataf*. The article is unsigned, but most likely written by one of the editors, Yaqub Sarruf or Faris Nimr, two Christian Arabs who taught at the Syrian Protestant College in Beirut. The stone simile does not describe the two men in any way. They were partaking in the intellectually blossoming environment that was late nineteenth-

1 "Mustaqbal al-Mashriq" [The Future of the East], *al-Muqtataf* 6 (1881/1882): 143.

century Levant, trailblazing vigorous debates on the Arabic language, literature, and identity and ideas on societal progress, nationhood, and civilization. The grievance suggested by the quote was, however, widespread in the region. According to the editors of *al-Muqtataf,* stagnation, being like a "deaf, motionless stone," was the somber diagnosis of the Arab condition. The desire to modernize was in fact the desire to "find one's wings" in order to fly, just like they envisioned the Europeans and Americans were doing.[2]

Sarruf and Nimr had been born into rural surroundings and came to the city for education. The shift toward cosmopolitanism that 1870s Beirut offered must have been transformative for the two men, and the awareness of the outside world spurred a growing self-awareness in the secular-minded, Arab literati. The dynamic movement Sarruf and Nimr were part of, later called the Arab *nahda* ("reawakening"), was the intellectual and cultural counterpart to the institutional and state-building projects of the Ottoman state.[3] Sarruf and Nimr's main concern was how to make "Arab civilization" relevant in a world that seemed to be changing at a drastically faster pace. The revolutionary new forms of communication had brought "European civilization" to their doorstep, and they felt "forced to take part in its benefits

2 I am grateful to the Norwegian Historical Association (HIFO) for generously providing support to write this chapter.

3 There is a growing corpus on the Arab *nahda*. See, e.g., Jens Hanssen and Max Weiss, eds., *Arabic Thought Beyond the Liberal Age: Towards an Intellectual History of the Nahda* (Cambridge University Press, 2016); Tarek El-Ariss, *Trials of Arab Modernity* (Fordham University Press, 2013); Elizabeth Holt, *Fictitious Capital: Silk, Cotton, and the Rise of the Arabic Novel* (Fordham University Press, 2017); Florian Zemmin, *Modernity in Islamic Tradition: The Concept of "Society" in the Journal "al-Manar" (Cairo, 1898–1940)* (De Gruyter, 2018); Peter Hill, *Utopia and Civilisation in the Arab Nahda* (Cambridge University Press, 2020); Ilham Khuri-Makdisi, *The Eastern Mediterranean and the Making of Global Radicalism, 1860–1914* (University of California Press, 2010); Stephen Sheehi, "Towards a Critical Theory of Al-Nahḍah: Epistemology, Ideology and Capital," *Journal of Arabic Literature* 43, nos. 2–3 (2012): 269–98; and Jens Hanssen, *Fin de Siècle Beirut: The Making of an Ottoman Provincial Capital* (Oxford University Press, 2005).

and harms."[4] Shahin Makarius, the third editor and print technician, wrote in the journal:

> [The Europeans] have plunged into the deep seas and returned soundly; stormed the fires and returned safely; flown on a magic carpet driven by gas instead of wind....Wherever we turn our gaze, we see traces of development [*taqaddum*] coming, the bacteria of progress [*irtiqa'*] dormant, for not a week goes by without hearing about amazing discoveries or strange inventions.[5]

The future was out there, it was being actualized in Europe, or so went *al-Muqtataf's* story. The editors felt, not without slight anxiety, that the tempo had accelerated and they believed they needed to "catch up."[6] The editors founded *al-Muqtataf* with the intention of making it a kind of vehicle to the future by educating their readers in scientific matters, exposing them to the wonders of technology, and encouraging "those who love progress" to roll up their sleeves and contribute to "the good of this country." They called on their readers not to despair, "for it is not impossible for us to keep up with [the Europeans] if we put our minds to it. All those who walk the path shall arrive."[7] But what did this "path" look like, and what would it mean to "walk" it?

History as a "form of thought and habit of mind," a temporal category independent of seasonal, "natural" time, emerged in the Middle East in the nineteenth century.[8] Hannah Arendt suggested that, alongside scholars such as Reinhart Koselleck, the

4 "Al-Nadhr fi Hadirina wa-Mustaqbalina" [A view of our present and future], *al-Muqtataf* 8 (1884): 471.

5 "Al-Irtiqa'" [Progress], *al-Muqtataf* 6 (1882): 599.

6 For an analysis of the colonial discourse on developmental "belatedness," see Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton University Press, 2000), 8, and Johannes Fabian, *Time and the Other: How Anthropology Makes Its Object* (Columbia University Press, 1983).

7 "Mustaqbal al-Mashriq" [The future of the East], 144.

8 Yoav Di-Capua, *Gatekeepers of the Arab Past: Historians and History Writing in Twentieth-Century Egypt* (University of California Press, 2009).

modern understanding of history can be understood as a process of temporalization, namely, construing phenomena, human and nonhuman, in processual terms, conceptualizing historical time as the movement forward in time.[9] The quotes above show that the self-awareness of *al-Muqtataf's* editors was modeled on temporal and spatial abstractions, using temporally charged concepts such as "decline" and "progress" to describe their ills and envisioned salvation. The editors discursively constituted the "Arab civilization" as something different from the "European civilization" and held that they existed in different times and actualized themselves at different speeds, thus interacting with a narrative of universal history in which human societies were placed on a timeline according to their level of sophistication.[10] This nevertheless afforded a sense of historical contingency in which the Arab future was malleable, which spurred an imperative to "act in one's time": to make the Arabs significant actors on the grand timeline of universal history.

This chapter moves away from the journal's discourse and turns to its materiality, contributing to "the necessity of adequately theorizing the relationship between discursive practices and the material world," per Karen Barad's invitation.[11] Notions of universal history helped stabilize a past-present-future nexus that was needed to act historically, but the emergence of these notions in the first place was the result of the restructuring of societal relations that the periodical press facilitated. Instead of focusing on how "expectations, hopes, or prognoses that are projected into the future become articulated into *language*," I study how these future-trajectories could arise through the ma-

9 Hannah Arendt, *Between Past and Future: Eight Exercises in Political Thought* (Penguin, 1977), and Reinhart Koselleck, "Neuzeit: Remarks on the Semantics of Modern Concepts of Movement," in *Futures Past: On the Semantics of Historical Time,* trans. Keith Tribe (Columbia University Press, 2004).

10 On Barak, *On Time: Technology and Temporality in Modern Egypt* (University of California Press, 2013).

11 Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Duke University Press, 2007), 28.

terial logics of the emerging printing press.[12] I focus less on history as a "form of thought" and more as a "habit of mind," a mediated rhythm with which the late nineteenth-century Arab could synchronize.[13] Matter structures meaning, and a thorough study on how *al-Muqtataf* contributed to the formation of historical time in late nineteenth-century Beirut must include how it functioned as a material object in the larger infrastructure of knowledge production. Scholars of the Arab *nahda* have rightly credited *al-Muqtataf* for contributing to the introduction of secular, positivistic science to a large audience in the region, but the focus has largely been textual-discursive.[14] An important part of the picture is how the journal's materiality gave vague notions of "progress" a legible form. I argue that *al-Muqtataf* facilitated an emerging abstraction of time *as history,* process-oriented and forward moving, by creating spaces — both concrete and abstract — for imaginaries of a common Arab past, by beating out a rhythm for public discourse, and by systematizing and ordering information on the "future" — cast as scientific and technological development — with a simplistic layout that encircled the imperative to *act*. In doing so, they were mobilizing what they perceived to be stale structures in a way that expanded the present moment, saturating it with emancipatory potential.

12 Koselleck, *Futures Past,* 3 (italics are mine).

13 Di-Capua, *Gatekeepers of the Arab Past,* 11. Di-Capua does not explicate how he understands the difference between history as "a form of thought" and "a habit of mind." However, I use these terms as a springboard to think about historical time as an epistemological structure (form of thought) and a mode of operation conditioned by rhythms, social constructs, and technologies (habit of mind).

14 See, e.g., Marwa Elshakry, *Reading Darwin in Arabic, 1860–1950* (University of Chicago Press, 2013), and Daniel A. Stolz, *The Lighthouse and the Observatory: Islam, Science, and Empire in Late Ottoman Egypt* (Cambridge University Press, 2013). A notable exception is Hala Auji, who has published several works on the materiality of the printing press in the *nahda*; see, e.g., Hala Auji, *Printing Arab Modernity: Book Culture and the American Press in Nineteenth-Century Beirut* (Brill, 2016), and Hala Auji, "Implications of Media: A Material Reading of Nineteenth-Century Arabic Broadsides," *Visible Language* 53, no. 1 (2019): 20–49.

Al-Muqtataf was but one journal in the growing media landscape, but perhaps the most important. Many of the arguments I make below can be applied to the emerging printing culture in general. The journal nevertheless stands out in its efforts to provide the recipe for historical progress by inducing in their readers a literacy of science's "language of form."[15] Science and technology provided a very concrete solution to the complex problem of "how to enter the future," and the editors domesticated this trope by naturalizing scientific tables, diagrams, and woodcut illustrations for its readership. Casting science as history's motor gave a keen sense of the present moment's contingency and in turn effected a feeling of historical agency. By giving "history" and "science" a form, *al-Muqtataf* was establishing boundaries for the scope of *action in time* and, in the process, spurred the notion of a "now-time," or *Jetztzeit,* ripe with potential for improvement.[16]

In this chapter, I consider the journal as a material object with inherent capabilities to act upon its environment, and I treat the early years (1876–1885) of *al-Muqtataf* as a case and lens by which to investigate how the material logics of the journal functioned as an agent for synchronizing the emerging civil society with a process-oriented temporal regime. I divide this effort into two categories. First, I argue that the journal's external infrastructure — its geographic distribution and periodic publication — facilitated imageries of a common Arab historical timeline. Second, I argue that the journal's methods for organizing and presenting its content gave this timeline direction by installing "science" as its motor.

Bringing together temporality studies, science and technology studies (STS), and *nahda* studies, I investigate the material underpinnings of the epistemological rupture that the *nahda*

15 Johanna Drucker, *Graphesis: Visual Forms of Knowledge Production* (Harvard University Press, 2014).

16 Walter Benjamin, "Theses on the Philosophy of History," in *Illuminations: Essays and Reflections,* ed. Hannah Arendt, trans. Harry Zohn (Schocken Books, 1988).

represented.[17] This entails not merely looking at political-economic changes in a macro-perspective but also inquiring into the details of how cultural outputs such as *al-Muqtataf* represented and channeled possibilities for other ways of thinking about time. A handful of scholars have studied the discourse in the late nineteenth-century Middle East from a temporalities perspective, many with a focus on conceptual change toward "modernity."[18] I take these perspectives further by looking at how temporal imaginaries were materially mediated.

Distribution and Social Cohesion

Although available in Europe since the fifteenth century, the technology of the printing press emerged quite suddenly in the Middle East in the nineteenth century. This was not caused by delay of technological development but the result of a deliberate preference for handwritten manuscripts over printed ones. Reasons for this include the fact that the Islamic tradition of calligraphy did not easily lend itself to a letterpress.[19] Moreover, it was thought that the fast spread of news would distort the information flow and make it unmanageable for both governing organs and the *'ulamā* (Islamic scholars).[20] With the influx of foreign missionaries, there was an impetus to establish precisely a quick and wide-reaching information flow. British and American missionaries saw the new printing press as an apt tool

17 Ilham Khuri-Makdisi, "The Conceptualization of the Social," in *A Global Conceptual History of Asia, 1860–1940,* ed. Hagen Schultz-Forberg (Pickering and Chatto, 2014), 97.

18 Zemmin, *Modernity in Islamic Tradition;* Wael Abu-'Uksa, *Freedom in the Arab World: Concepts and Ideologies in Arabic Thought in the Nineteenth Century* (Cambridge University Press, 2016); and Orit Bashkin, "Journeys between Civility and Wilderness," in *Civilizing Emotion: Concepts in Nineteenth Century Asia and Europe,* ed. Margrit Pernau and Helge Jordheim (Oxford University Press, 2015).

19 Hala Auji, *Printing Arab Modernity,* 25–27.

20 Reinhard Schulze, "The Birth of Tradition and Modernity in 18th and 19th Century Islamic Culture: The Case of Printing," in *The History of the Book in the Middle East,* ed. George Roper (Routledge, 2013), 345–88.

for "civilization" and established several printing houses in that vein.[21] The Ottoman government quickly responded by issuing a "Printing and Publication Law" intended to ensure that all printed material underwent prepublication censorship.[22] The censorship notwithstanding, a growing civil sphere of educated young men entertained each other in lively debates on the current conditions of Ottoman Arab society and mapped out visions for the future.

Al-Muqtataf was established in 1876 and published monthly. It had a circulation of 500 copies in the 1880s and about 3,000 in the 1890s.[23] Its importance lies in its novelty. It was one of the very first journals in the burgeoning field of knowledge production outside of the *madrasas* (Islamic schools) and paved the way for what was to become innumerous others. Subscribers were mostly representatives from civil society, such as teachers and engineers; it had limited outreach to the traditional elites or the mass population, at least in the beginning.[24] Although its readers were seemingly few, the group they came to make up was becoming increasingly important. Moreover, the number of subscribers may not accurately depict its influence. The high subscription price prompted salon-like structures to arise around the new magazine. Ami Ayalon describes an example of this: "A group of young Sunnis in Baghdad in the late 1870s organized…a collective effort to purchase a single subscription of *al-Muqtataf*."[25] Although printed in Beirut and later in Cairo, the journal reached as far as Baghdad, where eager young men would gather around to hear the latest. The journal's readership expanded quickly and reached far:

> Within a few years, it had established a network of agents who distributed it in Greater Syria (in Tripoli, Damascus,

21 Elshakry, *Reading Darwin,* 22.
22 Ami Ayalon, *The Press in the Arab Middle East: A History* (Oxford University Press, 1995), 23.
23 Ibid., 53.
24 Elshakry, *Reading Darwin,* 22.
25 Ayalon, *The Press,* 158.

> Jerusalem, Jaffa, Homs, Aleppo, Sidon, and Hama) and throughout Upper and Lower Egypt (in Cairo, Alexandria, Damanhur, Tanta, Al-Fayyum, Al-Minya, Asyut, and Tahta), as well as abroad. Syrian émigrés purchased it in Brazil, Argentina, Mexico, Cuba, Canada, and the United States, and by 1892 its circulation (at an estimated three thousand) was one of the largest of any Arabic journal.[26]

Marwa Elshakry shows that *al-Muqtataf* was not merely circulated by the editors. Its popularity gained them foot soldiers who contributed to its wide circulation. Soon, literate (and sometimes even illiterate)[27] people in all major Arabic-speaking communities were reading and discussing Sarruf and Nimr's journal. The journal's wide circulation determined the geographic scope of the project, bringing the Arab urban centers into its orbit. The quite sudden interest in their journal must have given the editors a growing sense of who they were speaking *to*. There was obviously a great potential in the Arabic-speaking public for platforms that could disseminate modern science in their language.

One of the main arenas for an "imagined community" is the "mass ceremony" of reading newspapers, according to Benedict Anderson.[28] It was not uncommon for a single edition to be circulated to a large group of people or be the centerpiece of conversation in coffeehouses or reading rooms. Sarruf and Nimr even founded their own scientific discussion group in 1882 called *al-Majmaʿ al-ʿIlm al-Sharq* (Eastern Science Society), which, though short-lived, contributed to forming a new standard for socialization and public culture.[29] This was not only

26 Elshakry, *Reading Darwin,* 31.

27 Hala Auji, "Picturing Knowledge: Visual Literacy in the Nineteenth-Century Arabic Periodical," in *Making Modernity in the Islamic Mediterranean,* ed. Margaret S. Graves and Alex Dika Seggerman (Indiana University Press, 2022).

28 Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (Verso, 1983), 35.

29 Elshakry, *Reading Darwin,* 62.

men's domain: one of the first literary societies was founded by the two editors' wives, Maryam Nimr Makariyus and Yaqut Barakat Sarruf, and the society's lectures and essays were printed in the journal.[30]

The salon-like structures emerging around *al-Muqtataf* had their counterpart within the journal itself. Each edition reserved space for letters from the readership, debate pages, and a section for questions and answers. It was not rare for the editors to devote many pages to mathematical equations upon request. It communicated an egalitarian view of knowledge, simply showing that anyone could take part in the new and wondrous world of scientific inquiry. This ideal, referred to as *tarbiya* (education, or *Bildung*), had the potential of breaking up hierarchies and realigning social bonds to a very different logic. When the social constitution of a given society changes, stories of its genesis change accordingly. The printed press reorganized the social constitution of society because it provided a platform for conversation between people who, had they been born merely fifty years earlier, would not have had a voice in the public.

Inasmuch as the production of historical time and the circumscription of historical collectives are co-constitutive processes, *al-Muqtataf* was an arena for both.[31] The concrete way that the journal contributed to the shaping of a public sphere arguably created a space in which one could agree on a common past. The journal published numerous articles on the Arab past with a particular focus on the Arabs' contribution to rational science and philosophy, especially in the so-called Arab golden age. This period, from the Muslim expansion in the eighth century to the collapse of the Abbasid caliphate in the thirteenth century, which saw great accomplishments in algebra, astronomy, medicine, and chemistry, and also in craftsmanship such as calligraphy, textiles, and ceramics, was particularly important

30 Toufoul Abou-Hodeib, *A Taste for Home: The Modern Middle Class in Ottoman Beirut* (Stanford University Press, 2017), 120.

31 Cemil Aydin, *The Idea of the Muslim World: A Global Intellectual History* (Harvard University Press, 2017), and Di-Capua, *Gatekeepers*.

for shaping the historical imaginary of the *nahdawis*.[32] The construction of a magnificent past asserted the Arab people's essential, though yet unrealized, ability to inhabit the future with confidence. The idea of the golden age proved that the Arabs could provide a fruitful habitat, or a garden, for civilizational blossoming and hence that they could — and should — do so again.[33] Such imaginaries, however, were quite possibly the direct result of the new forms of public social interaction that the journal itself facilitated. The formation and sustenance of a public discourse in constant movement — manifested as salons, debate pages, and conversations between leading intellectuals as essays in the journal — gave nourishment to the concept of a collective Arab project with roots that stretched far back in time. Carving out a space for oneself in the social body went hand in hand with carving out a space for oneself in time, or rather, in history.

Periodicity and Synchronization

The periodicity created by the printing press was phenomenologically different from the periodicity created by prayer times, festivities, or seasonal cycles. As thoroughly dealt with in different settings by scholars such as Anderson and Stephen Kern, the printing press imposed a sense of immediacy, of now-ness, that stimulated perceptions of simultaneity between oneself and the state of the world.[34] A journal with *al-Muqtataf*'s disposition was particularly apt for doing so because its aim was to broadcast and domesticate the wonders of science and industry as they progressed. It was no less than "the new world" they were

32 Marwa Elshakry, "The Invention of the Muslim Golden Age: Universal History, the Arabs, Science, and Islam," in *Power and Time: Temporalities in Conflict and the Making of History,* ed. Dan Edelstein, Stefanos Geroulanos, and Natasha Wheatley (University of Chicago Press, 2020).

33 See Holt, *Fictitious Capital,* chap. 1, for more on the "garden" trope in the contemporary jargon.

34 Anderson, *Imagined Communities,* and Stephen Kern, *The Culture of Time and Space, 1880–1918* (Harvard University Press, 1983).

launching in, and they did so in a repeated, monthly rhythm. In this sense, the journal itself was a manifestation of the world-to-come, an embodiment of the *nahda* they yearned for. The spatial expansion of the present moment helped foster a sense of the world as within reach, and that one could take part in the futures simultaneously arising in different parts of the globe.

We may also say that the periodical press imposed a sensed directionality, as each journal edition was one among many to come.[35] This was emphasized by the serialized feature articles and columns that filled *al-Muqtataf.* The journal also serialized novels (among them Yaqub Sarruf's own *Fatat Misr*).[36] Moreover, each edition came with a column called *'akhbar w-iktishafat w-ikhtira'at* (News, Discoveries, and Inventions) that gave updates on the immediate progress of the scientific world. The air of to-be-continued helped stretch the present moment into the future, adding an anticipatory component to the reading experience. This molded the intellectual production into the shape of conversation, setting the standard both for which topics should engage the educated public but also for what form such conversation should take. The ideal that it should be open-ended and open for contestation came to affect the educated public's view of themselves and their relations to one another. The men of letters of late nineteenth-century Beirut, to which group Nimr and Sarruf uncontestably belonged, saw their project as an endeavor for emancipation and education.[37] Emancipation meant creating one's own platform for conversation, and the serialization of public discourse brought the necessary pliancy to this project.

Not directly promising completion or fulfillment, the serial narrative brought an element of instability, effectively establishing change as a constant. Sommerville acutely remarks on periodicity that it "creates the impression that each day finds

35 Mark W. Turner, "Periodical Time in the Nineteenth Century," *Media History* 8, no. 2 (2002): 183–96.

36 For an excellent analysis of *Fatat Misr* in relation to speculative capitalism, see Holt, *Fictitious Capital,* 119–35.

37 Hanssen, *Fin de Siècle Beirut,* 6.

the world at a crossroads."[38] What information would the next day, the next week, the next month bring, and how would one go about realigning one's life accordingly? This mediated space of "the not-yet" ushered in a dynamic that made time eventful and complex — above all unpredictable — and this unsettled the present as a stable ground on which the future would calmly enter, thereby laying the ground for visions of reform.[39] Idealistic, reformist ideas of society demand destabilizing the traditional structures that it rests upon. In essence, therefore, the printing press was part of a radicalizing project because it brought rupture to the traditional platforms for knowledge production and contestation. It provided the material ground for imagining a "new time" that looked completely different from the "old."[40]

In the time organized by periodicals, the gaps mattered as much as the content. The intervals between readings afforded space for imagination, hope, and concern — in a word, for futurity.[41] Elizabeth M. Holt links the fractured nature of serialized literary production to the speculative practices undergirding capitalism.[42] To paraphrase Raymond Williams, it is by realizing that the cultural order is materially produced that we can begin to fully understand the relations between capitalist logic and changes in, say, language or music.[43] *Al-Muqtataf* was established as part of an American missionary project that also poured money into infrastructure, founded important social institutions, and in other ways made their presence known through providing an alternative system of logic that was not

38 John C. Sommerville, *The News Revolution in England: Cultural Dynamics of Daily Information* (Oxford University Press, 1996), 21.

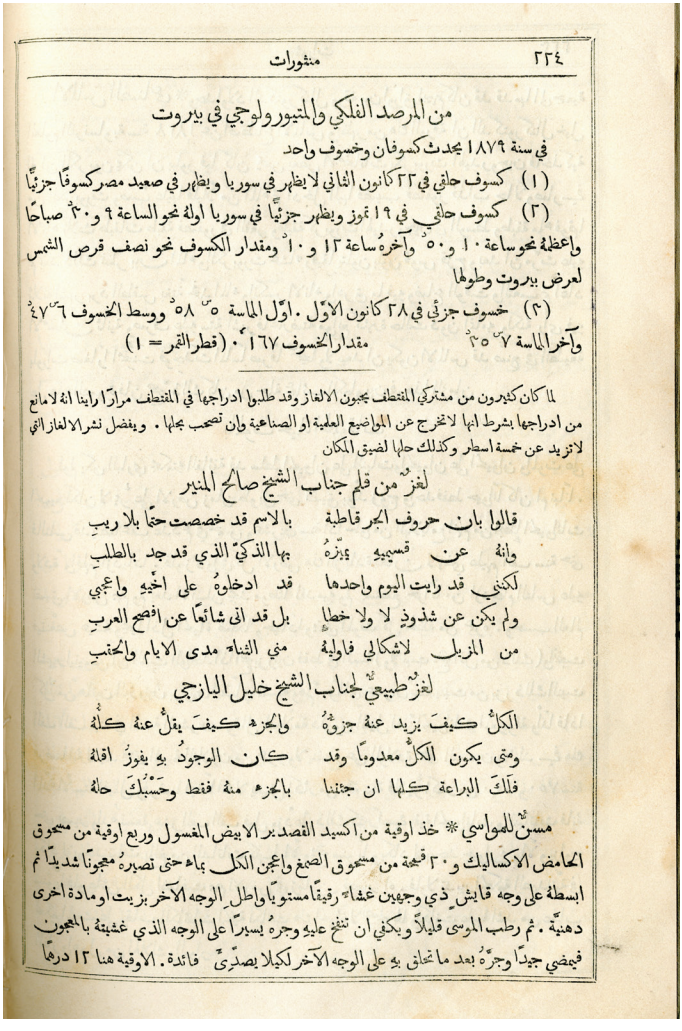
39 Ibid.

40 For a thorough study on the concept of "new time" in Istanbul, see Daniel Kolland, "Making and Universalizing New Time: A History of the Late Ottoman-Turkish Magazine Servet-i Funun (1891–1914)" (PhD diss., Freie Universität Berlin, 2021).

41 Wolfgang Iser, *Prospecting: From Reader Response to Literary Anthropology* (Johns Hopkins University Press, 1989).

42 Holt, *Fictitious Capital.*

43 Raymond Williams, *Marxism and Literature* (Oxford University Press, 1977), 92–94.



٢٢٤ منثورات

من المرصد الفلكي والمتيورولوجي في بيروت

في سنة ١٨٧٩ يحدث كسوفان وخسوف واحد

(١) كسوف حلقي في ٢٢ كانون الثاني لا يظهر في سوريا و يظهر في صعيد مصر كسوفًا جزئيًّا

(٢) كسوف حلقي في ١٩ تموز ويظهر جزئيًّا في سوريا اوله نحو الساعة ٩ و ٣٠ صباحًا واعظمهُ نحو ساعة ١٠ و ٥٠ وآخرهُ ساعة ١٢ و ١٠ ومقدار الكسوف نحو نصف قرص الشمس لعرض بيروت وطولها

(٣) خسوف جزئي في ٢٨ كانون الاوّل . اوّل المماسة ٥ ٥٨ ووسط الخسوف ٦ ٤٧ وآخر المماسة ٧ ٣٥ مقدار الخسوف ١٦٧ ٠ (قطر القمر = ١)

لما كان كثيرون من مشتركي المقتطف يحبون الالغاز وقد طلبوا ادراجها في المقتطف مرارًا رأينا انهُ لا مانع من ادراجها بشرط انها لا تخرج عن المواضيع العلمية او الصناعية وان تصحب بحلها . وبفضل نشر الالغاز التي لا تزيد عن خمسة اسطر وكذلك حلها لضيق المكان

لغزٌ من قلم جناب الشيخ صالح المنير

قالوا بان حروف الجر قاطبة ... بالاسم قد خصصت حتمًا بلا ريبِ
وانهُ عن قسيميهِ يميّزهُ ... بها الذكيّ الذي قد جد بالطلبِ
لكنني قد رايت اليوم واحدها ... قد ادخلوهُ على اخيهِ واعجبي
ولم يكن عن شذوذٍ لا ولا خطإٍ ... بل قد اتى شائعًا عن افصح العربِ
من المزيل لاشكالي فاولية ... مني الثناء مدى الايام والحقبِ

لغزٌ طبيعيٌّ لجناب الشيخ خليل اليازجي

الكلُّ كيفَ يزيد عنهُ جزؤهُ ... والجزء كيفَ يقلُّ عنهُ كلُّهُ
ومتى يكون الكلُّ معدومًا وقد ... كان الوجودُ بهِ يفوزُ اقلهُ
فلكَ البراعة كلها ان جئتنا ... بالجزء منهُ فقط وحَسْبُكَ حلهُ

مسنٌ للمواسي * خذ اوقية من اكسيد القصدير الابيض المغسول وربع اوقية من سنجوق الحامض الاكساليك و ٣٠ قمحة من سنجوق الصبغ واعجن الكل بماء حتى تصيرهُ معجونًا شديدًا ثم ابسطهُ على وجه قايش ذي وجهين غشاء رقيقًا مستويًا واطل الوجه الآخر بزيت او مادة اخرى دهنيَّة . ثم رطب الموسى قليلاً ويكفي ان تنفخ عليهِ وجرهُ يسيرًا على الوجه الذي غشيتهُ بالمعجون فيمضي جيدًا وجرّهُ بعد ما تحاتى بهِ على الوجه الآخر لكيلا يصدّئ فائدة . الاوقية هنا ١٢ درهمًا

Fig. 7.1. A typical page from the journal. At the top, information from the Astronomical and Meteorological Observatory in Beirut on eclipses. At the bottom, two riddles presented by sheikhs in the traditional parallel form. Source: *Al-Muqtataf* III (1878): 224. American University of Beirut/Library Archives.

just Christian or Protestant but capitalist and imperialist, with a certain claim to universality that we can see reproduced on the pages of *al-Muqtataf*.

There were, of course, many other rhythms in late nineteenth-century Beirut than the one provided by *al-Muqtataf* and similar magazines. I am not claiming that the printing press reshaped the temporal organization of Syrian society as a whole, seeing as it was a highly heterogeneous society, and it was only a small part of the literate elite that subscribed to these magazines. Another fraction of the elite, namely, the *ʿulamā*, even boycotted the new media actors and called them *kuffar* (unbelievers).[44] I am suggesting, however, that it provided an alternative rhythm in the polyrhythmic whole, which became increasingly important in the dynamic social, cultural, and political landscape that was late nineteenth-century Levant. In the following, I turn to how the journal gave this rhythm form, namely, by installing scientific and technological development as history's motor.

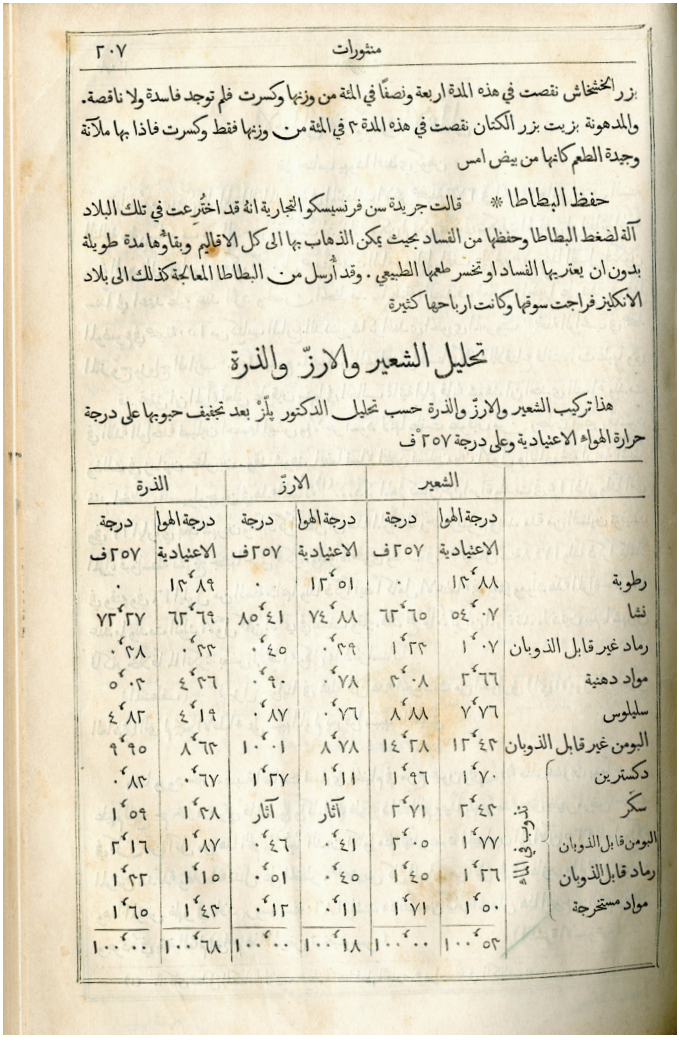
The Authority of Order (and Disorder)

Following Roger Chartier, we must "recognize the strategies by which authors and publishers tried to impose an orthodoxy or a prescribed reading on the text"[45] in order to fully appreciate the text as historical agent.[46] The guiding strategies consciously or subconsciously employed by the editors of *al-Muqtataf* left the impression that the journal was a kind of "vehicle to the future." The overall visual presentation of the journal was markedly more miscellaneous than in scribal culture. Although we may not recognize the journal format as particularly chaotic with modern eyes, what the journal presented was a kind of orderly disorder (fig. 7.1). The briefs and columns were new genres that made information easily digestible. Images and illustrations

44 Ayalon, *The Press,* 169.

45 Roger Chartier, "Texts, Printing, Readings," in *The New Cultural History,* ed. Lynn Hunt (University of California Press, 1989), 157.

46 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford University Press, 2005).



٢٠٧ منثورات

بزر الخشخاش نقصت في هذه المدة اربعة ونصفاً في المئة من وزنها وكسرت فلم توجد فاسدة ولا نافصة. والمدهونة بزيت بزر الكتان نقصت في هذه المدة ٣ في المئة من وزنها فقط وكسرت فاذا بها ملآنة وجيدة الطعم كانها من بيض امس

حفظ البطاطا * قالت جريدة سن فرنسيسكو التجارية انهُ قد اختُرعت في تلك البلاد آلة لضغط البطاطا وحفظها من الفساد بحيث يمكن الذهاب بها الى كل الاقاليم وبقاؤها مدة طويلة بدون ان يعتريها الفساد او تخسر طعمها الطبيعي . وقد أُرسل من البطاطا المعالجة كذلك الى بلاد الانكليز فراجت سوقها وكانت ارباحها كثيرة

تحليل الشعير والارزّ والذرة

هذا تركيب الشعير والارزّ والذرة حسب تحليل الدكتور بلّزْ بعد تجفيف حبوبها على درجة حرارة الهواء الاعتيادية وعلى درجة ٢٥٧° ف

	الشعير		الارزّ		الذرة	
	درجة الهوا الاعتيادية	درجة ٢٥٧ ف	درجة الهوا الاعتيادية	درجة ٢٥٧ ف	درجة الهوا الاعتيادية	درجة ٢٥٧ ف
رطوبة	١٤٫٨٨	٠	١٣٫٥١	٠	١٣٫٨٩	٠
نشا	٥٤٫٠٧	٦٣٫٦٥	٧٤٫٨٨	٨٥٫٤١	٦٣٫٦٩	٧٣٫٢٧
رماد غير قابل الذوبان	١٫٠٧	١٫٣٤	٠٫٣٩	٠٫٤٥	٠٫٣٣	٠٫٣٨
مواد دهنية	٣٫٦٦	٣٫٠٨	٠٫٧٨	٠٫٩٠	٤٫٣٦	٥٫٠٣
سليلوس	٧٫٧٦	٨٫٨٨	٠٫٧٦	٠٫٨٧	٤٫١٩	٤٫٨٣
البومن غير قابل الذوبان	١٣٫٤٣	١٤٫٣٨	٨٫٧٨	١٠٫٠١	٨٫٦٣	٩٫٩٥
دكسترين	١٫٧٠	١٫٩٦	١٫١١	١٫٢٧	٠٫٦٧	٠٫٨٣
سكر	٣٫٤٣	٣٫٧١	آثار	آثار	١٫٣٨	١٫٥٩
البومن قابل الذوبان	١٫٧٧	٣٫٠٥	٠٫٤١	٠٫٤٦	١٫٨٧	٣٫١٦
رماد قابل الذوبان	١٫٣٦	١٫٤٥	٠٫٤٥	٠٫٥١	١٫١٥	١٫٣٢
مواد مستخرجة	١٫٥٠	١٫٧١	٠٫١١	٠٫١٢	١٫٤٣	١٫٦٥
	١٠٠٫٥٣	١٠٠٫٠٠	١٠٠٫١٨	١٠٠٫٠٠	١٠٠٫٦٨	١٠٠٫٠٠

Fig. 7.2. A table of information on how the composition of barley, rice, and maize changes at different temperatures. Source: *Al-Muqtataf* V (1880): 207. American University of Beirut/Library Archives.

broke up the mass of text here and there. The mixture of essays from outside contributors, editors' notes, unsigned exposés, and short scraps of news from various parts of the globe introduced a new aesthetics and literary sensibility to the region. Its effect was that of mobility, movement, and change, which granted an ephemeral quality to public discussion guised as flexibility to the rapidly changing circumstances. Paradoxically, then, the disorder contributed to the journal's authority, in that it displayed a more "truthful" rendering of the state of the ever-evolving world. Although the overall presentation was collage-like, the information was neatly structured in tables and columns that ordered the disorderly. It was as if the editors, steadily marching into a hectic future, ordered and systematized the information needed for others to join them.

The journal's twelve yearly editions were bound together with a table of contents at the beginning, arranged alphabetically. For the collector, then, *al-Muqtataf* functioned as an encyclopedia that could be used for educational purposes or at leisure. The editors' methods for ordering their content relied on graphics quite foreign to the nascent readership. Tables of information, collage-like structures, illustrations, and simple, undecorated fonts induced a new visual literacy in the readers, but they also afforded a sense of legitimacy to the journal. There was power in numbers, tables, and illustrations, and they neatly circumscribed what the journal presented discursively: that science was the key to progress.

Tables neatly lined up information on, for example, different types of soil, the number of inhabitants in different parts of the Levant, or the decline in the Hawai'ian population. The tables listed different phenomena and their characteristics in a way that resembled how scientists would take notes of their findings (fig. 7.2). This contributed to a sense of indisputability and a factual base for the subsequent discussions of these phenomena. It prescribed a certain ethos to the text itself, fixating the fundament for the arguments that followed.

Elizabeth Eisenstein, a towering figure in the study of print culture, speaks about early print capitalism as introducing a new

"esprit de système."[47] By all measures, the editors of *al-Muqtataf* were aware of the power of numbers and tables and used them extensively in supporting their intended message. Using tables of information, they removed themselves from their role as messengers and instead let the numbers speak for themselves. Their message thus bore the mark of rational, indisputable knowledge. This certainly granted the journal a sense of authority, but — more interestingly — it also offered authority to the readers. The information presented was not the property of the editors. Rather, it was presented as existing information *out in the world* for all to consume and apply as they wished. The neat ordering of numerical information thus underscored the democratic ideals of the editors. Moreover, it prompted notions of a cultivated *individual* who could autonomously venture into the realm of science and technology.

Although diagrams and tables of information may seem like neutral depictions of what *is,* they are really interpretations, or arguments in disguise. *Al-Muqtataf's* extensive use of illustrations and information tables was effectively underscoring their belief that secular, positivistic science was a universal way of knowing, thereby masking that their version of science — of course — also was a construction. Mechanically reproduced and widely distributed, their visual representation of knowledge nevertheless helped standardize the ways in which its readers thought about the world. Through the library of the Syrian Protestant College, *al-Muqtataf's* editors could access not only innumerous Arabic and European books on medicine, astronomy, botany, physics, and others, but also state-of-the-art journals from abroad. The journals they were engaging most with were the English *Nature* and *Nineteenth Century* and the American *Popular Science Monthly.* When they copied and translated from these, they were contributing to an information flow across the globe that saw nature inscribed in a way that was becom-

47 Elizabeth L. Eisenstein, *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early-Modern Europe* (Cambridge University Press, 1980).

ing increasingly standardized. They did not uncritically adopt a "Western" worldview but went into dialogue with knowledge produced elsewhere and mediated it to their own audience. For example, they would not copy culture-specific essays (such as a colonialist essay on the domination of Egypt, printed in *Nineteenth Century*), but mostly "neutral" woodcut illustrations of natural phenomena or information tables that rendered "objective" knowledge. Sarruf and Nimr, always the advocates of the universality of knowledge, held that the geographic origins of scientific development were less important than accurately understanding science's principles. In the "golden age" of Islamic civilization, the meaningful knowledge production had happened in Arab lands and then been transferred to Europe. Now, it was the other way around, a point which Sarruf and Nimr often emphasized. The fact that many of their illustrations were reproductions of images the editors had found in similar European publications indicates that they were part of a synchronization process across cultural spheres that created common reference points on how to visually comprehend and orient oneself in the world. *Al-Muqtataf* can therefore rightly be accredited with contributing to the formation of a new visual culture that helped connect local and regional traditions to a more global space.

Each edition of *al-Muqtataf* had the same layout: a table of contents followed by a handful of feature articles over several pages (sometimes to be continued), then questions and answers, and finally the various columns on new inventions and discoveries, on housekeeping, agriculture, and mathematics. Both the questions-and-answers section and the columns were spaces of interaction between the readership and the editors. Not only did the journal establish a ground for public debate, but it also demarcated a space for private life. Dividing the magazine into two, one part purely expositional and the other oriented toward reader engagement and practical use of the knowledge in the readers' own home, operationalized the information. The aim was precisely to ground the ideal of progress in everyday mi-

nutiae.[48] Both Toufoul Abou-Hodeib and Holt have pointed out that the journal was not simply a conveyor of abstract visions on how science would propel the Arab world into a prosperous future, but rather the editors took matters into their own hands by educating their readers in a day-to-day manner.[49]

The feature articles were the centerpiece of each edition, and they were arranged according to discipline, with exposés on astronomy, botany, history, geology, anthropology, and meteorology, among other subjects. *Al-Muqtataf's* popularized and curated version of "how the world works" was not just an ordering of meaning. Systematizing the natural world, compartmentalizing phenomena into distinct sections, was in effect mediating it into an operable sphere, undergirding the implicit imperative to act in one's time, but also structuring how and where such action could take place. Of course, this was also a process of exclusion: the relative lack of references to religion is one, the outright condemnation of magic and superstition another. For instance, the editors took personal issue with belief in astrology, calling it "fraudulent" and warning their readers against its lure.[50] Astrology was firmly set as something other than astronomy, and the latter had a scientific weight that the former lacked. The editors took pride in presenting knowledge that was verifiable according to methods of scientific inquiry. Although they were not antireligion per se, they envisioned their project to be outside of the theological realm, effectively contributing to the bifurcation of the world into secular versus religious spheres of knowing.

Nimr and Sarruf were certainly not alone in pushing science's agenda. *Al-Muqtataf* was one of the very first journals to popularize science, but the imperative of education and scientific development pervaded the region. The *Tanzimat* period included several educational reforms that strongly suggested that educa-

48 For more on *al-Muqtataf's* contribution to encapsulate the private sphere, see Abou-Hodeib, *A Taste for Home.*

49 Abou-Hodeib, *A Taste for Home,* 119–20; Holt, *Fictitious Capital,* 64–68.

50 Stolz, *The Lighthouse,* 47.

tion was a state priority for the Sublime Porte. Facing military and economic challenges, the Ottoman government founded schools in order to educate the elite to perform civil and military duties. But the "new ideas these men learned in school led them to shift their loyalties from the person of the sultan to their own ideal of what the state should be."[51] Likewise, in Egypt, schooling was initially implemented in order to foster a functioning army for strengthening the state but eventually evolved to have the aim to "produce the individual citizen."[52] Once the imperative for secular knowledge was articulated and institutionalized, the leeway for individual epistemic reorientation was difficult to curtail. *Al-Muqtataf,* with its easily digestible systematization techniques, helped this process along. Along with educational reforms and improved infrastructure for knowledge distribution, the journal represented an interface for the "gospel of science" that permeated the nineteenth-century Middle East.[53]

The systematization and presentation of knowledge in newspapers, journals, and magazines differ from books in one important way. Whereas books typically present one aspect of a topic — seeing the world from one perspective — periodical media juxtapose several snippets of information on a wide range of topics. The collage-like structure and scattered focus make readers mistake it for an objective rendering of the world as it is *right now,* a neutral and honest representation of the world in all its complexity.[54] It is appropriate here to dwell on the meaning of *al-Muqtataf,* which literally translates as "selections." The name stems from Cornelius Van Dyck, who suggested that the journal should contain extracts and translations from popular

51 Carter Vaughn Findley, *Turkey, Islam, Nationalism, and Modernity: A History, 1789–2007* (Yale University Press, 2010), 91.

52 Timothy Mitchell, *Colonising Egypt* (Cambridge University Press, 1988), 69.

53 Marwa Elshakry. "The Gospel of Science and American Evangelism in Late Ottoman Beirut," *Past & Present* 196, no. 1 (2007): 173–214.

54 Marshall McLuhan, *Understanding Media: The Extensions of a Man* (Routledge, 2001), 204–7.

science magazines in the West.[55] The "now-time" offered by the mosaic-like structure brought the reader into the journal's immediate orbit in a quite literal way; it was up to the readers to orient themselves in the material, choosing what to read, skim, or skip — in effect, to position themselves toward and negotiate the miscellaneous perspectives they were presented with. It helped establish the "now" necessary for action.

The Visual Design of Modernity

The Iraqi poet Jamal Sidqi al-Zahawi said that he felt like he "owned all the treasures of earth" when he got ahold of an exemplar of *al-Muqtataf*.[56] The analogue to a treasure box may be fitting because of the assemblage of illustrations of ancient castles, city landscapes, old Tibetan tribe members, lunar eclipses, animals from all parts of the globe, and state-of-the-art technical objects that drew the reader's attention in. The images were not just there for entertainment but came with their own educational imperative. Woodcut illustrations showed minuscule phenomena, such as insects and the inside of a human vein, side by side with those of large machines and solar systems. Again, we see a deliberate systematization for the sake of operability, the various phenomena carefully fitted to human scale. This mediation ontologically altered these objects' place vis-à-vis the human, bringing them into the same sphere of being (and becoming). The intention was to induce in readers a visual literacy of the world, embedded in secular and rational ideals, in which all phenomena could be dissected and systematized.

In an enlightening article, historian Hala Auji emphasizes that the engravings and illustrations were also meant for the illiterate part of the population.[57] Scientific knowledge was presented in a diagrammatic form with extended use of descriptions and annotations that instructed the readers on how to rightly

55 Elshakry, *Reading Darwin,* 60.
56 Ayalon, *The Press,* 53.
57 Auji, "Picturing Knowledge," 80.

navigate the information. Although older manuscripts had also used diagrams and illustrations for educational purposes, they had presupposed some familiarity with the material presented. The visuals in *al-Muqtataf* were sufficiently didactical to appeal to nonspecialist readers.[58] In an introduction on how to read the journal, the editors emphasized that the pictures could "help the readers remember" the subjects that they encountered: "Many of the matters are hard to remember, unless one remembers their image, and therefore it is better for him to pay his full attention to the images."[59]

The illustrations offered a naturalistic quality in that they resembled photographic accuracy. They were not works of art but attempted to truthfully render the phenomena as they existed in the world. The illustrations (figs. 7.3 and 7.4) show phenomena that are invisible to the human eye. In printing them, the editors transported them from the realm of the unseen to the realm of the seen. What can be seen can be understood, and thus their emergence in graphic form facilitates their emergence in cognition. I must be careful not to give *al-Muqtataf* the sole credit in expanding its readers' comprehension of invisible natural phenomena, but I do argue that its contribution is a highly important one. There was no popular-scientific journal before *al-Muqtataf,* and its extensive use of visual representations of the natural world was an important part of its appeal. Many of its readers were unlikely to be accustomed to naturalistic images of scientific phenomena, and we can assume that they studied these images with equal parts enthusiasm and awe, as indicated by the al-Zahawi quote above.

In contrast to the older manuscripts from the Middle East, *al-Muqtataf's* use of calligraphy or ornaments was sparse. The pages were framed with a simple border, and the only ornaments that appeared were on the front cover. Perhaps more than just an aesthetic preference, the simplistic layout of the journal resulted from the limitations of the letterpress. Whereas older

58 Ibid., 87.
59 *Al-Muqtataf* 1 (1876): 207.



٤٣ حشرات الراس والبدن وادويتها

قراد الجرب . الجرب داء معروف وسببهُ حيوان صغير طول انثاهُ ما بين $\frac{1}{5}$ و $\frac{1}{4}$ الخط وعرضها ما بين $\frac{1}{10}$ و $\frac{1}{7}$ الخط وذكرهُ اصغر من ذلك والشكل الخامس صورة الذكر والسادس صورة الانثى وكلاهما مكبر كثيرًا . وعند ما تحمل الانثى تغور في البشرة الى الطبقات الغائرة وتغتذي هنالك وتبيض كل يوم بيضة وهي متقدمة في سيرها الغائر الى ان يبلغ عدد بيضها اربع عشرة فتموت والبيضة الاقرب الى سطح الجسد تفقس اولاً وتخرج الى خارج طالبة زوجًا او زوجةً ثم تتبعها التي بعدها وهكذا الى آخره

٦ انثى قراد الجرب

٧ دودة حب الصبا

دواؤهُ . ينظف الجسد بماء سخن وصابون (وصابون الحامض الكربوليك افعل من الصابون الاعتيادي) ثم يدهن بهرم الحامض الكربوليك او محلولهِ او بهرم الكبريت (مع تناول الكبريت شربًا) او بزيت البترول ويكرّر ذلك مرارًا عديدة حتى يكمل الشفاء

دودة حب الصبا . اذا اسندت فوهة الغدّيدات الدهنية تجتمع فيها المادة الدهنية وتظهر الفوهة نقطةً سوداء على الوجه واذا عصرت خرجت منها المادة الدهنية على شكل دودة بيضاء وكثيرًا ما يكون فيها دودة حنفية شكلها كالشكل السابع وهو مكبر عن الحنفية مرارًا كثيرة وليس لهذه الدودة اعراض مزعجة . اما اذا حدث منها التهاب فيعالج معالجة حب الصبا

حب الصبا ودواؤهُ

تقدم ذكر سببهِ في آخر المقالة السابقة وهو على ثلاث درجات الدرجة الاولى انسداد الغدديات والاجربة الدهنية قبل التهابها واكثر حدوثهِ في الصبا اوان البلوغ ويصيب اصحاب المزاج اللمفاوي اكثر من غيرهم وقد يتهيج بعسر الهضم او يزيد بهِ ودواؤهُ حينئذٍ ان تعصر الغدديات وتخرج منها المادة الدهنية ثم تدهن بمحلول في كلوريد الزئبق الخفيف وتغسل بالماء الحار تكرارًا الدرجة الثانية درجة احمرار الحبوب وهي تصيب الانف لاسيما في السكيرين والدواء الامتناع

Fig. 7.3. Illustration of mange mites in *al-Muqtataf* III (1878): 43. Source: American University of Beirut/Library Archives.

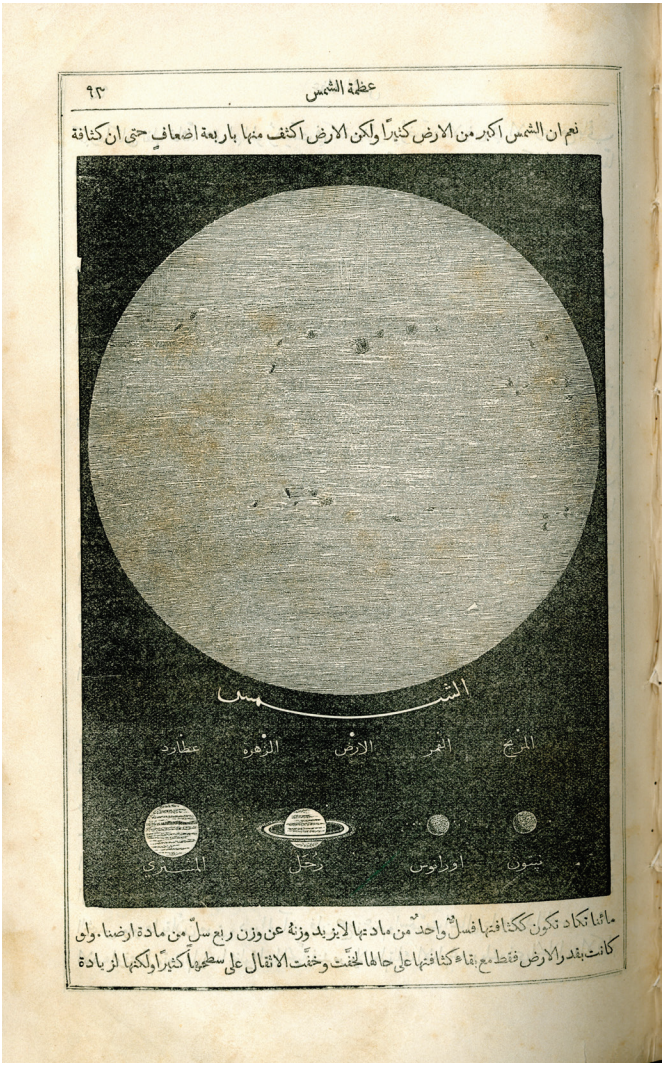


Fig. 7.4. The solar system in *al-Muqtataf* III (1878): 93. Source: American University of Beirut/Library Archives.

manuscripts were filled with calligraphy and ornaments, the letterpress did not cater well to ornamentation. Faster, simpler to use and, perhaps, above all, cheaper, the sudden burst of magazines and journals was possible precisely because of the commoditization of print. Although still expensive to make (Sarruf and Nimr reportedly funded the whole enterprise out of their own pockets during the first few years), this bore the mark of mass publication and the commoditization of information, itself adhering to the logics of speed and forward movement that the editors conceptualized as "the future."

The lack of ornaments made the text itself the visual focus. The margins were wide and devoid of the scribbles that had been a regular feature of scribal culture. The letterpress offered more space between the words, and the overall effect was a layout that was more spacious and "easier on the eye."[60] Just as the collage-like structure invited the readers to take a more active role in picking and choosing what to read, so the spaciousness of the page granted a simpler way into its message. The imperative was to free the reading experience, as far as possible, from hindrances, thus making knowledge consumption more efficient. By the same token, the editors used punctuation marks far more than what had been customary in traditional manuscripts, which were almost free of them.[61] Traditional Arabic has ascribed words to indicate when one sentence stops and another begins. The punctuation marks enhanced readability, but they also underscored the intention of individual education. The journal was not necessarily meant to be read in one sitting, but to be used for educational and encyclopedic purposes in which punctuation marks offered useful pauses.

During the nineteenth century, there had been several attempts to construct the right font for the letterpress. In 1841,

60 Geoffrey Roper, "Faris al-Shidyaq and the Transition from Scribal to Print Culture in the Middle East," in *The Book in the Islamic World: The Written Word and Communication in the Middle East,* ed. George N. Atiyeh (State University of New York Press, 1995), 220.

61 Ibid.

the American Board of Commissioners for Foreign Missions (ABCFM) provided their own version, and this was to become popular and eventually dominate the media landscape. Originally created in the process of translating the Bible into Arabic, the visual characteristics of the American Arabic typescript was carefully fashioned to attend to the particularities of the Arabic language, such as its connected characters and vocalization marks.[62] Moreover, the proselytizing aim of reaching as widely as possible made the process of creating the right font a meticulous and thoughtful one. First of all, it would have to accommodate the "Arabic taste" for calligraphy. Second, it should be accessible enough to have a wide outreach. Third, it should facilitate easy reading without any unnecessary stops.[63] The result was the *al-ʿamrikani* font, which can be seen on the pages of *al-Muqtataf.* Its "left-slanted vertical strokes gave the font a forward movement that helped guide the eyes along the reading direction, thus facilitating a faster reading pace."[64] Interestingly, even the reading process was mediated for the sake of efficiency and fast absorption of knowledge.

From the editors' point of view, the Arabs' way into a new global culture was through science. They thought about science not as an essentially Western but as a universal way of knowing. When they stripped their publication of cultural markers such as calligraphy and lack of punctuation marks and replaced them with the science's "language of form," they effectively realigned themselves to an idea of a global space in which science was the lingua franca. We can therefore view *al-Muqtataf's* efforts as performative, meaning that its editors dressed their publication in the attire of their conviction and thus performed the change they wanted to be part of. The rich calligraphic traditions of the Middle East had dominated the visual culture for centuries, and their capacities for organizing ideas of divinity and ways

62 Auji, *Printing Modernity,* 112–13.

63 Huda Abufares, "The Modern Arabic Book Design as Agent of Cultural Progress" (PhD diss., Universiteit Leiden, 2017), 34n44.

64 Ibid., 56.

of knowing are phenomenologically very different from the naturalistic illustrations and austere tables of information that can be seen in *al-Muqtataf*. Framed by a spacious layout, simple font, and collage-like form, these graphics make an interesting case for how the editors envisioned the process of secularization needed to "move forward" on the grand historical timeline.

Conclusion

The stated goal of the editors of *al-Muqtataf* was to be guides in the careful process toward civilizational revival. Their focus on forward movement conveyed a heightened sensitivity for time's passing. They saw the past and future as utopian ideals and the present as the transitional phase between the two, as if the present were the lower part of a horseshoe flanked by the past and future on either side. This brought with it a sense of optimism, but also anxiety. The present moment held the ominous potential of breaking out of a "natural cycle" of civilizational revival — either by staying put in the lower part of the horseshoe, determined for perpetual decline because of intellectual laziness, or by overeagerly Europeanizing, thereby effecting an inauthentic future that might only bring them halfway up the horseshoe. In any case, the weight of the present moment paired with the idea of science as its variable of success or failure engendered not only a sense of historical opportunity, it also provided a recipe for *how* to be a historical agent.

Al-Muqtataf's contribution to engendering a "now-time" was perhaps a result of its infrastructure — its periodicity, distribution, and serialization of public discourse, the collage-like structure of knowledge dissemination, and visual changes such as the eschewing of calligraphy and ornaments — more than its discourse. In fact, one can hardly envision a discourse such as *al-Muqtataf's* on the pages of traditional, ornamented manuscripts. The process-oriented temporal regime presented by the journal was arguably produced as much by the galleys of the printing press houses as through the words that they printed. Just as maps produce spatial orders, temporal orders are established

by watches, calendars, or — as it were — periodical journals. The editors attempted to — literally — mobilize a time within which they could meaningfully act. This process of mobilization was the productive intersection of several temporal logics. It happened not merely on the level of discourse: the journal's periodicity and modern layout established a "now-time" that spurred a sense of being on the verge of the future.

The structural and technological changes of the time went hand in hand with a reorganization of social, cultural, and political relations. The editors' efforts were symptomatic of a wider restructuring of society. Hence, we should understand *al-Muqtataf* as a cultural producer in a reflexive sense, because of the way the editors navigated the changing landscape, responding to and reproducing — in effect representing — the material changes that marked the late nineteenth-century Arab world. They were not creating an all-encompassing collective time, since society was too heterogeneous for such an endeavor. Rather, they represented an interface and infrastructure that could contain and channel new experiences of time.

The *nahdawis* sensed that they were on the threshold of a different time, but it is difficult for the historian to study what this felt like. Analysis discourse only brings us halfway to an answer — the rhythm of everyday life can never be fully encapsulated in words. Here, the multitemporal framework opens a possible trajectory. Its notion of relational time, meaning that any object has its own embodied temporality that comes into view when interacting with other objects, reminds us that time is not pre-given, but emergent. A personal or collective sense of time is therefore a negotiation between innumerous different time standards.. The multitemporal approach is enticing because of its potential to awaken history; we may sense the salience of an era if we pay specific attention to its rhythms. The editors of *al-Muqtataf* sought precisely to beat out a new tempo for the "Arab civilization," and by paying attention to the tangible products of their efforts, we may catch a glimpse of the hopes, prospects, anxieties, and frustrations they were addressing.

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8

History on the Grid: Colonial Maps as Tools of Time, 1870–1910

Leonoor Zuiderveen Borgesius

Introduction

In *Time Maps,* Eviatar Zerubavel writes about the "social map-like structures in which history is typically organized in our minds." He goes on to say, "What we need, in other words, is a sociomental topography of the past."[1] Rather than thinking of maps as metaphorical tools or adapters to think about time and memory in an abstract sense, this chapter takes maps literally as tools that make time. It turns Zerubavel's argument on its head and explores how maps function as technologies to construct a past temporality and examines the political nature of those technologies in context. In particular, it investigates how the temporal practice of history has been shaped by cartographic maps, and by the visual language and techniques they rely on.

1 Eviatar Zerubavel, *Time Maps: Collective Memory and the Social Shape of the Past* (University of Chicago Press, 2003), 1.

Here, history is understood in three distinct ways. First, as a general understanding of the time that has passed before the present moment, leading up to current realities. Second, as a particular narrative of this past time as a unilateral trajectory that progressively moves forward toward the realization of culture and society in the form of civilization, by means of science and technology, economy, and morality. This is a particular understanding that is politically charged and historically and culturally specific to Western intellectual traditions.[2] Third, history is understood as the scholarly discipline that studies this trajectory according to dedicated sources (typically documents — texts — found in archives) and methods (reading, interpreting, writing, and publishing), as it originated in the late nineteenth and early twentieth centuries. This history is deeply connected to the development of political institutions, notably in European nation-states; the violent expansion of economic, cultural, and political influence toward the building of empires; and the intellectual narratives that supported them.

The connections between these two last understandings of history, on the one hand, and the intellectual roots of empire, racism, and colonial extractivism, on the other, have been well documented. In 1961, Frantz Fanon wrote in *The Wretched of the Earth* that "the colonist makes history and he knows it," attesting that both history as the past and history as efforts to write about the past are deeply connected to the colonial project.[3] For decades, the discipline of history has looked to the past of Western civilization as the white European project of moral, intellectual, and cultural development, as opposed to anthropology or ethnography, which study the peoples "without history," as

2 Georg Iggers, *The German Conception of History: The National Tradition of Historical Thought from Herder to the Present,* rev. ed. (Wesleyan University Press, 2014), and Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton University Press, 2000).

3 Frantz Fanon, *The Wretched of the Earth,* ed. Jean-Paul Sartre and Homi K. Bhaba (Grove Press, 1963), 14–15.

Eric R. Wolf famously put it.[4] It imagined its subjects as timeless, traditional, and primitive in the sense that they were thought of as predeveloped, outside of the historical discipline with its archives, institutions, and documents.[5] More recently, Priya Satya's *Time's Monster,* a close-up of the intellectual networks and practices of the historical discipline and its narratives of progress, has shown how the historical imagination had a major role in the unfolding of empire. Progressive history formulated as an ethical narrative of progress functioned as legitimation for violence and repression.[6]

This was also true for the Dutch colony of Suriname, which is where the maps that this chapter discusses are from. Suriname is located on the northern coast of South America, but culturally it is part of what is known as the wider Caribbean, or the "Caribbean colonial creation."[7] What this entire area around the Atlantic coast from North to South America has in common is that from the early sixteenth century onward, it has been essentially shaped — politically, socially, and environmentally — by the histories of empire, political revolutions and resistance, and plantation colonialism. The Dutch East Indies — present-day Indonesia — far surpassed Suriname in terms of population, size, and profitability, but Suriname became an acute economic problem for the Dutch government in the Netherlands in the 1870s. The legal ownership of people, and the exploitation of people for labor without wages, was abolished in the Dutch Empire in 1863.[8] Without being able to rely on slave labor, the plantation

4 Eric R. Wolf, *Europe and the People without History* (University of California Press, 1982).

5 Johannes Fabian, *Time and the Other: How Anthropology Makes Its Object* (Columbia University Press, 1983).

6 Priya Satia, *Time's Monster: History, Conscience and Britain's Empire* (Penguin Books, 2020).

7 J.R. McNeill, *Mosquito Empires: Ecology and War in the Greater Caribbean, 1620–1914* (Cambridge University Press, 2010), and Rosemarijn Hoefte, *Suriname in the Long Twentieth Century: Domination, Contestation, Globalization* (Palgrave Macmillan, 2014).

8 Despite slavery as such being abolished, formerly enslaved people were forced to keep working for their former "owners" for another ten years

economy collapsed. Based on promising prospects, the colonial administration decided to focus its efforts on gold mining instead. The notion of hidden gold deposits and an abundance of riches has a long history in the legitimation of exploration and colonization of this part of South America. The myth of El Dorado dates back to the sixteenth century, symbolizing the promises of abundance and wealth that the colonies held, but never truly surrendered.[9]

The year 1874 marked the start of a series of serious waves of gold rush, which were organized on increasingly large scales and motivated by more efficient and professional commercial interest. These efforts peaked in the 1910s. Agencies, companies, and investors settled in Suriname, hoping that they could make large profits off the concessions that the Dutch colonial government issued. The Koninklijk Nederlandsch Aardrijkskundig Genootschap (KNAG, Royal Dutch Geographical Society) funded a series of four large expeditions along the big rivers of Suriname between 1902 and 1905 to survey the interior and map it in terms of prospects for development: either agricultural exploitation or mining. Accounts of these investigations were printed in journal articles and books putting forth a Suriname of technical details, maps, and graphs. Others were printed in books intended for wider audiences, and with the aim of sparking interest in the colonies by evoking a feeling of tropical exoticism regarding the country's landscape and climate and heroism toward the expedition leaders. To all of these publications, geological and cartographic maps were essential.

This chapter explores how maps have been a technology for producing time in colonial contexts, and, more precisely, examines the construction of history as a particular form of time. I

under violent and exploitative circumstances. See Rosemarijn Hoefte, "Control and Resistance: Indentured Labor in Suriname," *New West Indian Guide/Nieuwe West-Indische Gids* 61, no. 1 (1987): 1–22.

9 Alex van Stipriaan, "Suriname, El Dorado van de korte termijn; exploitatie van natuurlijke rijkdommen en hun milieueffecten, 17e–20e eeuw," in *Jaarboek voor ecologische geschiedenis,* ed. Henk van Zon (Academia Press, 2009).

will first discuss maps as textual objects. Like any kind of text, maps rely on literacy and discourse, both optical. Then I will address text on maps, more specifically place-names and their potential for temporal and historical work in the form of toponymic memory. Finally, I delve deeper into the mapping process as I explain how the grid structure, scales, and ability to carry universal time in the form of a chronometer were essential technologies for the making of maps.

Optical Literacy: Maps as Texts

There is a certain logic to maps that rests on the idea that the more accurate or detailed maps seem to be, the closer they come to objective representation of the reality it represents, which is built on the notion that science is a project toward progressive knowledge. However, just as documents and texts can never represent an "objective" or "true" reality in an absolute and universal sense, the spatial imaginaries that maps emulate cannot be taken for granted. Instead, maps need to be subjected to source criticism. They should be considered and analyzed as political documents and tools for the creation, negotiation, and perpetuation of social and political power, especially in the context of colonial spaces.[10]

Maps are characterized by recurring visual elements, including a grid, a certain repeated color scheme that indicates land, water, or altitude, and dotted and solid lines indicating borders, roads, or railroads, all of which together make up an optical language. What is included and excluded are choices. They rely on discourse. The consistency in these symbols indicates that the image should be interpreted as a rendering of a certain space at a given point in time. Maps are communication tools; they make arguments.[11] According to Bruno Latour, they are inscriptions

10 Denis Wood, "The Map as a Kind of Talk: Brian Harley and the Confabulation of the Inner and Outer Voice," *Visual Communication* 1, no. 2 (2002): 139–61.

11 James Brian Harley, *The New Nature of Maps: Essays in the History of Cartography* (Johns Hopkins University Press, 2001); Wood, "The Map

that make statements that can be taken up by others and passed along, and in this way become what could be considered fact. To be able to do that, they need to be "immutable mobiles."[12] They take a static representation of one place, and "transport" that place by means of technologies such as inscription, print, and paper to be legible and controllable in another place. Maps need to be "presentable, readable, and combinable with one another."[13]

This means that they rely on optical linguistic consistency. A map of the coastal area of Suriname that was made in the 1890s is comprehensible now in the Dutch National Archive in the Netherlands because it is communicating in a technological language, namely, latitude, longitude, and altitude, which is then communicated in an optical language by means of shapes, symbols, and color. All of this enables the map to be readable, but also combinable with or comparable to other maps of the same or another place — they can be scaled up and down — all of which I will elaborate on in this chapter.

Joanna Drucker argues in her work on visual knowledge production that histories of architecture and science are relevant to understanding exactly what visual language is. Textual communication was inadequate to communicate shapes, motives, texture, style, and color and their relationships in the form of composition, narrative, or proportion.[14] To communicate style, graphic techniques were developed to enable the codification of physical forms and construction methods in the fields of architecture, cartography, and engineering.[15] The visual consistency of maps, specifically paper cartographic maps, does temporal work too. It enables the imagination of the indicated space as a

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as a Kind of Talk"; and Denis Wood, *Rethinking the Power of Maps* (The Guilford Press, 2010).

12 Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society* 6 (1986): 1–40.

13 Bruno Latour, "On Actor-Network Theory: A Few Clarifications," *Soziale Welt* 47, no. 4 (1996): 21.

14 Johanna Drucker, *Graphesis: Visual Forms of Knowledge Production* (Harvard University Press, 2014), 25.

15 Ibid., 25–27; see also Johanna Drucker, *Visualization and Interpretation: Humanistic Approaches to Display* (MIT Press, 2020).

static whole. In this language and discourse also lies the power of maps. Visual and cartographic discourses are complicated and carry within them intricate politics. The writer decides what gets prioritized, whose reality is included and what is not. The writer also decides how the space is shaped in the minds of the reader.

Toponymic Memory: Texts on Maps

A big part of that shaping of space through mapmaking is the topographical practice of naming those dedicated locations. The practice of place-naming is referred to as "toponymy," or "toponymic inscription," and the politics of toponymy has important symbolic and material implications. The naming of places is rooted in political and social contestations over land, identity, and history, which are often layered, and for that reason it plays a significant role as a colonial tactic.[16] Naming and renaming a place reformulates it in order to establish a clearly demarcated spatial identity and meaning. Existing identities or other points of significance are often overridden or erased, including the cultural memories that are attached to that place.[17] When Dutch government surveyors named some thing or some place on their maps and in documents upon their "discovery," they took the liberty to claim the object or landmark as a subject that they essentially owned and exercised control over.[18]

16 For an overview of different tactics of power and place-naming in colonial, Indigenous, and urban contexts, see Lawrence D. Berg and Jani Vuolteenaho, eds., *Critical Toponymies: The Contested Politics of Place Naming* (Routledge, 2009), and Robin A. Kearns and Lawrence D. Berg, "Proclaiming Place: Towards a Geography of Place Name Pronunciation," *Social and Cultural Geography* 3, no. 3 (2002): 283–302.

17 Reuben Rose-Redwood, Derek Alderman, and Maoz Azaryahu, "Geographies of Toponymic Inscription: New Directions in Critical Place-Name Studies," *Progress in Human Geography* 34, no. 4 (2010): 453–54.

18 Alex van Stipriaan, "Kijk maar, er staat niet wat er staat: De dubbele werkelijkheid van Surinaamse kaarten," in *Ik ben een haan met een kroon op mijn hoofd: Pacificatie en verzet in koloniaal en postkoloniaal Suriname,* ed. Peter Meel and Hans Ramsoedh (Bert Bakker, 2007), 200.

The purpose of this was both practical and symbolic. Renaming sites enabled the incorporation of those places into the bureaucratic and juridical infrastructures of colonial paperwork and governance. Political authorities monopolized toponymy so that territory, landmarks, and towns — including the people that inhabited them — were made governable as bureaucratic entities in a formal system of governance and control.[19] In terms of direct material consequences, the renaming of places meant the reformulations of their social and cultural meaning and properties, which were often rooted in local histories and communities. Both of these properties of toponymic inscription are connected: one builds on the other, and vice versa.

One of the things they have in common is that toponymy is doing temporal work. Again, some of that work is symbolic or conceptual; other work is practical. The symbolic temporality of place-names refers to the fact that within the colonial contexts of the Surinamese mapping expeditions, Maroon and Indigenous histories were retained in place-names. Place-names referred to past events or people. Renaming places meant erasing those histories. The disturbance of the practical or bureaucratic temporality through colonial toponymy continues to show up in documents, maps, and archives and has to do with history as a particular temporality that it influences.

How that worked can be explained by the close reading of an article about toponymy in Suriname from 1909. The KNAG published an article titled "Geographical Names in Guyana and Surrounding Countries," written by Claudius De Goeje.[20] He had worked in the Dutch East Indies as a naval officer in the colonial army. Trained as a geographer and anthropologist, he had been a prominent member of several Suriname expeditions

19 Reuben Rose-Redwood, "'Sixth Avenue Is Now a Memory': Regimes of Spatial Inscription and the Performative Limits of the Official City Text," in *Performativity, Politics, and the Production of Social Space,* ed. Michael R. Glass and Reuben Rose-Redwood (Routledge, 2014), 178.

20 Claudius De Goeje, "Aardrijkskundige Namen in Guyana en omliggende Landen," *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap* (1909): 278–94.

before leading his own in 1908.[21] De Goeje reflected on the geographical naming practices in Suriname and was interested in toponymical practices both by Europeans and Surinamers. He insisted that knowing about the meaning of names as a Dutchman was paramount to understanding the colony as a whole: "If we impress the names in our minds now, we learn about the country, about the animals and plants that live there, and especially a lot about the people that have lived there in the past or still reside there."[22] His source for the names he studied was what he called "the" map of Suriname, which in all probability referred to the series of ten large and detailed maps that were made by cartographer Johan Cateau van Rosevelt, which I will come back to later.

Place-names that refer to people or events function like small archives that carry within them histories that are not otherwise kept or recorded. Looking at it this way, maps function as repositories of those histories. To De Goeje, it was clear that understanding place-names was a way of doing historical work. This was a particularly interesting function of studying them, he pointed out, because the "written history only contains a few centuries."[23] Place-names could add to this because "every name has a piece of history to tell, sometimes irrelevant, but not seldomly important."[24] Still, he did not refer to this investigating the history of these places and people it as history, but as "ethnology."

There is a temporal power dynamic at work in this division of certain pasts as the domain of historians, while other pasts are made out as the subject matter of ethnographers or anthropolo-

21 Freek de Goeje, *Een berg die mijn naam draagt: Naar het hart van de Surinaamse jungle, op zoek naar mijn koloniale erfenis* (Walbrug, 2023), and F. Spirlet, "Werkzaamheden op topografisch en kadastraal gebeid in Suriname van 1911–1920," *New West Indian Guide/Nieuwe West-Indische Gids* 4, no. 1 (January 1923): 619.

22 De Goeje, "Aardrijkskundige namen in Guyana en omliggende Landen," 178.

23 Ibid., 279.

24 Ibid.

gists. In essence, the discipline of history — the "written history" that spanned "only a few centuries" that De Goeje meant — studied the progression of civilized Western culture. Ethnography and anthropology, on the other hand, defined their subjects as being inherently in the past. Johannes Fabian has famously argued in *Time and the Other* that the notion of time and history "naturally" produced a "scheme in terms of which not only past cultures, but all living societies were irrevocably placed on a temporal slope, a stream of Time — some upstream, others downstream."[25] Those two directions on this imaginary timeline were academically divided into different disciplines with their own respective temporal occupations that defined the objects of their studies. Historians were interested in Western cultures that were ahead in that scheme, whereas anthropologists were concerned with those that were perpetually kept behind. This process was coined by Fabian as the "denial of coevalness."[26]

Priya Satia writes about this "metaphysics of historical thought" and the way that this historical theory, and the historical discipline more widely, has to a large extent "shaped world events according to certain historical scripts."[27] The peoples in the colonies that were owned and exploited by those European societies, such as Suriname, were denied equal access to material progress and growth and to history as the intellectual interpretation of that process. The notion that history was necessarily progress-oriented made the exploitation, expropriation, and excessive violence of colonialism "ethically thinkable."[28] The result of this belief in the idea that history is inherently evolutionary, that it moves along an axis that is ahistorical and universal, is what Johannes Fabian coins as "a taxonomic approach to sociocultural reality."[29] As a consequence, the study of Indigenous and racialized colonial subjects as anthropological objects — both

25 Fabian, *Time and the Other,* 17.
26 Ibid.
27 Satia, *Time's Monster,* 246.
28 Ibid., 6.
29 Johannes Fabian, "Time and the Emerging Other," in *Time and the Other,* 17.

in the past and present — and the study of Western progress as history became important intellectual tools for legitimizing expansion and violence. Both the understanding of the historical narrative of progress and the scholarly discipline of history that studied the unfolding of such a narrative contributed to the rationalization of empire.[30]

Language and Time Layers

The historical understanding that De Goeje claimed to gain from studying Surinamese place-names came from their original Indigenous and Maroon languages. He relied solely on the stories local people told, very much like expedition leaders before him had relied on Indigenous and Maroon guides and their intricate knowledge of environments and landscapes. However, this knowledge had been predominantly oral, which had consequences for the bureaucratic lives of the knowledge and histories kept within place-names. An aggressive language politics had ensured that people in Suriname who did not come from the Netherlands or were not descended directly from white European colonists were encouraged to abandon their native languages. By being denied literacy, they were also denied influence in the policies that concerned them and the way Western historians wrote about them.

Enslaved people were forbidden to learn how to read and write, which meant that this was the case until at least 1863.[31] Creole languages continued to be spoken until it was forbidden as educational language altogether in 1891. Before that, however, the African people that were taken to Suriname came from oral

30 This phenomenon in which the notions of history and civilization become intertwined has been well researched by Eric Wolf and Thomas Hylland Eriksen, *Europe and the People without History,* 2nd ed. (University of California Press, 2010).

31 Jacques Arends, *Language and Slavery: A Social and Linguistic History of the Surinamese Creoles* (John Benjamins Publishing Company, 2017), and Hans Buddingh', *De geschiedenis van Suriname* (Uitgeverij Nieuw Amsterdam, 2012).

cultures. As a result, almost all the written sources that were not in Dutch but in local language were written by nonnative speakers, such as missionaries, who had agendas of their own.[32]

The names are translated from the local creole language that De Goeje refers to as *Neger-Engels (*Negro English), the language that was spoken by Maroon populations, and as a general lingua franca at the time.[33] The language is today known as Sranantongo (which means "Surinamese tongue" or "Surinamese language") and is currently spoken by the approximately 550,000 inhabitants of Suriname and among the 300,000 people of the Surinamese diaspora.[34] It is based in English and Dutch and is greatly influenced by Portuguese and African languages. It is in itself a product of displacement, since it was created by enslaved Africans from different parts of the continent to communicate with each other.[35]

Like the language, the etymologies of place-names often carried within them traces of a longer, layered history of colonial presence, a phenomenon that is coined as "toponymic memory."[36] These archival characteristics of toponyms are twofold. First, it occurs in the meaning of the name itself and what event, person, or landmark is referred to, and, second, in the linguistic and etymological history of that term or name.

Besides names that refer to landmarks, trees, plants, or animals, De Goeje was interested in names that referred to past

32 A classic study on colonial state institutions and the infrastructural logics of archives is Ann Laura Stoler, *Along the Archival Grain: Epistemic Anxieties and Colonial Common Sense* (Princeton University Press, 2009).

33 This terminology is no longer in use because of the violent histories it is rooted in and the colonial language politics of the Dutch colonial regime that moralized and regulated its use. See R.A.J. Van Lier, *Frontier Society: A Social Analysis of the History of Surinam* (Springer Netherlands, 1971), 171.

34 Arends, *Language and Slavery,* 7.

35 Ibid., 12.

36 For a more elaborate study of the political implications of toponymic memory in settler colonial contexts, see Nur Masalha, "Settler-Colonialism, Memoricide and Indigenous Toponymic Memory: The Appropriation of Palestinian Place Names by the Israeli State," *Journal of Holy Land and Palestine Studies* 14, no. 1 (2015): 3–57.

events. He based his investigation on the ethnographic work in the published reports of earlier large expeditions.[37] He listed examples of places that were named after things that happened in a local context, but the majority of his examples refer to encounters with Europeans or were directly derived from efforts of Dutch colonial expansion.

A telling example is the Hebiwerie mountain.[38] After traveling down the river for several weeks, Maroon laborers that were employed on the Coppename expedition in 1901 were instructed to cut pathways through the rainforest to the top of a hill.[39] The expedition leaders, surveyor Willem Lodewijk Loth (1844–1916), in particular, wanted to climb the mountain so that they could map the mountains and rainforest around it. It turned out to be a difficult job because of the hardwood trees and their size, texture, and weight. The wood was so hard that several hafts of the axes they used splintered during the many attempts. One day, the Maroon laborers that had been logging came back to the camp at the foot of the mountain exhausted (fig. 8.1). They exclaimed that they were "very tired," which Loth translated with the words *hebi* ("heavily" or "badly") and *weri* ("tired" or "exhausted") in Sranantongo.[40] The expedition leader kept the name for the mountain and described the anecdote in his report.

37 A.J. van Stockum, *Een ontdekkingstocht in de binnenlanden van Suriname: Dagboek van de Saramacca-Expeditie* (G.P. Thierie, 1905); A. Franssen Herderschee, "Verslag van de Tapanahoni-Expeditie," *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap* 2 (1905): 847–1085; and L.A. Bakhuis, *Verslag der Coppename-Expeditie* (Brill, 1902), reprinted as "Verslag der Coppename-Expeditie," *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap* (1902): 695–852.

38 Bakhuis, "Verslag der Coppename-Expeditie."

39 That mountain, the Voltzberg, was named after a German explorer who had visited the Surinamese interior in the 1850s.

40 Bakhuis, "Verslag der Coppename-Expeditie," 777–78.

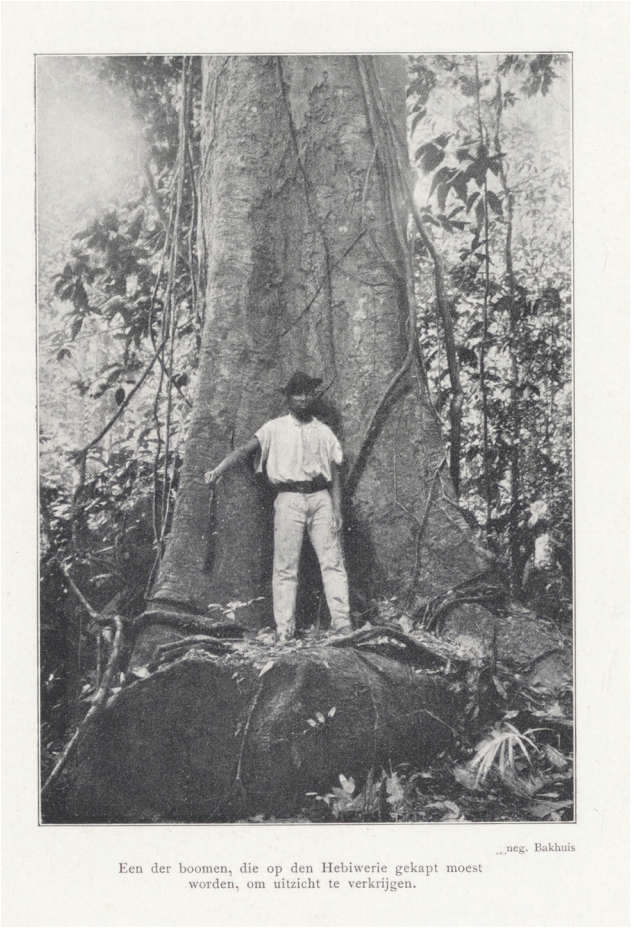


Fig. 8.1. A picture from the report on the expedition along the Coppename river led by Louis Bakhuis. The caption reads: "One of the trees that was cut down on the Hebiweri to get a view." The man in the picture, most likely one of the Maroon workers, is not mentioned by name. Source: Bakhuis, *Verslag der Coppename-Expeditie,* 85.

Inscribing Presence and History

De Goeje's final section in the article is about place-names that were inscribed into the landscape by Dutch officials and other influential men, whereby local names were erased. Independent of knowledge about this place, local histories captured in the name were dismissed in the process and overridden by the state building of the Dutch regime.[41] Renaming and remapping was a powerful tool for establishing new notions of white, Dutch imperialist identity, by centralizing the heroes of the Dutch national narrative of, in this case, technological and scientific advancement.[42]

Lelydorp, named after Cornelis Lely, is one example. Lely was governor of Suriname between 1902 and 1905, during which time he insisted on the construction of a large railroad, which was never finished and only in operation for a handful of years. Lelydorp, a stop along the road southward from Paramaribo, was originally called Koffiedjompo. That name referred to an act of resistance against military repression by the Dutch. De Goeje explained the story of Koffie, for which he used the expedition report of the Coppename expedition from 1901 as a source. The author of that report based his story on what the government surveyor Loth told him and "some official documents."[43] Loth was esteemed at the KNAG for his knowledge of local people and languages and his experience traveling to the interior, so he was most likely told the story by Maroons.

Koffie was a Maroon rebel from the area around the Pará River, about 50 kilometers south of Suriname's capital Paramaribo. He led an escape from the plantation where he was kept, with a group of other enslaved people, into the woods surrounding the river. A series of highly racialized tropes indicate that

41 Masalha, "Settler-Colonialism," 4.

42 For similar colonial state building efforts by the French Empire and British Empire in Africa, see Ambe J. Njoh, "Toponymic Inscription as an Instrument of Power in Africa: The Case of Colonial and Post-Colonial Dakar and Nairobi," *Journal of Asian and African Studies* 52, no. 8 (2017): 1174–92.

43 Bakhuis, "Verslag der Coppename-Expeditie," 725.

Koffie's escape from slavery was considered a breach of propriety and law, even decades after abolition. During the digging of the Saramacca canal, he "dared to enter" a military base, where he was recognized and chased. Right before he was about to be caught, he escaped by jumping down a 5- to 6-meter-high cliff into the river. This place was then named Koffiedjompo, meaning "Koffie's Jump."[44]

De Goeje wrote that the name change from Koffiedjompo to Lelydorp was "to provide him [Lely] with a permanent place of remembrance."[45] In addition, about 200 kilometers south, a mountain range was renamed *Lely-gebergte* (Lely-mountains). Stripping away the history that was encapsulated in the name was a way of silencing the stories and histories of existing space. In this case, it was also an act of erasing a history of resistance and resilience of Maroon life against colonial repression and exploitation. In the oral Maroon cultures, toponymy had been one of many ways to retain stories — every time the place-name is spoken, the story is reinvoked.[46] Renaming places after Dutch heads of government was also a way of isolating towns, rivers, mountains, and mangroves from the relations between land and people.

By creating a bureaucratic reality, but also by constructing a collective national historical conscience, new toponyms celebrating the heroes of colonial advancement were meant to establish and perpetuate alternative histories and to appropriate a chronology in which the arrival of the Dutch state demarcated a beginning.[47] In 1954, a biography of Lely stated how in this way "the name of the leaving governor was immortalized for

44 De Goeje, "Aardrijkskundige namen in Guyana en omliggende landen," 283.

45 Ibid., 284.

46 For the importance of spoken place-names and pronunciation, see Kearns and Berg, "Proclaiming Place."

47 Eric Hobsbawm and Terence Ranger, *The Invention of Tradition* (Cambridge University Press, 2012); Pierre Nora, "Between Memory and History: Les Lieux de Mémoire," *Representations* 26 (1989): 7–24; and Masalha, "Settler-Colonialism," 10.

the future while he returned to the fatherland."[48] This illustrates how literal this aim should be taken. A place-name invoked the presence and influence of the regime and also the person of Lely during his absence. Still, his name is there on contemporary maps of Suriname: this process of erasure is ongoing.

The Grid: Maps as Plans, and How They Are Made

Mapmaking as a process and craft is thick with time. Suriname's maps do temporal work in the sense that they evoke a static, universal, and timeless spatial reality. Through the map, reality is made predicable and accessible. At the same time, maps provided the planning tools to change the future of that reality. To draw the maps and to know *where* they were, cartographers needed to know *when* they were.

The people who first inhabited Suriname, and especially the parts that were not yet mapped in detail by the late nineteenth century, had little use for cartographic maps. Their knowledge of the geography and landscape was carried around by memory; they were hired by some of the expedition leaders to navigate for this reason.[49] Many of the early European-made maps of Suriname were drawn from surveying and observations from the rivers, and the plantations on the shores, for which they often used a "measuring chain" of a standardized size.[50] The inland was hard to access for Europeans, partially because of the ter-

48 K. Jansma, *Lely: Bedwinger der Zuiderzee* (H.J. Paris, 1954), 134.

49 Alex van Stipriaan, "Kijk maar, er staat niet wat er staat: De dubbele werkelijkheid van Surinaamse kaarten," in *Ik ben een haan met een Kroon op mijn hoofd: Pacificatie en verzet in koloniaal en postkoloniaal Suriname,* ed. Peter Meel and Hans Ramsoedh (Bert Bakker, 2007), 197.

50 Measuring chains were part of the standard equipment of surveyors, cartographers, and engineers in the Dutch East Indies, where especially toward the second half of the nineteenth century the same experts were working there as were in Suriname. See, e.g., J.J.A. Muller, "Het 10de Nederlandsch Natuur- en Geneeskundig Congres," *De Ingenieur* 20, no. 21 (1905): 335–38, and Hillebrand Ehrenburg and Marcel Meyer, *Bouwen aan de wilde kust: Geschiedenis van de civiele infrastructuur van Suriname* (LM Publishers, 2015), 301–3.

rain, and partially because of the resistance from Maroon and Indigenous populations against European expedition groups entering their lands.[51]

Until late in the nineteenth century, cartographic maps of Suriname were primarily maps of the plantation network, and surveying had the primary purpose to determine landownership between the plantations. After the expeditions farther inland, maps also started to represent geological characteristics, such as soil composition and the different kinds of mineral deposits. Maps were essentially infrastructure for the establishment of flows of money and chains of production from mining or growing resources into profits for plantation owners and the colonial state by means of taxes. They were economical tools that commodified land and turned environments into legible, countable, and workable resources.[52] Since maps were such important tools of governance, it is no wonder that institutions went through great lengths to make them detailed and reliable.

The triangulation method made it possible to make more precise measurements from the eighteenth century onward. This method builds on the mathematical principle that the length of one side of a triangle can be calculated with the lengths and the angles to the other two. To start, a surveyor decides on a visible point from the landscape, often high up, such as a hill or a bell tower. From there, they measure both the angle and the distance to two other markers. A more thorough and detailed measurement therefore had to wait.[53]

The astronomical method, also called "astronavigation" or "celestial navigation," exchanged the spatial markers for temporal ones. This method determined coordinates for the triangulation network more precisely, but it was also more complicated.

51 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 613.

52 For the bureaucratic workings of cadastral maps, see, e.g., James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (Yale University Press, 1998), 9–52.

53 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 616–17.

To determine one's location, the navigator needed to establish the longitude (east–west position), latitude (north–south position), and the altitude of the location. For altitude, they used barometers, but for determining the coordinates, they had to calculate from a series of sights: observations of the distance and angles between a star, planet, the moon, or the sun at a given time, and between those celestial bodies and the horizon. For determining latitude, it was possible to measure the angle of the sun at its highest point at noon.[54] For this process, it was essential to be able to tell the time.

This kind of navigation therefore required one to bring a time device on an expedition. This chronometer was essentially a very precise analog clock, a technology for synchronizing time in one place and making it available in another.[55] The instrument embodies the time–space entanglement that characterizes astronavigation. It was calibrated at a central point. After that, the navigator had to rely solely on the accuracy of the mechanism of the device to show them the time it took to travel from that central place to the place where the navigation needed to happen.[56] Chronometers were initially developed for maritime navigation. They made it possible, for the first time, to reliably determine the position of a vessel on the ocean with no other visual markers in sight.[57] This made them essential tools in the process of colonial expansion. Eventually, chronometers became part of the standard equipment of most land expeditions, and of the expeditions into the Surinamese interior.

The problem with chronometers, however, was that they were extremely sensitive instruments. The slightest shock could knock them out of balance. To be useful at all, they had to be ultraprecise, and most expeditions carried more than one so that

54 See, e.g., Bernhard Siegert, "Longitude and Simultaneity in Philosophy, Physics, and Empires," *Configurations* 23, no. 2 (2015): 145–63.

55 Ibid., 147.

56 Vanessa Ogle, *The Global Transformation of Time, 1870–1950* (Harvard University Press, 2015), 10–12.

57 Giordano Nanni, *The Colonisation of Time: Ritual, Routine and Resistance in the British Empire* (Manchester University Press, 2012), 25–31.

they could calculate with a margin for deviation. Moving chronometers across land or fast-flowing rivers with waterfalls was risky. In Suriname, the chronometers that were taken on the expedition to the Nickerie district in 1900 were treated as precious cargo.[58] They were packed to be watertight, which came in useful when the rowers lost control of a *korjaal* (the long narrow boats) with which equipment, provisions, and people were transported down the river. When a korjaal crashed against a rock and capsized, "boxes, suitcases, tins with petroleum, canned food, one of the cameras, a collection of plants, shoes, yes and even the box with the valuable chronometer — everything went overboard."[59] The chronometer did not suffer water damage, but it was useless for the rest of the trip.[60]

Drawing a Map

In 1923, the journal *De West Indische Gids* published an article about topographical work in which Johannes Spirlet explained in practical detail how a map like that came into existence. The article gives an insight into the methods of colonial mapmakers around the turn of the century. Spirlet, trained as a geographer and surveyor, was a high-ranking officer in the Royal East-Indian Army (KNIL), and was appointed governmental surveyor in Suriname in 1910.[61] He initiated a project to make more detailed measurements and draw more precise maps both of the low-lying flats along the coast and of the areas farther south and inland. His large general map of the whole of the colony was

58 Herman van Capelle, *De binnenlanden van het district Nickerie: Lotgevallen en algemeene uitkomsten van eene expeditie door het westelijk deel der kolonie Suriname in september en october van het jaar 1900* (Hollandia Drukkerij, 1903), 17.

59 Ibid., 152.

60 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 617.

61 *Koloniaal-aardrijkskundige tentoonstelling ter gelegenheid van het veertigjarig bestaan van het Koninklijk Nederlandsch Aardrijkskundig Genootschap: 20 Sept.–31 Oct. 1913, Stedelijk Museum Amsterdam* (Mouton & Co, 1913), 38.

published in 1913, based on earlier, more rudimentary maps and topographical information from expedition reports. The map was updated and reprinted, and the latest version covered the information provided by all nine large expeditions.

A lot of his personnel and equipment had been part of the construction of the Lawa railroad that was finished in 1909, a couple of years before he started his project. Many Dutch surveyors who had been dismissed after the railroad was finished stuck around in Suriname, either because they hoped for more work or because they could not afford to make the journey back. At the offices of the department, Spirlet came across a series of useful instruments that were left behind. Among them, he found a compass theodolite, a so-called *boussole-theodoliet*,[62] that had been used by Claudius De Goeje, the author of the article on Suriname's toponymy.[63]

The role of governmental surveyor (*Gouvernementslandmeter*) was an interesting one. By the late nineteenth century, many different parties were surveying and mapping the coast and the rivers in the north, often under the authority of plantation owners — or aspiring ones — to establish documentation for ownership of land or the (re)establishment of concession borders. Others were initiated by companies to establish the possibilities for profitable exploitation of gold and other resources, and by the turn of the century, the Dutch government also started pulling together funds and experts with the KNAG and the Royal Navy to map Suriname.[64] The profession and methods of a surveyor were hardly regulated. Surveyors often operated on their own initiative or on behalf of private companies. The role of the governmental surveyor was, to Spirlet's initial surprise, not to actually survey but to oversee and archive ongoing sur-

62 Whereas theodolites usually consist of a telescope that can rotate around both a horizontal and vertical axis, this instrument also had a compass attached to it that reliably pointed north.

63 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 619.

64 Van Stipriaan, "Kijk maar, er staat niet wat er staat: De dubbele werkelijkheid van Surinaamse kaarten," 192.

veying and mapping efforts.[65] Mapping meant not just measuring but collecting and translating existing knowledge.

As the governmental surveyor, Spirlet was also the director of the so-called Domain Office, whose role it was to collect documentation, results, and equipment that was deposited there by the private surveyors who were active in Suriname. Its role was also to process requests for concessions in agriculture, forestry, and mining, and to advise the governor on concession matters. The office had a relatively passive role and little to say about the mapping processes themselves. Spirlet complained of the surveyors that "if they acted contrary to the regulations, the only way to act correctively is to refuse to deposit their work in the archives of the Domain Office."[66] Spirlet's annoyance at the lack of government control testifies to the commercial significance of maps as spatial knowledge tools, but also as temporal tools that were essential for planning future exploitation.

Spirlet found out that the archiving of other older maps was not done in any systematic or thorough way, which concerned him not just because of the technological and political value of some maps but also because of their symbolic character. When he attempted to collect older maps and instruments in preparation for his expeditions, he found an undated map "between a pile of practically useless maps in the early stages of decomposition and decay, and covered in a thick layer of dust."[67] This map was particularly meaningful to him because he believed it to be the basis for the famous large general map by the well-known mapmaker Johannes Cateau van Rosevelt (1824–1891).[68] Spirlet found this map a significant historical document for the history of Suriname as a Dutch colony. He explained how "he preserved the map from certain ruin and carefully separated her from the

65 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 616.

66 Ibid.

67 Ibid., 613.

68 R. Bijlsma, "Alexander de Lavaux en zijne generale Kaart van Suriname 1737," *New West Indian Guide/Nieuwe West-Indische Gids* 2, no. 1 (1921): 397–406.

rotten canvas, reapplied her and gave her new rolls" and then made a public appeal to the minister to keep such an essential piece in the National Archives in the Netherlands.[69]

The maker of this map, Cateau van Rosevelt, started his career as a naval officer, which is where he learned to navigate, and after also schooled himself in geodesy and architecture, before preceding Spirlet as the head of the Building Department in Suriname. For more than two decades, he played a decisive role in the colony's cartographic and infrastructural history as a central figure in the administration. Besides this affiliation, he also undertook a series of long journeys south to collect measurements. From his field notes, he drew a series of maps, from which he eventually composed a large general map of Suriname (fig. 8.2). The map is divided up into ten detailed sheets and contains both characteristic traits of a map and elaborate written text. It shows waterways and the coastal lines in blue, and dotted lines indicate the square and rectangular shapes of plantations, either still in use or not. Gray tints indicate mountain ranges or hills, wherever they have been measured, accompanied by their height in meters. Thin lines on the map indicate latitude and longitude. There is written information in both black and blue lettering on the white spaces in between.

The map was published in the 1880s and bought by the Dutch state. The map was expensive because it was the only one with this amount of detail and level of accuracy. The state used the map as a basis for legal practices that involved capital and property.[70] Some of the text written on the map was clearly meant to indicate possibilities for future exploitation, and it was thick with environmental temporalities too, indicating seasonal changes in the landscape. It speculated about forestry and logging, since hardwood grew on the eastern shore of the Corantijn River. For example, there were "beautiful forests of mora, cedar,

69 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 619.

70 Ehrenburg and Meyer, *Bouwen aan de wilde kust,* 216–17.

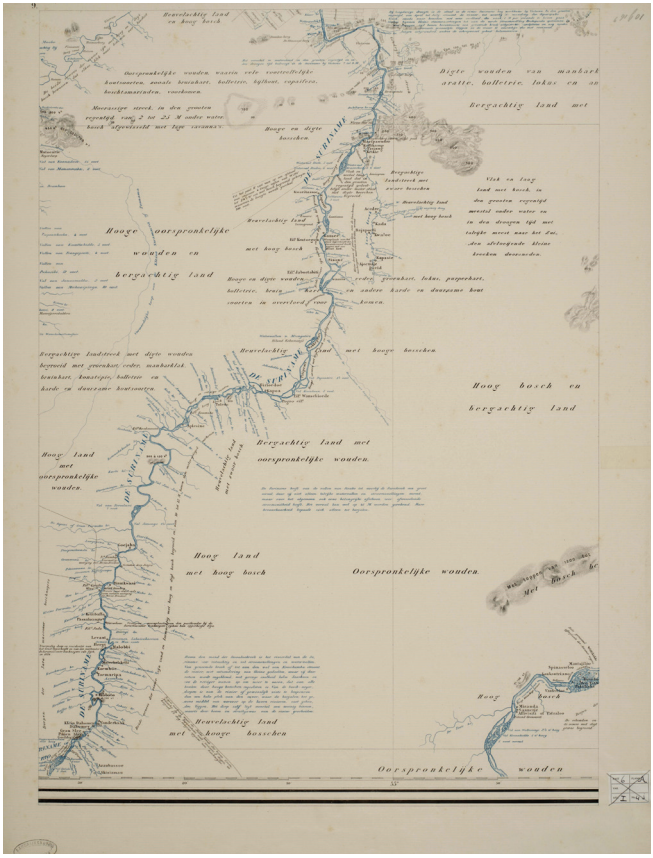


Fig. 8.2. This is number nine out of ten maps that together made up a large and detailed map of Suriname's coast and part of the inland, drawn up by Johannes Cateau van Rosevelt. The maps were 70 by 50 cm each, the scale: 1:200,000, and the text on them gives the reader mostly economically relevant information. The thin straight lines that cross the text and shapes of landmarks are part of a grid. In this case that of the lines of longitude and latitude, that make it possible to calculate the coordinates of precise locations. Source: J.F.A. Cateau van Rosevelt, *Kaart van Suriname: Naar de Opmetingen gedaan in de Jaren 1860-1879* (J.A. de Bussy, 1882), bl. 9. Location: Koninklijke Bibliotheek, Plano's en plakkaten: [1054 D 15].

locus, greenheart and other types of excellent timber."[71] Finally, the map was filled with observations on the different layers of soil underneath the covering of trees or grass. The delta of the Coppename River was surrounded by "alluvial planes covered with dense forest," whereas farther east from the river one could find "lowlands with sand and sand ridges, overgrown with thick forest." The text even indicated the accessibility and the possibilities for transport, for example, whether or not the area could be reached by land or boat, or whether or not it would be under water in the rainy or dry season. It also showed if parts of a certain river or creek would get too shallow for boats of a certain size, and what the circumstances of the riverbed were with regard to docking.

In the article in *De West-Indische Gids,* Spirlet described in detail how the maps were eventually drawn (e.g., fig. 8.3). For his cartographic expedition, he recruited a surveyor and unexpectedly found an excellent drawer in an alumnus from the local technical school in Paramaribo. He recruited three more students of this school to take private lessons in mathematics and become fully trained topographers. He did not mention the ethnicity of his personnel, except for the cleaner and administrator, whom he mentions was a "Javanese person."[72] They used astronomical location, triangulation, compasses, theodolites, and measuring chains to take measurements between 1912 and 1916. The lines they measured were translated on a 55 × 55 cm piece of paper, which was divided into thirty-six squares with thick blue lines, which were in turn divided up into a grid of 100 smaller squares with thinner blue lines.

71 J.H. Cateau van Rosenvelt, J.F. Adriaan, and J.F.A.E. van Lansberge, *Kaart van Suriname: Naar de Opmetingen gedaan in de Jaren 1860–1879* (Allard Pierson, Universiteit van Amsterdam, 1882), bl. 6.

72 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 620–21.



Fig. 8.3. The large overview map by Spirlet at a scale of 1:800,000, from which the grid pattern is removed. Source: F.E. Spirlet, *Overzichtskaart van Suriname: Samengesteld door den Chef der Opnemingsbrigade van Suriname* (N.V. Smulders & Co, 1913). Location: Koninklijke Bibliotheek, Plano's en plakkaten: [1054 D 15].

The Grid

The grid is an essential tool when it comes to the technology of maps, as both a spatial and temporal tool, and was a widely used drawing technique for cartographers. It is a characteristic feature of what makes drawings of location and space legible, and grids are part of the cartographic optical language. For both the drawer and the reader of the map, a grid is what media theo-

rist Bernard Siegert calls an "imagining technology."[73] Because of the pattern of squares, the reader can imagine the space as neatly arranged, controllable, and predictable.[74] A grid enables the location of objects, landmarks, settlements, resources, and movement.

It does so in two distinct but related ways. It provides a predictable pattern and creates a space of expectation. The pattern repeats itself. In this repetition and predictability lies its potential as a tool for the imagination of change. Specifically, a grid is a technology of anticipation, and thereby the imagination of emptiness. The square might be empty and white, indicating land unknown to the cartographer but promising that it will be kept white until they know what is there. The grid of 100 small squares is what turns the squared piece of paper into a projection screen.

For the cartographer, the grid was first and foremost a practical projection tool and a way to organize the collected data in an orderly fashion and to be able to scale up and down between larger and smaller squares. Cateau van Rosevelt had used a grid pattern in the field to draw in details.[75] When he came back from the field with his measurements, the observations were first drawn on a large scale, after which the results were compared with the permanent astronomical coordinates, and any potential mistakes were compensated for. Then they were drawn on the map, on a smaller scale, and the topographic personnel would continue with the drawing of the terrain. To do this, they used the same symbols and optical cartographical language that

73 Bernhard Siegert, *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real* (Fordham University Press, 2015).

74 Ibid., 97–111.

75 The drawing was such a precise work that the makers even took into account the meteorological circumstances under which the paper was pressed and the grid was preprinted. This is why Spirlet chose to use paper from the topographical services in Batavia, in the Dutch East Indies, which was pressed at the same temperature and with the same humidity as it would be in Paramaribo.

was used in the East Indies.[76] Then, a pantograph — a drawing instrument that enables the drawing of an object on smaller or larger scale but with similar proportions — was used to scale the map up from 1:5000 all the way to 1:50,000 and eventually 1:200,000. From these maps, Spirlet composed a general map of Suriname on a scale of 1:800,000, from which the grid pattern was ultimately removed.

Scalability, like the grid, relies on predictability and repetition. Anthropologist Anna Tsing defines it as "the ability to expand — and expand, and expand — without rethinking basic elements."[77] It is an essential design principle of the kind of standardization effective economic exploitation creates in landscapes and environments under colonial regimes.[78] Scaling like this ignores spatial and temporal particularity and creates a universal reality. In the case of plantation design, this principle transferred back from the maps to the spaces they represented. "Grid-shaped control," states Bernard Siegert, was a way to monetize the environment and make a swamp into a commodity: something that could be sold.[79] The map helped one imagine that commodity to be a promise of a rich gold or bauxite mine.[80]

Maps formed the blueprint — in some occasions literally — for the control and surveillance of land and people in the form of cadastral divisions and the administration of concession grounds. In doing so, they had an active role in the creation of the reality they were depicting. Maps like the one by Cateau van Rosevelt enabled the categorization of land into valuable or useful versus useless or unvaluable land, by indicating where and how land could be utilized. This was then elaborated by Spirlet,

76 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 622–23.

77 Anna Lowenhaupt Tsing, "On Nonscalability: The Living World Is Not Amenable to Precision-Nested Scales," *Common Knowledge* 18, no. 3 (2012): 505.

78 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press, 2015).

79 Siegert, *Cultural Techniques,* 97.

80 Tsing, "On Nonscalability," 506.

who added information about the geological circumstances and built on information about bauxite and especially gold deposits that had been around since well before that time. The maps formed the basis for bureaucratic paperwork that further transformed those categories into legal categories by means of cadastral administration and concessions indicating exactly how those potentials were allowed to be utilized. The grid pattern of plantations, the building of mines, and the construction of a railroad connect those areas to the administrative center.

The grid was a transferrable tool: technology of the grid presupposed an acontextual and ahistorical universality of space and time. This characteristic is illustrated by the fact that Spirlet wrote how he was "following the ways in which it is happening in the East Indies where…astronomical location of the necessary criterion made for excellent results." He emphasized that because of their similar environments "this was also the appropriate method for the lowlands of Suriname."[81] *De Ingenieur* [The engineer], the weekly journal of the Royal Institute for Engineers, printed a series of articles dedicated to the surveying — specifically the triangulation — of the Dutch East Indies. The journal only sporadically mentioned the mapping of Suriname and other colonies in the West Indies, but it reprinted or summarized reports that were initially issued and published by the Topographical Services (Topografischen Dienst) in the Netherlands and the Dutch East Indies.[82] It goes to show how the technology of triangulation, astronavigation, and the grid presupposed an abstraction and therefore a universality of spatial principles, and to a certain degree also a temporal decontextualization. The square pattern remained the same, no matter the place or the time. It could be Java in the present, or Lawa in the future, anticipating a reality in which a railroad was already built.

81 Spirlet, "Werkzaamheden op topografisch en kadastraal gebied in Suriname van 1911–1920," 617.

82 See, e.g., "Uit het verslag van den topografischen dienst in Ned.-Indië over 1912," *De Ingenieur* 29, no. 24 (1914): 455.

Conclusion

Responding to Zerubavel's argument for a mental topography of time and memory, I argue that maps, topography, and cartography are not only metaphors for thinking about time but active technologies for the production of time in colonial contexts. Maps follow an optical language, which allows for them to make arguments, and — like texts — this means that they are subjected to the omissions and conventions of discourse. The most important text on maps are the names of places, towns, rivers, mountains, or streets. Toponymic practices — the naming and renaming of place — are temporal and historical work. Through their optical discourse, but especially by their constant evoking of settler place-names, maps are technologies that have contributed to the erasure of local Indigenous and Maroon histories. They put forth a reality in which they were replaced by Western history, both as the understanding of the past as a progressive history of Western civilization and as documents to substantiate that narrative of universal progress in the study of history through bureaucracy and archives.

The grid is a cultural technology that enables this time work to move from the qualitative temporal tools to the quantitative. The ability to measure and carry universal time with a chronometer was essential to the drawing of those maps. The predictability and repeatability that the grid provided enabled the anticipation of the resources and riches that would actualize the triumphant universal history and future of the Dutch. Though often overlooked when it comes to their characteristic as temporal tools, maps have been indispensable tools for the production of the particular kind of historical time that fed and sustained colonialism and imperialism and in which, in Fanon's words, colonizers made history.

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9

On a Dais, in a Globe, Racing the Weather: Obscuring the Many Times of Climate Change

Emil Flatø

The first global atmospheric model for predicting the weather was not digital. It was not electronic. It was never even made. The model in question was a two-page "fantasy" about a "forecast factory" that appeared in the meteorologist Lewis Fry Richardson's *Weather Prediction by Numerical Process*.[1] Richardson invited his readers to imagine themselves standing inside a "large hall like a theater except that the circles and galleries go right round through the space usually occupied by the stage."[2] The walls would be painted with a map of the globe, with the Arctic on the ceiling, the Antarctic in the pit, England in the gallery, and Australia in the dress circle (fig. 9.1).

1 Lewis Fry Richardson, *Weather Prediction by Numerical Process* (Cambridge University Press, 1922), 219.

2 Ibid.

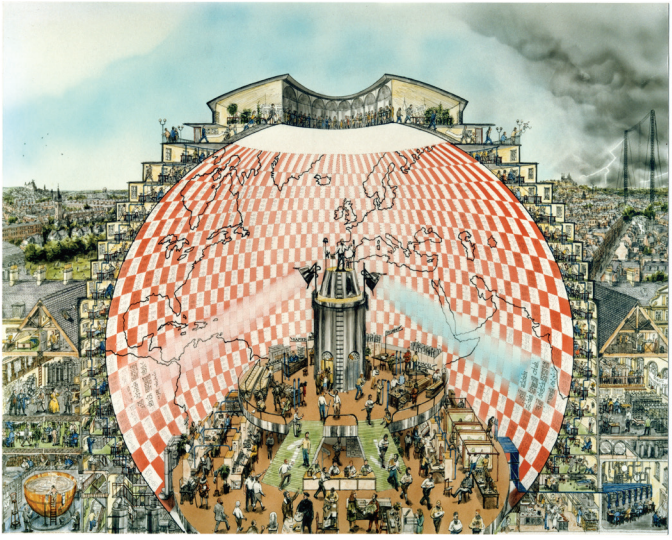


Fig. 9.1. Weather Forecasting Factory by Stephen Conlin, 1986. Based on the description in Richardson, *Weather Prediction by Numerical Process* and on advice from Prof. John Byrne, Trinity College Dublin.

The architecture of Richardson's fantasy seems like a familiar effort from the industrial era to create displays that would render the world knowable as a whole — a meteorological corollary to Paul Otlet's Mundaneum, the Panoramic displays of Victorian London, or early twentieth-century planetariums,[3] with one important difference: Richardson's idea was to create a *dynamic* display. The point was to create a blueprint for how to predict the weather numerically, or, as Richardson indelibly put it, to "race the weather for the whole globe."[4]

3 Alex Wright, *Cataloging the World: Paul Otlet and the Birth of the Information Age* (Oxford University Press, 2014); Richard D. Altick, *The Shows of London* (Belknap Press, 1978); and Jordan D. Marché, *Theaters of Time and Space: American Planetaria,* 1930–1970 (Rutgers University Press, 2005).

4 Richardson, *Weather Prediction by Numerical Process,* 219.

In the 218 pages preceding the fantasy, Richardson had argued that to compute the weather, the Earth could be conceived as a checkered grid at a resolution of 200 × 200 kilometers, where fixed values representing average change in the seven key variables of the atmospheric system would be calculated, by performing a twenty-three-step procedure on the data, and then displayed.[5] No human could solve those equations alone; there were too many equations for each square on the grid, taking too much time to solve. It had taken Richardson six weeks to calculate just two columns, and a 200 km resolution would yield 3,200 columns. This would not do, because the whole point of a forecast was to calculate more quickly than the planet. To even catch up with unraveling weather, the calculation would have to be provided in less than twenty-four hours. The grid might be simplified into 2,000 squares (because tropical weather was predictable), and the calculations might be computed more effectively, but it still would not do.

The solution? "A myriad computers are at work upon the weather of the part of the map where each sits."[6] In line with the historical meaning, the computers in question would be human.[7] The factory, in other words, was not a metaphor. Richardson estimated the drudgery of synoptic numeric forecasting would require 64,000 computers working at any one time, in synchrony.[8]

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5 Edwards argues that this twenty-three-step procedure was in effect an algorithm; see Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (MIT Press, 2010), 93–94.

6 Richardson, *Weather Prediction by Numerical Process,* 219.

7 The history of human computers has been explored widely. Computing was seen as menial work; in the war and immediately after, it was often feminized labor; see Jennifer S. Light, "When Computers Were Women," *Technology and Culture* 40, no. 3 (1999): 455–83, and Mar Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing* (MIT Press, 2017).

8 Ever the gentleman (and assured that he would never be charged with menial work himself), Richardson wrote of the computers in the forecast factory: "Let us hope for their sakes that they are moved on from time to time to new operations." Richardson, *Weather Prediction by Numerical Process,* 219.

To "win" the "race with the weather" would require knowledge production not as the careful reflections of some genius but as mass gymnastics display. Centralized command would come from a tall pillar in the middle of the room, rising to half the room's height. Perched on top, there would be a pulpit:

> In this sits the man in charge of the whole theatre; he is surrounded by several assistants and messengers. One of his duties is to maintain a uniform speed of progress in all parts of the globe. In this respect he is like the conductor of an orchestra in which the instruments are slide-rules and calculating machines. But instead of waving a baton he turns a beam of rosy light upon any region that is running ahead of the rest, and a beam of blue light upon those who are behindhand.[9]

This steampunk dream of a knowledge factory was never realized (alas!), largely because of technological disruption; as early as the 1950s, the drudgery could be automated through digital computers. But Richardson's concept of a grid-based calculation, solving for the differential nonlinear equations that model the dynamics of global weather, would remain. Indeed, it enabled two marvels of the computer age: a fairly accurate weather forecast — extending days, even weeks, into the future — and models of the longer-term global climate that can simulate vast durations of the planet's climatic history.

With this, the nested *spatial* metaphors of Richardson's fantasy lodged themselves somewhere deep in the climatological subconscious: the meteorologist on a dais, inside a theater-panopticon (filled with audience-workers), and the "show," a planetarium, computed on a global grid.

Yet, was the fantasy not, in some fundamental way, about the conquest of *time,* the "race with the weather"?

9 Ibid., 219.

How — or Is It Where, or Is It *When* — Do Times Meet?

Synoptic weather forecasting is a key scientific achievement of the twentieth century, not least because synoptics — the quest for a general or comprehensive point of view — was an obsession of twentieth-century thought.[10] Accordingly, histories of science after the turn of the millennium have interpreted Richardson's fantasy of a forecast factory as a precursor to the growth of institutionalized big sciences capable of producing *global* forms of knowledge. There is no clearer sign of success than opposition, and today, as cultural climate scholarship is grappling with climate science's inability to stymie climate change, the synoptic strategy at the heart of the science — "the vast machine"[11] of global climate monitoring and modeling — has been singled out for critique. With a predominantly spatial frame of analysis, these criticisms indict scientific "views from nowhere–everywhere" on the grounds that synoptic vision is oblivious to its own situatedness and the richness of the localities that are mere blips on a satellite image.[12] In some corners, "global" forms of knowledge have become suspect in and of themselves.[13] Yet, climate change would

10 This was not only a scientific quest evident in remote sensing, satellite imagery, climate models, etc.; it was also a central theme in late phenomenology. See Benjamin Lazier, "Earthrise; or, the Globalization of the World Picture," *American Historical Review* 116, no. 3 (2011): 602–30; Denis E. Cosgrove, *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Johns Hopkins University Press, 2001); Peter Sloterdijk, *Bubbles: Microspherology,* trans. Wieland Hoban (Semiotext(e), 2011); and Martin Heidegger and Marjorie Grene, "The Age of the World View," *boundary 2* 4, no. 2 (1976): 340–55.

11 Edwards, *A Vast Machine.*

12 Hannah Arendt, *The Human Condition* (University of Chicago Press, 1958); Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1988): 575–99; and Sheila Jasanoff, "A New Climate for Society," *Theory, Culture & Society* 27, nos. 2–3 (2010): 233–53.

13 Mike Hulme, "Reducing the Future to Climate: A Story of Climate Determinism and Reductionism," *Osiris* 26, no. 1 (2011): 245–66, and Bruno Latour, "Fourth Lecture: The Anthropocene and the Destruction of (the

never have been visible without the more-than-local theory of a climate system and the synoptic global model that could organize the data necessary to put the theory in evidence.[14] It seems that the effort to fault the epistemology of *globality* for the political disappointments of *globalization* — an association at play in the later work of Chakrabarty or Latour — is something of a dead end.[15]

Recent theoretical work on multiple temporalities seems to be elaborating a path out of this intellectual quagmire, with its emphasis on how socioecological change occurs as so many distinct, but intersecting, processes.[16] At times in explicit dialogue with theories of multiple temporalities, an exciting branch of the history of earth and environmental sciences tries to move beyond the global model-dominated epistemologies of climate science toward a more temporal understanding of the multiple processes, synchronizations, human histories, planetary deep times, horizons, and so on that come together within it.[17]

Image of) the Globe," in *Facing Gaia: Eight Lectures on the New Climatic Regime*, trans. Catherine Porter (Polity, 2017), 111–45.

14 Edwards, *A Vast Machine;* Matthias Heymann and Amy Dahan Dalmedico, "Epistemology and Politics in Earth System Modeling: Historical Perspectives," *Journal of Advances in Modeling Earth Systems* 11, no. 5 (2019): 1139–52; Jasanoff, "A New Climate for Society"; and Sheila Jasanoff, "Virtual, Visible, and Actionable: Data Assemblages and the Sightlines of Justice," *Big Data & Society* 4, no. 2 (2017).

15 Dipesh Chakrabarty, "The Planet: An Emergent Humanist Category," *Critical Inquiry* 46, no. 1 (2019): 1–31, and Latour, "Fourth Lecture."

16 Helge Jordheim, "Natural Histories for the Anthropocene: Koselleck's Theories and the Possibility of a History of Lifetimes," *History & Theory* 61, no. 3 (2022): 391–425; Jordheim et al., "Fossilization, or the Matter of Historical Futures," *History & Theory* 61, no. 1 (2022): 4–26; Michelle Bastian, "Fatally Confused: Telling the Time in the Midst of Ecological Crises," *Journal of Environmental Philosophy* 9, no. 1 (2012): 23–48; and Barbara Adam, *Timescapes of Modernity: The Environment and Invisible Hazards* (Routledge, 1998).

17 Sverker Sörlin, "Environmental Times: Synchronizing Human-Earth Temporalities from Annales to Anthropocene, 1920s to 2020s," in *Times of History, Times of Nature: Temporalization and the Limits of Modern Knowledge,* ed. Anders Ekström and Staffan Bergwik (Berghahn Books, 2022); Alessandro Antonello, "Antarctic Krill and the Temporalities of Oceanic

A basic issue in multiple temporalities theory is how to account for the *interface* between multiple times: to figure out how — or is it where?, or is it *when?* — distinct times relate, compete, conflict, synchronize, and so on.[18] In this chapter, I will approach the issue historically, building from the observation that the creation of global models — this quintessential intellectual technology devised for the study of a spatially vast object such as the Earth — was predicated on issues of managing *time:* the organization and effectivization of collective analytical labor and the synchronization of multiple temporalities of planetary flows. As such, the ambition in atmospheric and earth science to produce a synoptic vision of the planet through global modeling appears in a fresh light, as a knowledge object that "synchronizes" multiple temporalities.[19] Richardson's fantasy privileged the spatial concepts of the planetarium, the gridded globe, the stage, the factory. The quest was for a dais where the scientist could be positioned, and for a dynamic display of the world that the scientist could conduct. In what follows, I will demonstrate how an imagined observatory has time and again been invoked by climate scientists to make the unruly temporalities of the planet tractable.

However, as early as Richardson's thought experiment, the challenges of building an observatory within a multiplicity of times were evident. Since Richardson's goal was to race ahead of planetary time, into the virtual realm of prediction, the relationship between the irreversible temporalities of the planet

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Abundance, 1930s–1960s," *Isis* 113, no. 2 (2022): 245–65; Sverker Sörlin and Erik Isberg, "Synchronizing Earthly Timescales: Ice, Pollen, and the Making of Proto-Anthropocene Knowledge in the North Atlantic Region," *Annals of the American Association of Geographers* 111, no. 3 (2021): 717–28; and Cristián Simonetti, "Weathering Climate: Telescoping Change," *Journal of the Royal Anthropological Institute* 25, no. 2 (2019): 241–64.

18 Helge Jordheim, "Introduction: Multiple Times and the Work of Synchronization," *History & Theory* 53, no. 4 (2014): 498–518, and Dan Edelstein, Stefanos Geroulanos, and Natasha Wheatley, *Power and Time: Temporalities in Conflict and the Making of History* (University of Chicago Press, 2020).

19 Jordheim, "Introduction."

and the time it often takes to do science became newly critical. The science of weather forecasting and climate modeling following Richardson was about racing with a real-time phenomenon by coordinating action against time, the irreversible time of weather.

The cost of a synoptic impression is that it takes time to make. Before the digital computer, Richardson saw no way to view the whole synoptic weather system at roughly the same time except through the checkered division of the Earth into a grid with visualized values computed by 64,000 people working together, taking leads from a conductor maintaining a "uniform speed of progress in all parts of the globe."[20] Furthermore, findings had to be tabulated and brought downstairs, to the four expert clerks who were charged with logging and interpreting. Another unit would experiment with the data and make recommendations for improvements to the factory.[21] This level of coordination requires labor. It is irreducibly diachronous.

To parse how the work of maintaining a global "observatory" has mediated the multiple process of climate change, I will employ a basic distinction proposed by Sabina Leonelli, between the temporal dimensions of research and the "assumptions researchers make about the temporal features of their research targets" — times of knowledge production and times imputed to phenomena, if you will.[22] Building on examples from biological modeling and experimentation, Leonelli argues that the temporality of knowledge production affects how researchers understand the temporality of phenomena. I have found this basic insight illuminating for climate science, but given the planetary

20 Richardson, *Weather Prediction,* 219.

21 Ibid., 220.

22 Sabina Leonelli, "The Time of Data: Timescales of Data Use in the Life Sciences," *Philosophy of Science* 85, no. 5 (2018): 741–43. Leonelli uses the terms "Data time (Dt)" and "Phenomenon time (Pt)," but I have used a more ample terminology, not least to avoid conflating the temporalities inherent to phenomena with the temporalities imputed to phenomena by scientists.

extension of the atmosphere, its multiple entanglements with the Earth system, and that climate conditions span decades, a more complex interplay between times of research and times of climate has played out over a longer period. Climate science operates at far vaster scales than a biological laboratory. Generations of scientists have collaborated on an experiment in Earth system modeling that is taking place over a timescale of decades. Accordingly, in the history of weather forecasting and climate modeling, I have found that multiple times of knowledge production and multiple understandings of phenomenal temporalities appear. The synchronizing knowledge object of atmospheric models obfuscates a complicated tangle of temporal relations.

Following a patchy chronology of events from the postwar boom in atmospheric science in the United States to the stirrings of an integrated regime of climate science and governance under the United Nations, I will draw out three major challenges to rendering multiple temporalities of the atmosphere commensurable.[23] First, I will suggest that breakthroughs in atmospheric prediction yielded two different scientific understandings of the atmosphere's temporalities: *dynamic* temporalities that depict singular atmospheric time spans (empirical or simulated) and *statistical* temporalities that require the analysis of comparable ensembles of atmospheric durations. Second, I discuss the historical response to the challenge of integrating dynamic and statistical temporalities of climate; the use of global climate models to bring the two together, calibrating and verifying the models with dynamic data (modeled or empirical), and shaping empirical data collection through modeling. I reveal the computer-modeled "present" to be a black box wherein a wide array of variously timed data was integrated through simulated lines of best fit. Third, I discuss how specifically anthropogenic

23 For a thorough investigation of climatology's "histories of scaling" — that is, its historical power to bring a wide array of sources and environmental domains into the same epistemologies, diagrams and frameworks—see Deborah R. Coen, *Climate in Motion: Science, Empire, and the Problem of Scale* (University of Chicago Press, 2018).

change disrupted temporalities supposing continuity in nature, raising the question whether climate was any more predictable than history.

Taken together, these issues suggest that producing synchronic views of the Earth system is at least as challenging as producing synoptic ones. Indeed, I would argue that global climate models' synchronizations of multiple temporalities — and the associated fantasy of a point in space from which the temporal multiplicity of climate change can be observed and predicted — is key to the disorienting legacies of climate science.[24]

Climate's Dynamic and Statistical Temporalities

Meteorologists, in a sense, "won" the race against the weather during the 1950s by employing digital computers.[25] It is tempting to argue that the emergence of high-speed computing made "the future" mappable, that is, knowable, within the reach of science. Certainly, there was a proliferation of futures expertise following the breakthrough in weather prediction, not least within atmospheric science itself, where finer distinctions began to be drawn according to the remoteness of the futurity.[26]

24 On public disorientation and climate science, see Bruno Latour, *Down to Earth: Politics in the New Climatic Regime,* trans. Catherine Porter (Polity Press, 2018); Latour, "Fourth Lecture"; and Jasanoff, "A New Climate for Society."

25 Jule Charney and his colleagues at the Institute for Advanced Study at Princeton delivered the proof of concept in 1949, but it took some time before they were able to compute the forecast with real-time (as opposed to historical) data and in less than twenty-four hours. A Scandinavian collaborative effort between the Universities of Stockholm and Oslo and the Swedish air force was the first to deliver regular, operational numerical weather forecasts, three times a week, from 1954. For a full account, see Edwards, *A Vast Machine,* 111–37.

26 Emil Flatø, "When Science Could Not Wait: Climate, Experts, and the Times of Anthropogenic Change, 1945–1979" (PhD diss., University of Oslo, 2022); Jule Charney, "Numerical Prediction and the General Circulation," in *Dynamics of Climate: The Proceedings of a Conference on the Application of Numerical Integration Techniques to the Problem of the General Circulation Held October 26–28, 1955,* ed. Richard L. Pfeffer (Pergamon

The assumption was that the short and the long term came with different epistemological challenges, and that the medium term might be the hardest to grapple with.[27] (At the time, the distinctions were made strictly according to duration, but there are obvious associations between weather and the short term, climate and the long term, and seasons and the medium term.)

Computer models became the locus where these temporalities were brought together: Richardson's theater-planetarium-panopticon had been replaced by a virtual space, coded onto magnetic tapes in early digital computers.[28] The American meteorologist Jule Charney and his team — on the move from Princeton's Institute of Advanced Study to the Massachusetts Institute of Technology (MIT) — pointed to digital computers as virtual laboratories.[29] A prevalent idea at the time was that computers could be used not only to improve forecasts but also to discover the laws of the "general circulation" — what is now known as the global climate system — to accurately simulate the atmosphere from now until forever. The historian of science Paul Edwards has dubbed this goal the "infinite weather forecast"; the presumption was that numerical weather forecasting and climate modeling were integrated endeavors, two sides of the same coin.[30]

However, meteorology was moving into a strange epistemological frontier space, and profound issues soon emerged

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Press, 1960); and John Von Neumann, "Some Remarks on the Problem of Forecasting Climatic Fluctuations," in Pfeffer, ed., *Dynamics of Climate.*

27 This assumption was borne out in subsequent research; the European Medium-Range Weather Forecast is the latest endeavor to succeed in postwar atmospheric science.

28 Edwards, *A Vast Machine,* 111. Alexander Galloway devotes a chapter to the hardware of digital computing in the Electronic Numerical Integrator and Computer (ENIAC), which began as magnetic spools on two large bicycle wheels; see Galloway, "From One to Two," in *Uncomputable: Play and Politics in the Long Digital Age* (Verso Books, 2021).

29 Richard L. Pfeffer, ed., *Dynamics of Climate: The Proceedings of a Conference on the Application of Numerical Integration Techniques to the Problem of the General Circulation Held October 26–28, 1955* (Pergamon Press, 1960).

30 Edwards, *A Vast Machine,* 141–43.

from the effort to map out the atmospheric future. Charney's protégé at MIT, Edward Lorenz, appears to have been skeptical of the infinite forecast all along.[31] The possibility of long-term prediction of the atmosphere — that is, ideas about its phenomenal temporality — formed the core stakes of his most famous work. In 1963, Lorenz suggested that minuscule fluctuations in a single parameter quickly aggregated into "chaos," a finding that was later popularized as "the butterfly effect."[32] It began to dawn on meteorologists that chaos might pose an insurmountable barrier to how far their forecasts could extend. Because of Lorenz's proximity to the people running the UN World Meteorological Organization's Global Atmospheric Research Programme (GARP), the implications of his finding for the feasibility of the big science of collaborative global modeling were immediately felt. However fresh and contested the 1963 article remained, Charney found the question of the limits of climatological predictability paramount. The collaborative modeling and observation experiment of GARP required shared epistemological opinions on such matters. These would be translated into technical specifications for the research infrastructure of GARP's global "observing system."[33] Thus, Charney commissioned a series of modeling experiments to assess exactly how limited weather forecasting was likely to be. In 1966, they concluded:

31 In a conversation, Lorenz recalled that "there were still a lot of people at that time who were claiming that long-range forecasting was possible to the extent that in due time we would be able to know just what the weather would be on the next Fourth of July for our picnic or something like that"; see "Transcript of Dialogue between Phil Thompson and Ed Lorenz," interview by Philip Duncan Thompson, in *American Meteorological Society Oral History Project* 7 (1986), http://n2t.net/ark:/85065/d7df6pfq.

32 Edward N. Lorenz, "Deterministic Nonperiodic Flow," *Journal of Atmospheric Sciences* 20, no. 2 (1963): 130–41, and Edward N. Lorenz, "Predictability: Does the Flap of a Butterfly's Wings in Brazil Set Off a Tornado in Texas?," paper presented before the American Association for the Advancement of Science, December 29, 1972; reproduced in Edward N. Lorenz, *The Essence of Chaos* (University of Washington Press, 2008), appendix 1, 181.

33 Edwards, *A Vast Machine,* 187–227.

> Preliminary numerical model calculations indicate that if the initial state of the entire atmosphere were known with sufficient accuracy, the large-scale motions would, in principle, be predictable as a determinate physical system for a period of approximately two weeks, but that beyond this period only averages or statistical distributions could remain predictable.[34]

This meant that the transparency of the atmosphere as represented by models had become significantly reduced. The future "phenomenal time" of the atmosphere would be rendered in distinct ways: a maximum two-week dynamic flow at first, then a set of statistical averages. Dynamic prediction was only possible as a situated calculation, which at most might extend two weeks into the future from any given point in time. But situatedness was anathema to the very concept of climate, which is a statistical construction — the average of weathers. Could the shifting irreversible horizon of weather be integrated into the long-term temporal pattern called climate?

The "Moving Platform"

It is important to notice how the diachronic temporality of data and forecast production had grown a lot more complicated at this point, because of the rise of an atmospheric "big science."[35] The "forecast factory" that could realize the joint work of numerical weather forecasting and general circulation modeling was becoming more of a forecast industry, requiring the collaboration of a number of research groups. The expense of access to computers meant that moneyed interests, such as insur-

34 NAS-NRC Panel on International Meteorological Cooperation to the Committee on Atmospheric Sciences, "The Feasibility of a Global Observation and Analysis Experiment," *Bulletin of the American Meteorological Society* 47, no. 3 (1966): 202.

35 P. Galison and B.W. Hevly, *Big Science: The Growth of Large-Scale Research* (Stanford University Press, 1992), and Derek J Price, *Little Science, Big Science… and Beyond* (Columbia University Press, 1963).

ance companies, research and development (R&D) departments, and consulting firms, were also involved.[36] The handful of digital computers at work on the issue in the United States were scattered around in places such as Princeton, MIT (where Jule Charney moved in 1954), and Maryland. There were also important modeling communities in the Soviet Union, Scandinavia, and Japan.[37] In the late 1950s and on through the 1960s, international endeavors such as the International Geophysical Year (IGY) and GARP became increasingly necessary to coordinate the work.

This increased the importance of small modifications in the "institutional epistemology" that was forming around institutionally coordinated research such as GARP.[38] Charney's preliminary plan from 1966 is one example where the means of institutionalizing a collaborative science shaped fundamental assumptions in the entire field of atmospheric modeling.

In 1971, the synchronizing ambitions of the global modeling community were expanded. A special symposium was arranged at Princeton, dedicated to handling "four-dimensional data assimilation" according to the GARP framework, featuring Charney, Lorenz, and a select group of numerical meteorologists.[39] The proceedings provide a rare window onto the complicated temporal challenges that were raised by the collective research program of GARP and the synchronizing role it ascribed to the models. The challenges of climate science had become more infrastructural. New sources of weather and climate data were available, covering different durations and spatial information,

36 Despite the presence of corporate outfits such as Travelers Research Center and Arthur D. Little in computed meteorology, and the even heavier influence of industry (e.g., General Electric) on weather modification, the story of postwar meteorology has focused more on the influence of the military and the federal state than on private interests.

37 Edwards, *A Vast Machine,* 111–37.

38 Maud Borie et al., "Knowing Like a Global Expert Organization: Comparative Insights from the IPCC and IPBES," *Global Environmental Change* 68 (2021): 102261.

39 Akira Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," *Bulletin of the American Meteorological Society* 53, no. 3 (1972): 252–65.

I. Space coverage

A. Nonuniform distribution

1. Fixed stations (Eulerian)—example is conventional weather network
2. Floating stations (Lagrangian)—constant-level balloons, ocean buoys
3. Moving stations—aircraft, ships

B. Uniform distribution

1. Fixed stations—geostationary satellites
2. Moving stations—polar-orbit satellites

II. Time coverage

A. Intermittent observation

1. Regular time interval—conventional weather stations
2. Irregular time interval—aircraft, ships

B. Continuous observation—satellites, balloons

Fig. 9.2. Table from the GARP report, categorizing the data sources to be modeled by their spatial and temporal "coverage." Source: Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 254.

and arriving in a range of fashions: continuously, intermittently, and at regular intervals (fig. 9.2). At this juncture, the scientists doubled down on the global models as the locus where these potentially incommensurate, or at least distinct, times and data sources were brought together. GARP insisted on the feasibility of "four-dimensional data assimilation," the use of the models as sites that would integrate heterogeneous sources of data to produce coherent visions of the past, the two-week future of weather, and the longer-term patterns of climate. In the diagrammatic representation of this project, the virtual "forecast factory" of the models was elaborated as the device that organized the temporality of research to grasp the temporality of the phenomenon. In effect, the "present" of the models — the suture between past and future temporalities — was black-boxed, and

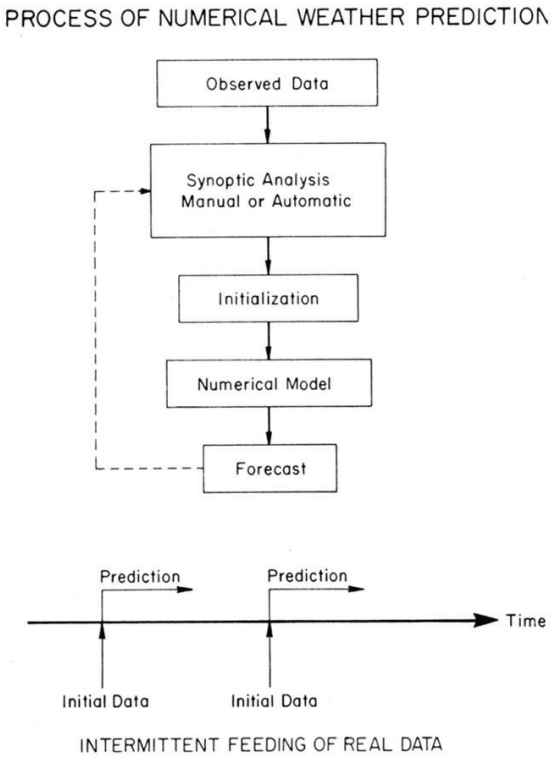


Fig. 9.3. Diagrams of the "conventional process of numerical weather prediction" and, at the bottom, the "intermittent nature of data processing." Source: Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 254.

the tensions between situated weather forecasting and longer-term climate modeling were understated.

A striking facet of the 1971 report is how the task GARP was taking on — of four-dimensional, global data assimilation with increasingly heterogeneous sources — required that the scientists made the "process" of observation and prediction visible and manipulable (fig. 9.3). To explain the novel idea of "four-

dimensional data assimilation," they began by taking a step back and spelled out the process of what had become "conventional" numerical weather forecasting by the mid-1960s. First, observed data were collected from a variety of sources worldwide at a specified time, such as 00:00 Greenwich Mean Time.[40] These were then automatically processed for the fields of pressure and horizontal velocity, a move familiar from Richardson's chessboard. However, a prediction model running on these observed values would be disturbed by various sources of "meteorological noise."[41] Through operations ironically referred to as "data initialization," the initial data had to be modified to provide more analytically useful input. The models could use that input to run a forecast, which could be looped back: "The forecast is then used as an initial guess for the synoptic analysis at the next map time."[42] Given the two-week obsolescence of weather forecasts, the operation had to be repeated by inputting new observations at regular intervals. In sum, the when of modeling for weather forecasts had been straightforward. Prediction happened at a locatable moment in time. Predictions could be looped in the models to produce forecasts that might prove accurate for as long as two weeks. But the process ultimately had to be repeated with intermittent updates of real-world data.

The ambition on behalf of global circulation models in GARP was to improve weather forecasting and climate modeling simultaneously by integrating more sources of data, with heterogeneous spatiality and temporality (fig. 9.4). Further, to save computing power, the meteorologists were looking for sufficiency rather than completeness or verisimilitude in their models. Accordingly, instead of trying to pinpoint what the modeled "present" would now become — exactly how, or when, different data and predictions would be related — they experimented by simulating different "observing systems" that could be built by

40 Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 253.

41 Ibid.

42 Ibid., 254.

GARP. For the experiment, they first generated a simulated set of observation data of the atmosphere as a control case.[43] They then simulated experimental "observed" data from various proposed mixes of measuring devices (including and excluding conventional sources), performing various assimilation procedures on them, and processing their various time sequences, to "reconstruct a less accurate and less detailed approximation of the control case."[44] Simultaneously, the same experimental data would be used to run a forecast model. The goal was to find the mix that would produce a satisfactory fit between the observations and forecast from the control case data and the observations and forecast for the experimental data. If not, "we vary the accuracy, density, and frequency of the measurements, the data assimilation schemes, and even add more data from another observing system(s) and repeat the above experiment until we arrive at satisfactory answers to the questions originally posed."[45]

In other words, the *when* of modeling was determined as a black-boxed site of simulated fit. Within the global circulation models, heterogeneous sources of observed data were harmonized with prediction data through operations that were found through a satisfactory simulation.

This choice generated a complex situation regarding time. In effect, there were now several *whens* of modeling. There might still be a locatable moment in time where the researcher "pressed play" on the models. More precisely, there would be several such moments; the science was proceeding through a plurality

43 This was a curious stand-in for the real. The authors acknowledged that real observations could have been used, but they appeared just as skeptical of the limitations of geographical coverage, "imperfect analysis procedures," and initialization in real data; see ibid., 255. The sense that computers offered the "perfect" laboratory setting, with more controlled conditions than in the real world, was prevalent in the postwar period; see Peter Galison, "Computer Simulations and the Trading Zone," in *The Disunity of Science: Boundaries, Contexts, and Power,* ed. Peter Galison and David J. Stump (Stanford University Press, 1996), 118–57.

44 Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 255.

45 Ibid.

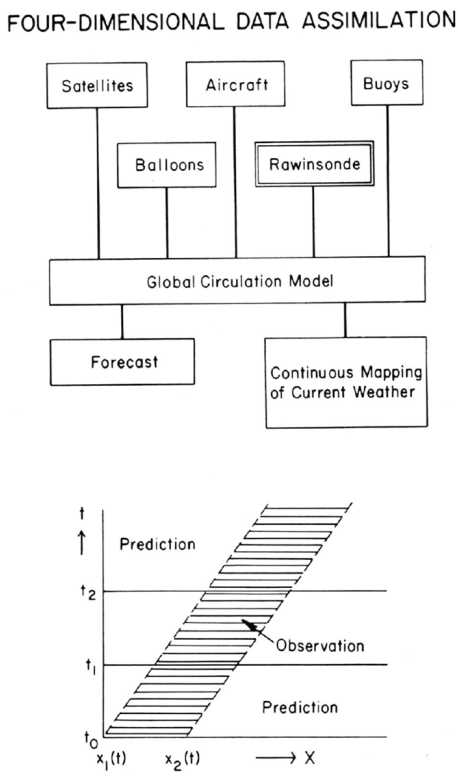


Fig. 9.4. Diagrams of the sources to be integrated in Global Circulation Models and the "moving platform" where observed data would be "mixed with prediction." Source: Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 254.

of models and individual simulation runs. But inside — or "in silico"[46] — of the models that executed four-dimensional data

46 Gabriele Gramelsberger uses this term to denote how the experimental setting for climate science after modeling was largely digital, encoded in silicone; see Gramelsberger, "Climate and Simulation," *Oxford Research Encyclopedia Climate Science,* 2018, https://oxfordre.com/

assimilation, the models effected a simulated present whose only characteristic was the effective ability to produce a working harmony between scattered sources of data to produce a realistic forecast. The times of knowledge production would be multiple.

The diachrony of modeling was also extended with four-dimensional data assimilation. An unpublished diagram of the planning timeline for four-dimensional data assimilation in GARP demonstrates how the work of assimilation sketched out above would take at least five years, at which point "real-time implementation" would, one hoped, be possible.[47] Further, the diagram accounted for how data assimilation would rely on, and run parallel with, the development of data collection and processing infrastructures and the coding of several "global prediction models."

A new metaphor was now introduced to explain the role of the global circulation models. They would serve as "moving platforms."[48] This put the manual forecast factory, which had become a digital forecast industry, into motion, a recognition that models were situated in time. Yet, the notion of a "platform" recalled the dais on which Richardson's imaginary meteorologist would conduct the concerted production of views of the transparent Earth. At the site of the models, the possibly distinct phenomenal temporalities of weather and climate were both engaged; scattered and heterogeneous observations would be organized through the models, and model predictions of both weather and climate would be calibrated through observation. The platform metaphor made it seem like the knowledge production still took place at an identifiable locus, obfuscating the multiple times of knowledge production involved (individual

climatescience/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-52.

47 Kikuro Miyakoda, Letter to Edward Lorenz, May 17, 1971, Box 3, Edward Lorenz Papers, GARP Research Coordination and Planning Group, Library of Congress.

48 Kasahara, "Simulation Experiments for Meteorological Observing Systems for GARP," 254–55.

simulations, distributed research, data assimilation within the models, and the five-year span of the pilot project).

Edwards has referred to the work of organizing observations through models and calibrating models through observations as "model-data symbiosis."[49] Missing from the ecosystemic notion of "symbiosis," however, is an idea about how the relationship of mutual dependency develops and holds over time. In the 1971 report, to justify the time needed to create models that were assimilated in four dimensions, the models also had to be written into a more metaphysical, historical imaginary, the cumulative progress of science that was to be expressed through ever-more perfect models. This is subtly suggested visually by the ascendant scale of prediction, observation, and prediction in fig. 9.4, but there is ample evidence in the documents surrounding general circulation models, climate modification, GARP, and the proto-climate assessment in the Study of Man's Impact on Climate.[50] The point, in temporal terms, is that the dynamic data object of the model offered shelter from the irreversible temporality of weather. It served as the locus where the laws of the climate system could be expressed, calibrated with empirical data, and tested through simulations that could be compared with observations. And through this iterative process of constant improvement at scales of weather and scales of climate alike, the "moving platform" would transcend the contingencies of time that knowledge production was embedded in.

The Other Kind of Factory

Absent in the conceptualization of the "moving platform" was any meaningful discussion about the *anthropogenic* quality of change in the late twentieth century. Climate science was one of the strands of postwar science that sublimated the peculiarity of anthropogenesis by naturalizing it, even as the environmen-

49 Edwards, *A Vast Machine,* 281–82.

50 Study of Man's Impact on Climate (SMIC), *Inadvertent Climate Modification—Report of the Study of Man's Impact on Climate* (MIT Press, 1971).

tal effect of social life was increasingly palpable. In concepts of the Earth system, "human factors" are merely another source of input. Francis Bretherton's famous diagram of the Earth system makes no distinction between "human factors" (illustrated by a mass of anonymous faces), ocean dynamics, and "global moisture."[51] Bretherton drew on a tendency that was evident in environmental thought from ecology to Gaia theory. Aronowsky has unearthed a diagram by the ecologist G. Evelyn Hutchinson where "the combustion of fossil fuels" was represented as just another input to the carbon cycle.[52] Sörlin and Isberg show how the paleoclimatologist Oeschger argued for the predictive value of his field through a diagram analogizing volcano eruptions, the explosion of a nuclear bomb, and industrial emissions.[53] Most importantly to mainstream climate science, and subsequent to GARP's work on four-dimensional data assimilation, the climate modeler William W. Kellogg spent the 1970s working out how to render human influence on climate as a set of quantified, model-ready, time-series trajectories.[54] The implication was that humans are part of the system, as computable as other planetary factors.

The trouble is that the metaphor of the factory did not merely serve to illuminate the labor of weather forecasting in climate science. In those diagrams of interrelationships of the climate system, the factory was frequently invoked as shorthand for anthropogenic emissions.[55] Richardson's factory may have been in

51 NASA, *Earth System Science: Overview: A Program for Global Change* (The National Academies Press, 1986), fig. 2b.

52 Leah Aronowsky, "The Planet as Self-Regulating System: Configuring the Biosphere as an Object of Knowledge, 1940–1990" (PhD diss., Harvard University, 2018), 84–85, and G. Evelyn Hutchinson, "Circular Causal Systems in Ecology," *Annals of the New York Academy of Science* 50, no. 4 (1948): 223.

53 Sörlin and Isberg, "Synchronizing Earthly Timescales," fig. 4.

54 Flatø, "When Science Could Not Wait," 265–94, and William Welch Kellogg, *Effects of Human Activities on Global Climate* (World Meteorological Organization, 1977).

55 "Fossil fuels" and other sources of "human activities" were represented in diagrams of the climate system from the 1970s onward, but I have not seen

the business of producing forecasts, but it was part of an economy that also produced emissions. In my opinion, this duality challenged the synoptic strategy of climate science more than anything. The science of a "moving platform" emerged from a historical civilization that was "shifting the baseline."[56] In addition to the multiple temporalities of knowledge production (the modeler's time and the models' time) and multiple phenomenal temporalities (the dynamic and the statistical) the global climate models were thought to assimilate, the prospective temporality of planetary change was also subject to collective human agencies. Thus, the future of climate was not merely a scientific question about the systematicity of climate. The climate system was the responsive agent, not the prime mover. There is no "physical science basis" of climate change; there is a history of increasing fossil fuel extraction and other extractive or industrial activities that result in trace gas emissions.[57] Key questions about climate change had to do with its impulse, that is, the speed, timing, scale, and form of anthropogenic forcing.[58] Could this force really be any more predetermined — and by implication, any more predictable — than history itself? Would it not depend on a political struggle between the entrenched interests of an energy-intensive civilization and the creation of a greener future?

On this count, the "big" science of climate science has not always agreed with itself. Despite the power of institutionalized

examples of climate system diagrams using the metonym of smokestacks before the third assessment report; see Alfons Baede et al., "The Climate System: An Overview," in *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change,* ed. J.T. Houghton et al. (Cambridge University Press, 2001), 88.

56 Ian McHarg, *Design with Nature,* 1st ed. (Natural History Press, 1969), 67–70.

57 Andreas Malm, *The Progress of This Storm: Nature and Society in a Warming World* (Verso, 2018).

58 Naomi Oreskes, "The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong?," in *Climate Change: What It Means for Us, Our Children, and Our Grandchildren,* ed. Naomi Oreskes, Joseph F.C. DiMento, and Pamela Doughman (MIT Press, 2007), 74–76.

research programs such as GARP, some climate scientists were clearly sensitive to the performativity of prediction as early as the 1970s. In 1976, the climate modeler Stephen Schneider used this urgency to call for a science of "dirty crystal balls" — provisional, political, aware that time was of the essence.[59] Part of the goal of modeling long-term ecological catastrophes was to preempt global warming by putting it in evidence. In other words, as evidence, modeling was not unequivocally intended as predictive, but also as exploratory and even cautionary.[60] Moreover, discourses around modeling have exhibited a striking sensitivity to the timing of political action as an independent factor in understanding change. In fact, as early as the *First Assessment Report,* the chapter on scenarios pointed out that timing was of the essence when it came to climate action. Under the heading "Time Profile of Emissions," the expert group developing future scenarios of emissions "recognized that emissions and concentrations in the future are not only a function of factors such as economic growth and technological change, but also of when measures to reduce emissions are adopted."[61] Running simulations where emission cuts started at different dates (2000, 2010, 2020, and 2030), the group found that "emissions would have to be curtailed sharply if the emissions reduction measures are delayed until a later date."[62]

Given this background, the choice, in the *Sixth Assessment Report,* to compare historical modeled projections of future climate change with subsequently observed data is something of an anachronism.[63] The climate models were not meant to be right; they were meant to become wrong, because the presump-

59 Stephen Henry Schneider and Lynne E. Mesirow, *The Genesis Strategy: Climate and Global Survival* (Plenum Press, 1976), 149.

60 Emil Flatø, "When Science Could Not Wait," chaps. 3, 5, 6, and Heymann and Dalmedico, "Epistemology and Politics."

61 D. Tirpak and P. Vellinga, "Emissions Scenarios," in *Report of the Response Strategy Working Group,* ed. F. Bernthal et al. (International Panel on Climate Change, 1990), 39.

62 Ibid.

63 D. Chen et al., "Framing, Context, and Methods," in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth*

tion was that politicians would act on sufficient evidence of the climatological dangers arising from fossil fuel emissions. Nonetheless, because climate science's warnings failed to effect political action, the field ended up patiently improving its global climate models anyway.

Conclusion: Working on the Move

How — or is it where, or is it *when* — do times meet? The historical answer to this, in the context of climate science, is in the collaborative epistemic technology of global numerical models, and the visual representations of the models as world simulators that give scientists a privileged position on a dais, from which they can conduct analyses for the whole globe. I have shown the staggering array of times meteorologists, atmospheric scientists, and climatologists have tried to synchronize through the models, in an intergenerational enterprise lasting almost exactly a century. These include several diachronous times of knowledge production, or "data times": individual runs of computer models, networked model collaboration, and longer-term research by the big science institutions dedicated to climate change. They include the variegated phenomenal times of weather and climate systems: one dynamic and prone to chaos, the other statistical, and thus antithetical to localization. And finally, the strangely recursive times resulting from anthropogenic influence. These are times climate science has naturalized as components of the Earth system, even though anthropogenic events entangle risk and science, history and chronology, inquiry, and action, in irreversible processes of change.

As the variety, diachrony, and separation between these times grow, Leonelli's argument that knowledge-making times affect how the temporality of phenomena are understood becomes acute. However, climate science's imaginary of constructing a dais, or a "moving platform," within global models has tended to

Assessment Report of the Intergovernmental Panel on Climate Change, ed. V. Masson-Delmotte et al. (Cambridge University Press, 2021), 184–87.

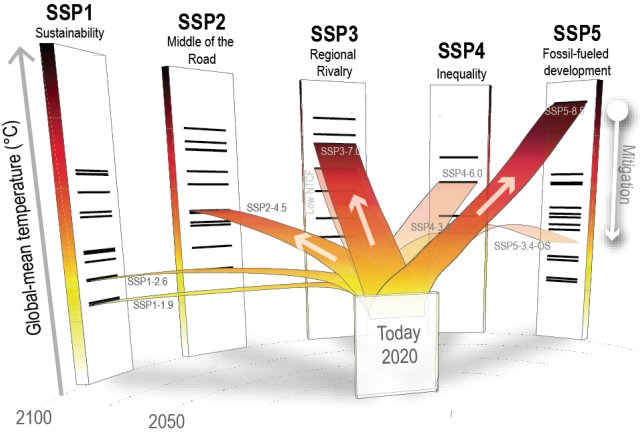


Fig. 9.5. Diagram of the scenario matrix framework in the Sixth Assessment Report. Source: Intergovernmental Panel on Climate Change (IPPC), "Framing, Context and Methods," in *Climate Change 2021: The Physical Science Basis* (Cambridge University Press, 2023), 232.

obscure the temporal complexity of what they do and the phenomena they study. The legacy of this imagination is readily legible in the newest assessment report, where the framing chapter is organized around these questions: "Where are we? Where do we want to go? And how do we get there?"[64] The guiding imperatives are *where* and *there.* To get an overview of something as vast as climate change, the framing chapter operates spatially, the emphasis is on orientation.[65] Even clearer is the diagram of futures work in the *Assessment Report,* which depicts the present (or the oxymoronic point in time labeled "Today 2020") as a dais from which several futures may unravel (fig. 9.5).

I believe the imaginary of a platform from which the times of climate change can be observed and intervened upon is key

64 Ibid., 20.

65 Another conceptual frame the science shares with the social science critique; see Latour, *Down to Earth.*

to the sense of disorientation that has emerged in the politics building on climate science.[66] The interface between real pasts, scientific understandings, and possible futures of the complex, planetary temporalities of climate change cannot be flattened into coherence in space. Planetary futures do not flow from one present, however ample its boundaries. Rather, they are subject to intricate and complex relations that occur over time. The relationship between agents of change, social dynamics, and the climate system in the creation of a changing planetary future is bound to remain profoundly challenging to understand.

By disaggregating the multiple, asynchronous processes of change, at least "we" will not be looking in vain for a site where all this time coheres. Perhaps the science can tune in with the moving contexts of ongoing change, politics, and history it is inextricable from; accept that its models will never be perfected but always pragmatically representative, adequate only for specific purposes;[67] leave behind the quest for insight that transcends a position in time; and learn how to work on the move. The rudiments of a more time-sensitive positioning of climate science can be found within the field's own literature. When the authors of the AR6 framing chapter respond to the first of the guiding questions — where are we? — they position the climate assessment against multiple temporalities. The chapter's overarching goal, they claim, is "to set the scene for the [working group 1] assessment and to place it in the context of ongoing global changes, international policy processes, the history of climate science and the evolution from previous IPCC assessments, including the Special Reports prepared as part of the sixth assessment cycle."[68]

66 Hulme, "Reducing the Future to Climate"; Jasanoff, "A New Climate for Society"; and Latour, *Down to Earth*.

67 Alisa Bokulich and Wendy Parker, "Data Models, Representation and Adequacy-for-Purpose," *European Journal for Philosophy of Science* 11, no. 1 (2021): 31.

68 Chen et al., "Framing, Context, and Methods," 13.

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PART 4

Natural Histories

10

Assemblages versus Orders: Gilbert White's Precise Lines in a Sensible World

Erik Ljungberg

Introduction

This chapter centers on Gilbert White, an eighteenth-century natural historian who endeavored to determine the punctuality of nature's rhythms in his small parish in southern England between 1763 and 1793. White was part of a group of parson-naturalists who gathered knowledge on the natural surroundings of their parishes.[1] He spent a lifetime observing nature, corresponding with fellow naturalists, spending hours outdoors, and diligently noting observations in his notebooks, all of which eventually culminated in the work for which he is best known, *A Natural History of Selborne (NHS),* published in 1789 in what was at the time a burgeoning London market for books about

1 Brita Brenna, "Clergymen Abiding in the Fields: The Making of the Naturalist Observer in Eighteenth-Century Norwegian Natural History," *Science in Context* 24, no. 2 (2011): 143–66, and Patrick H. Armstrong, *The English Parson-Naturalist: A Companionship between Science and Religion* (Gracewing, 2000).

nature.[2] But more specifically, White was part of a much smaller group of people attempting to make calendars of nature. For these figures, the great diversity of rhythms found in nature and their annual regularity — the coming and going of ladybugs, the bloom and wither of beech trees, the departure and arrival of swallows, that is, rhythms they understood to be highly punctual from year to year — was a puzzle that needed to be investigated. And the way in which they went about investigating this puzzle was to write things down, keeping track of flowering times, making daily records of weather, writing down migration times year after year in journals and notebooks.

White, for example, kept an unbroken series of daily weather records between 1768 and 1790, and he kept track of the annual appearances of 400 species, including birds, plants, trees, flowers, and insects. White recorded 70,000 entries in his journals, tailor-made for the purpose.[3] The journal, officially titled *The Naturalist's Journal,* was printed by a friend of his, and enjoyed a limited circulation. The daily practice of making observations in *The Naturalist's Journal* was something that set down natural rhythms in a way that had not been done before. It enabled access to decades worth of information about natural events, and it afforded the mobilization of that information within networks of naturalists, thus introducing the possibility of collectively attending to natural durations at scale.

I argue that not only do temporal-semiotic artifacts, such as calendars, clocks, and timelines, co-produce times, but that such artifacts also embody specific temporal orders, expres-

2 *NHS* consists of 100 letters nominally addressed to White's main interlocutors, Thomas Pennant, a leading zoologist in Britain at the time, and Daines Barrington, a jurist and several-time contributor to the proceedings of the Royal Society. It became somewhat of a classic during the nineteenth century, appearing in more than 100 editions, and never going out of print since its first publication. For more on this, see Amy M. King, *Seeing the Divine in the Commonplace: Natural History, the Theology of Nature, and the Novel in Britain, 1789–1865* (Cambridge University Press, 2019).

3 Paul G.M. Foster, *Gilbert White and His Records: A Scientific Biography* (Boxtree, 1988).

sive of and animated by the deeper layers of cultural code that subtends them.[4] It is precisely because artifacts accrete out of complex webs of technologies, techniques, practices, values, and cultural forms that one can read into them the worlds from which they originate. Thus, one can trace an ingoing direction in which historically and culturally specific temporal orders are inscribed into temporal-semiotic artifacts. But one can also trace an outgoing direction in which the temporal order is brought forth through its embodiment within artifacts.

It often seems that historians of science, technology, and ideas tend to read artifacts "backward," showing how they disclose a particular world, while people in science and technology studies (STS), new materialism, and postphenomenology often read artifacts "forward," showing how they perform, enact, or intra-act particular worlds. I suggest that it is possible to do both by finding a middle ground between a relational ontology and a realist conception of structure. In brief terms, a relational ontology posits that relations precede relata. It acknowledges that both things and connections exist, but connections are more primary — they make things what they are. Bruno Latour, for example, is a clear example of someone thinking in terms of a relational ontology. In *Reassembling the Social,* he takes issue with phenomena such as social or linguistic structures. It would be impossible, he says, to refer to such phenomena without the vast apparatuses of computers, filing cabinets, offices, papers, seminar rooms, equations, and questionnaires that compile

4 The term "temporal-semiotic artifact" is used to denote signs that are both material and semiotic and whose referents are durations of different kinds. The term "artifact" is chosen to draw attention to the significance of the variable embodiment of signs whose referents are durations. For some temporal-semiotic artifacts, such as monuments, sundials, and calendars, their shape, texture, and corporeality impinge upon how they bring forth times. As for concepts, ideas, periodizations, or genres, their concrete embodiment may impinge less upon how they bring forth times. Examples of temporal-semiotic artifacts would be clocks, calendars, timelines, hourglasses, bar charts of birth rates per year, graphs of global mean temperature forecasts, history books, bell towers, and printed astrological charts.

them.[5] It's assemblages all the way down, and no assemblage can afford to waive the price of being assembled. Thus Latour's move is simple, but effective. For any system, structure, order, regime, society, institution, or culture, he simply asks, What process of assembly afforded its legibility? In which buildings was the assembly performed? In which rooms? With what tools?

This challenges any appeal to structure. Met with the argument that there was such a thing as an early modern temporal regime that conditioned how White and his journal co-produces times, an actor-network theorist would refer us back to the assemblage of things and practices and ask, From which part of the assemblage does the temporal regime emanate? Through which vehicle in particular does it act? The library that housed the leather-bound stack of paper? The pen that inscribed its pages? The printing press that stamped its rows and columns? Appeals to large-scale phenomena such as systems, regimes, or structures can always be short-circuited by this line of argument. However, it also undermines the ability to confidently assert that times in the early modern period tended to unfold in consistent and similar ways. Whenever one tries to move outside the meshwork of things and practices to phenomena that purport to shape situations of action from the outside, such as contexts, structures, systems, or regimes, we are politely returned to the situation and asked to remain there.

Charles Sanders Peirce, a pragmatist philosopher, offers a solution to the problem of how something outside a situation of action can act from within it, namely, the concept of habit. According to Peirce, habits are plastic regularities that emerge out of repetition.[6] Pickering explains that Peirce views habit as a general tendency of systems of various kinds to form a self-

5 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford University Press, 2007), 175.

6 Winfried Nöth, "Habit Change, and the Habit of Habit Change according to Peirce," in *Consensus on Peirce's Concept of Habit,* ed. D. West and M. Anderson (Springer, 2016), 35.

generating cycle that aligns future actions with past actions.[7] I contend that habits do not need any external factors to emerge. They can arise from constraints, which are inherent in situations of action. Constraints make certain actions more likely to occur. Emergent habits shaped by constraints help to bind the meshwork of practices and give it a tendency to influence situations of action in a similar way.

This allows us to maintain the circulating movement connecting all that was assembled in White's knowledge practice, all the tools, people, objects, and ideas — his epistolary interlocutors, his brother's bookshop on Fleet Street, his printing press, the huntsmen and farmers he conversed with, the Royal Society in London, his thermometer, his garden plot, his library, the sheets of paper he sometimes brought along for his field observations, his portable watch. But in seeing this network as a more or less stable assemblage — stabilized, that is, by habit and constraint — we can also assume that as it unfolded it predisposed events to unfold in similar ways. The kind of temporal order that is being referred to here thus has no locus external to the practices themselves, but nonetheless acts upon them as if it were an external structure.[8] Based on this reasoning, I argue that temporal-semiotic artifacts, such as White's journal, can stand as indicators of larger networks of practices glued together by habit, even though some of these networks might have their origin far beyond the world of eighteenth-century British natural history.

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7 John Pickering, "Is Nature Habit-Forming?," in *Consensus on Peirce's Concept of Habit,* ed. D. West and M. Anderson (Springer, 2016), 91.

8 The two notions of habit and constraint afford the circumvention and satisfaction of a common criterion in actor-network theory, namely, that each member of an assemblage is able to act as a "full blown mediator." This criterion problematizes the ability of structure to circulate unchallenged throughout the assemblage. Even a typo at the printer's house can bring down the early modern temporal regime. But because situations of action provide a limited number of outcomes, and outcomes sediment through repetition, the agentic range of mediators is tempered. In other words, after a few complaints have been made, and some errors committed, the printing house creates routines to avoid such typos.

To maintain a realist stance on temporal orders while securing the possibility of times being co-produced by artifacts, I propose the superimposition of two distinct notions. It is important to maintain this superimposition for several reasons. First, it establishes the possibility of a two-way street between the epistemic and the artifactual. This strengthens the possibility of referring particular temporal concepts or experiences back to particular artifacts or objects, and vice versa. Second, each notion acts as an antidote to problems that may arise when discussing multiple times in a postnature register. The first notion is that temporalities are observer-dependent. Acceleration, endings, rhythms, forecasts, intensities, before and after, soon, and not yet exist as such only *for someone* (whether that someone be a person, a deer, or a frog). This notion tempers the ability to transcend inherent situatedness in order to describe more-than-human forms of time. The second notion mitigates the risk of relativism inherent in the first by loosening the strict external–internal divide and claiming that each forms the condition of possibility for the other. This notion of reciprocal conditions of possibility between the inner and the outer stipulates that for any temporal experience or category it should be possible to understand the infrastructure, apparatus, network, or material-semiotic set up that gives rise to it. This is, I believe, what Husserl achieves with his concept of intentionality.

Basically, intentionality refers to the fact that perception is always perception of something.[9] An act of perception always already entails an act of attending to that object.[10] Putting it per-

9 Edmund Husserl, *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy, First Book, General Introduction to a Pure Phenomenology* (Kluwer Academic, 1983), 75.

10 Searle refers to this as the directedness or aboutness of mental states, meaning that mental states are about something: fear is fear of something, beliefs are beliefs about something, statements are statements about something; see John Searle, *Intentionality: An Essay in the Philosophy of Mind* (Cambridge University Press, 1983). Varela, Rosch, and Thompson talk about the two-sidedness of intentionality (a phrase also used by Husserl) in order to highlight the futility of referring to a cognizing system without referring to its continuous interaction with its environment; see Husserl,

haps too crudely, everything that is seen is seen by someone, presupposing both that there is an observer and something to be observed, and everything that is known is known by someone, presupposing both that there is a knower and something to be known (or, alternatively, with Haraway, there is no view from nowhere). Putting it in terms of temporality, occasions occur unto beings, presupposing both that there are occasions and beings. What this in turn entails is that there is a peculiar kind of correspondence between the occasion and what might be called the "occasionner." In fact, they always arise together. They are ensnared in a special kind of dance, these two poles, as if connected by an invariant thread. They are entwined, interwoven, co-constituted. This move establishes that inner and outer are not antithetical essences, but rather both form part of a continuum, meaning that occasions can be variously located within the continuum, but that the coupling itself remains stable.

Invoking the concept of intentionality in service of our attempt to understand how the journal brings forth times serves several purposes. One is that it provides a way to make the connection between external knowledge objects and internal knowledge structures. Intentionality shows the mutual binding of mind and world. It reveals that we bring things into being by grasping them (physically or perceptually), but also that our grasping itself is shaped by what it grasps. This view sees a dynamic coupling between the epistemic and the artifactual. The internal and external world sync with each other moment by moment — they oscillate. The co-produced times in White's journal thus emerged from a recursive looping of mind and matter, between the tools of knowledge production and the embodied knowledge-producer, where the direction of influence

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Ideas Pertaining to a Pure Phenomenology, 308; see also Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (MIT Press, 1991), 208. Zahavi speaks of intentionality as the Janus-face of experience; see Dan Zahavi, "Intentionality and Phenomenality: A Phenomenological Take on the Hard Problem," in *Consciousness and Intentionality: Models and Modalities of Attribution,* ed. Thomas Szanto and Hilge Landweer (Springer International, 2014), 95–110.

moves both ways. But before describing how this panned out in the use of the journal, it is necessary to describe the circumstances of its use.

White's Knowledge Practice

The times assembled through White's use of the journal grew out of a wider set of practices that were in turn attuned by his participation in the wider field of natural history at the time. In his attempt to uncover the regularities behind the seasonal fluxes of plants and animals, he abided by particular principles and methods. At the center of his knowledge practice was the study of what he called "the life and conversation of animals." He articulated his own position in opposition to what he saw as a prominent trend at the time of writing general descriptions of plants and animals. Whereas many leading naturalists, such as Linnaeus, Buffon, and Scopoli, wrote about plants and animals in terms of their general behavior and characteristics, White was more focused on the "conversation" between organism and environment.[11]

In contrast to many of his eighteenth-century peers who focused on creating taxonomies and descriptive overviews, which amounted to systems of decontextualized information, White held a particular view of what natural history should aspire to.[12] "If people who live in the country," he says, "would take a

11 Gilbert White, *The Natural History and Antiquities of Selborne,* ed. Thomas Bell (Van Voorst, 1887), 1:81.

12 Examples of such works might be Richard Weston, *Botanicus Universalis et Hortulanus: Containing Descriptions of the Species and Varieties of All the Trees, Shrubs, Herbs, Flowers, and Fruits, Natives and Exotics, at Present Cultivated in the European Nurseries, Green-Houses, and Stoves, or Described by Modern Botanists; Arranged According to the Linnaean System, with Their Names in English: to Which are Added a Copious Botanical Glossary, Several Useful Catalogues and Indexes: Illustrated with Elegant Engravings: in Four Volumes* (printed for J. Bell, 1772); Carl von Linnaeus, *A General System of Nature: Through the Three Grand Kingdoms of Animals, Vegetables, and Minerals, Systematically Divided into Their Several Classes, Orders, Genera, Species, and Varieties* (printed for Lackington,

little pains, daily observations might be made with respect to animals, and particularly regarding their life and conversation, their actions and economy, which are the life and soul of natural history." This quote, in essence, summarizes White's entire approach to investigating the natural world. Emphasis is placed on daily observation. The naturalist ideal that White espoused presupposed a particular kind of temporal habitus premised upon long-term dedication to making observations on a daily basis, as seen by his long-running track record of writing entries in his *Naturalist's Journal* from the day he received it almost up until his last years.

"Economy" is also an important term here, one that carried specific connotations in the eighteenth century. The historian of science Lorraine Daston has noted that the term did for early modern naturalists something similar to what the term "ecology" does for contemporary readers, namely, denote "a harmonious whole whose interlocking parts were in delicate equilibrium with one another."[13] For White, such a view meant that to study animals was to study the relationship between an animal and its habitat, and with respect to other animals. Living beings, whether plant or animal, are described by White in *NHS* as they have been observed by him, in a particular place and time. Rather than rending asunder the inherent emplacement of living beings in concrete times and places and projecting them into what Foucault succinctly described as an "area of visibility," devoid of touch, smell, taste, and all those other elements that inevitably constitute actual occasions, they are described in terms of their behavior and interaction with particular places.[14] Thus, making daily observations was a central part of White's attempt to understand the natural world.

Allen, 1802); and Thomas Pennant, *British Zoology,* 4th ed. (printed by William Eyres for Benjamin White, 1776–1777).

13 Lorraine Daston, *Against Nature* (MIT Press, 2019), 18.

14 Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (Vintage Press, 1994), 123.

The term "observation" also entailed very specific connotations in the early modern period.[15] A contemporary rendering might be something like "data collection," or a recording in writing of concrete events made by a firsthand observer, very often including date and time, within the context of an implicit protocol of quality standards. For White, making an observation usually meant writing something down in his *Naturalist's Journal,* something that he might have seen on one his travels or excursions in the field, or something that had been reported to him by others. The relationship between White's field observations and his entries in the journal is important to note here, because oftentimes observations were made in the field in order to be added to the journal. The journal thus served to imbue his field observations with a particular kind of temporal significance. As his notations aggregated over the years, he would read across entries in an attempt to discern regularities.

He also often spent extended periods of time outside simply watching natural phenomena, sometimes for several hours at a time, and he even built a small shelter on his property facing the surrounding woods so that he could continue his regime of observation if it was raining. His insistence on field-based observations inclined White toward a particular habitus based on cultivating the senses. Sustained attention was a key factor, as was the ability to listen well and see clearly. Amy King has coined the term "reverent empiricism," characterized by an "aesthetic of the commonplace" — of which she sees White as an early forerunner — to describe early Victorian natural history, because it was premised on approaching nature through minute attention to quotidian occurrences.[16] Nature was seen as an expression of a divine order that manifested itself in the smallest things: a blooming crocus, a stirring fly, or a cawing rook.

There were, however, other important strands in his repertoire of naturalist methods that are important to mention. A

15 Lorraine Daston, *Observation as a Way of Life: Time, Attention, Allegory* (Uppsala universitet, 2011), 9

16 King, *Seeing the Divine.*

major part of his activity as a naturalist involved studying in his library and updating himself on the latest works in zoology and botany. White would perhaps have had greater awareness of the publishing world of natural history compared to other parson-naturalists, seeing as his brother, Benjamin White, owned a bookshop on Fleet Street, central ground for London's bustling printing industry at the time, which specialized in works concerning natural history. It came to enjoy a special status among naturalists and became a meeting place of sorts for people who shared a proclivity toward natural history.[17] However, reading was also just one strand of his practice. Another important strand was conversations. Through his profession as a vicar, which often involved traveling on horseback to neighboring parishes, White came into contact with a great number of people. Through this network of informants, he came to learn many of the intricacies of rural life. Local people, who were most likely aware of his work as a naturalist, frequently brought him wildlife reports, and also live and dead specimens to inspect.

Whether he consulted his own firsthand experiences, secondhand reports, or the writings of natural historians, observations formed the elemental units in his attempt to reconstruct the order of the natural world. And, indeed, observations were generated in abundance, flowing generously ever forth, not only in White's journals but in the broader field of British natural history at the time, essentially irrigating a growing discourse on nature's order.[18] The comprehensiveness of the task of filtering, sorting, and organizing the products emerging from the data-producing pipeline that was the enterprise of natural history in the eighteenth-century was not lost on White himself: "The field of nature is boundless."[19] And the boundlessness of nature leaves "endless room for observation." Part of what allowed White to tackle the task of encoding the dynamic web of more-than-human lifetimes within any kind of system at all was

17 Foster, *Gilbert White,* 80.
18 Allen, *The Naturalist in Britain,* 22.
19 White, *The Natural History,* 126.

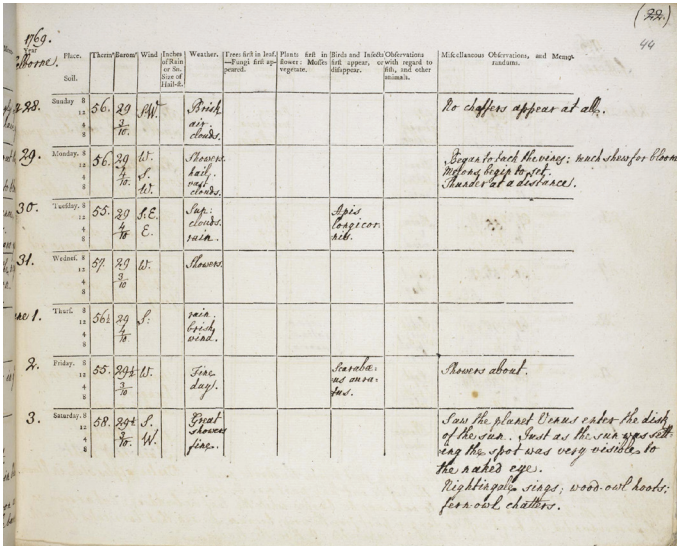


Fig. 10.1. Gilbert White's records in *The Naturalist's Journal* from March 28 to June 3, 1769. © The British Library Board (Add. MS 31846).

his use of the journal, and, more importantly, its grid-shaped outline of rows and columns (fig. 10.1). They allowed entries to be made each in their corresponding place, and consequently in their corresponding time: a swallow's arrival in one place, and the call of a ring ouzel in another, each accompanied by their respective date and year. The multiply entangled lives of cherry trees, daffodils, martins, and mayflies became arrayed as isolable positions within a matrix of separate points. The precision and uniformity of the printed tabular grid was an aspect of a novel information technology afforded by the printing press, and the reason for its gradual emergence in the early modern era may be gleaned from the areas where it was most often used: demographics, meteorology, and astronomy. In short, when the information load was high, the table was the tool of choice.

Here is a first glance at how the concrete and embodied lifetimes that White encountered in his knowledge practice were brought forth through the use of the journal. When noting the arrival and departure of swallows each year, gradually a pattern emerged through the stacks of paper, a pattern that would not have come into being otherwise, and that came into being through being embodied in paper stacks of printed tables. What this means is that it is possible to look at the way in which the journal embodied the times of nature in order to better understand the times that emerged from its use. Thus, it is necessary to look more closely at the actual layout of *The Naturalist's Journal.*

The Naturalist's Journal

In essence, as can be seen in figure 10.1, each page of *The Naturalist's Journal* is divided into eighty-eight squares. There are seven rows running from top to bottom. Each row was labeled with a day of the week, and White would note the calendar date to the left of each day. Each edition of the journal would cover one year. Moving from left to right across the page are ten columns, each containing a type of information. The first five columns were meteorological: temperature, pressure, wind direction, rainfall, and general weather. The next four are purely phenological, that is, aimed at seasonal periodicities. Hawitt and Bastian have argued that phenology grew out of ancient practices of tracking plant and animal behaviors, but became increasingly formalized as the wish to discover the underlying rules within nature became more prevalent.[20] What was of interest here were primarily first appearances. Thus, in one column one was to note the first appearances of trees and fungi, in the next plants and mosses, in the third birds and insects (here disappearances were also of interest), and in the fourth fish and what

20 M. Bastian and R. Bayliss Hawitt, "Multi-Species, Ecological and Climate Change Temporalities: Opening a Dialogue with Phenology," *Environment and Planning E: Nature and Space* 6, no. 2 (2023): 1074–97.

was simply labeled "other animals." Finally, the tenth column, labeled "Miscellaneous Observations," served as a catchall for any other notable observations.[21]

The actual layout of the journal was created by Daines Barrington, White's epistolary interlocutor. According to Jankovic, Barrington drew up the schema in 1767 based on a similar schema found in the work of a fellow phenologist, Benjamin Stillingfleet.[22] Stillingfleet was in turn inspired by Linnaeus and his students in Uppsala.[23] Both of them had taken to registering periodical occurrences in the natural environment in order to spot regularities. Indeed, the belief in nature's invariable regularity was part and parcel of making calendars of nature. "Wonderful is the regularity observed by nature!" White writes in one of his letters.[24] The calendar of nature stood in contrast to the social calendar, which could be shifted and transposed, as England had recently learned during their conversion to the Gregorian calendar as a result of the British Calendar Act of 1751. In order to synchronize the traditional calendar with the Easter equinox, which had been drifting farther and farther apart, the

21 It should be said the intended use of the journal was somewhat different from how White actually used it. He maintained a habit of entering the spare, neutral scientific species names in the three columns marked "Trees first in leaf," "Plants first in flower," and "[When] Birds and Insects first appear or disappear" up until around 1776, but from that point onward he takes up his custom of writing sustained comment in the "Miscellaneous" column, deeply ingrained as it must have been after seventeen years of semistructured journaling in the Garden Kalendar.

22 I argue elsewhere that Barrington derived the schema from meteorological tables found in the publications of the Royal Society. For more on this, see Erik Ljungberg, "18th Century Times of Nature: Cultural Techniques in Gilbert White's Natural History" (Master's thesis, University of Oslo, 2021). For Jankovic's treatment on the topic, see Vladimir Jankovic, "The Place of Nature and the Nature of Place: The Chorographic Challenge to the History of British Provincial Science," *History of Science* 38, no. 1 (2000): 79–113.

23 Benjamin Stillingfleet, *Miscellaneous Tracts Relating to Natural History, Husbandry, and Physick. To Which is Added the Calendar of Flora* (printed by R. and J. Hodsley, 1762).

24 Gilbert White, *The Natural History and Antiquities of Selborne,* ed. Thomas Bell (Van Voorst, 1887), 2:81.

British Parliament decreed that September 3 would be followed by September 14, in effect eliding eleven days. Thus, one of the motivations underlying the project was to make, in the words of Stillingfleet, "a calendar that cannot deceive."

Meanwhile, just as Linnaeus, Stillingfleet, and Barrington had embarked upon the making of calendars of nature, so White had developed his own way of recording the regularities of nature. Before receiving the journal, he had written daily entries in a bound leather book with blank pages, titled simply the "Garden Kalendar." He mostly used it to keep track of the different gardening and farming experiments and projects he conducted on his twenty-five acres of productive land in Selborne. But after seeing Stillingfleet's calendar in 1765, he was inspired to make his own, and thus spent the next year meticulously writing down the seasonality of the flora in his surroundings.[25] Two years later he met Thomas Pennant in his brother's bookshop, whereupon Pennant quickly realized the utility of the data White was gathering.[26] And in the same year, after printing *The Naturalist's Journal* using the printing shop owned by White's brother, Barrington sent a copy to White, having most likely been encouraged to do so by Pennant. It is unclear whether White's diligent usage of *The Naturalist's Journal* satisfied the intended purpose that Barrington had in mind, but from then on, right up to his last years, White had a new copy printed by his brother each year.

A World of Pure Lines

Many authors have looked at the early modern period and noted an emerging attitude and temperament predisposed toward precision, regularity, and punctuality. To appreciate these changes, it is necessary to remember a world where cubic meters, degrees

25 F.N. Egerton, "A History of the Ecological Sciences, Part 26: Gilbert White, Naturalist Extraordinaire," *Bulletin of the Ecological Society of America* 88, no. 4 (2007): 385–98.

26 Foster, *Gilbert White.*

of Celsius or Fahrenheit, lines of longitude and latitude, minutes and seconds, indeed most kinds of universally standardized metrics and measures, had only but a faint relationship to experience. Lewis Mumford recognized in the invention of the mechanical clock a strengthened impulse toward regularity and regimentation.[27] James Scott has shown how German forestry in the eighteenth century used new techniques of calculation, standardization, and measurement to produce a managed and regimented forest, optimized for maximum yield.[28] Historian of science Eduard Jan Dijksterhuis has traced the shift from a theological or animistic conception of nature in the medieval period toward a nature understood through an increasingly mathematized science, eventually resulting in the rise of what he called a "mechanized world-picture."[29] Alexandre Koyré noticed a similar development. For Koyré, the shift was one from a closed world to an infinite universe. The closed world was one of approximation, indeterminacy, and common sense — a qualitative world of daily life — that gave way to an infinite universe of measurement and precision: a universe of "geometry made real."[30] This substitution meant, he argued, "the exclusion from this universe of everything that cannot be subjected to exact measurement."

Husserl also made similar remarks with respect to Galileo. He claimed that Galileo's science signaled the "mathematization of nature."[31] Before this mathematization, there was a pre-metric sensible world of approximation. In this world, Husserl said, one never encountered ideal shapes, such as perfectly straight lines.

27 Lewis Mumford, *Technics and Civilization* (Routledge & Kegan Paul, 1955), 131.

28 James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (Yale University Press, 1998), 15.

29 E.J. Dijksterhuis, *The Mechanization of the World Picture* (Oxford University Press, 1961), 501.

30 Alexandre Koyré, "An Experiment in Measurement," *Proceedings of the American Philosophical Society* 97, no. 2 (1953): 223.

31 Christoph Durt, "The Paradox of the Primary-Secondary Quality Distinction and Husserl's Genealogy of the Mathematization of Nature" (PhD diss., University of California, Santa Cruz, 2012).

Only geometry could produce straight lines. In Husserl's *Krisis,* he writes that in the wake of Galileo's scientific discoveries there occurred an "idealization of the body world" (with idealization we might also understand abstraction or mentalization), which took place by way of the conceptualization of the universe in terms of mathematics.[32] This idealization produced a universal geometry and what Husserl called a "world of pure lines." This is a significant phrase that helps us to understand the temporal order that emerged in the early modern period. As one might imagine, pure lines and sensible lines operate in very different ways. Pure lines have sharp, distinct edges — they are discrete and separable. With pure lines one can detect precisely where one thing begins and another ends. Sensible lines, however, are fuzzy and ambiguous. They bleed into the surround and have permeable boundaries. The pure lines of geometry delineate absolutely; the sensible lines of the lifeworld restlessly writhe and wiggle.

According to Husserl, the knowledge operations involved in geometry and its praxis of working with pure shapes had their earlier origin in measuring and surveying.[33] This is a kind of archaeological statement, in the Foucauldian sense, indicating that he is intimating a way in which order itself operates. If we take Husserl's distinction between pure and sensible lines as a distinction that gestures in the direction of a broader epistemic shift tending toward precision and exactness, we are better able to see how the journal enacted times of nature in very particular ways. Knowledge operations that seek to detect precise, accurate, or exact borders, such as the border between the moment of the swallows' departure and ensuing absence, or the moment of a lily's sleep and subsequent bloom, are operations that traffic in pure rather than sensible lines.

32 Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology: An Introduction to Phenomenological Philosophy,* trans. David Carr (Northwestern University Press, 1970), 291.

33 Ibid., 27.

One important take away from Husserl's analysis is that absolute distinctions do not occur naturally by themselves in ordinary experience. Indeed, it seems that in the absence of widely standardized temporal infrastructures, many human collectives have historically upheld temporal sensibilities operating according to widely varying styles.[34] E.P. Thompson and Jacques Le Goff, two historians who have both written at length about the cultural history of time, contended that time in medieval Europe was primarily "task-oriented" and "linked to events."[35] Thus, one might say that in addition to apprehending time as consisting of punctuated now-moments that could be registered, ordered, aligned, serialized, measured, synchronized, and standardized, there was another style of apprehending time, which was devoid of this kind of orderability and operated according to a logic of sensible lines.

However, though White oscillated back and forth between these two logics, the very format of the journal was heavily geared toward the serialized, quantified, and standardized ordering of events. His project was a fundamentally comparative project. When did the swallows depart compared to last year? On what spring date did the crocus bloom compared to other years? And, of course, only times that are roughly alike can be compared. But this likeness does not inhere in the times themselves — they achieve likeness through being compared to a third entity, a grid, if you will. In reference to the grid they become comparable. An epistemic disposition tending toward pure lines, based on an understanding of moments as having sharp borders, can thus be understood as the condition of possibility for White's knowledge project. This is an expression of the temporal order that operated through *The Naturalist's Journal.* The sine qua non of this epistemic disposition was the presupposition that dates and times exist in a fixed relation to each other, that the elapsed

34 Anders Johansen, *All Verdens Tid* (Spartacus, 2011).

35 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (1967): 60, and Jacques Le Goff, *Time, Work, and Culture in the Middle Ages* (University of Chicago Press, 1980), 48.

duration between two moments can be absolutely determined, and that it will be the same in other contexts, regardless of its content or its mode of enactment by embodied observers. Thus, we find that the printed grid of *The Naturalist's Journal* is also expressive of an epistemic grid that projects the times of nature into a world of pure lines. We might say that this epistemic disposition preceded the act of registering events in the journal. But, as I've argued earlier, the journal is both expressive of a historically contingent temporal order that underpinned its usage and a temporal-semiotic artifact capable of bringing forth phenomena that emerge in the interaction between elements. So, in the next section I want to show the ways in which times were co-produced through the act of using the journal.

Four Affordances: Precision, Transposition, Sequence, and Absence

From the basic properties of the *Naturalist Journal,* a few key affordances emerged as particularly potent. One of them was the ability to precisely separate events from each other. This comes especially to the fore in relation to the topic of avian migration. Whereas the seventeenth-century work by Francis Willoughby *The Ornithology* made use of terms such as "in the summer," "early spring," or "mid-March" to describe the seasonal movements of birds, White tended to use exact calendar dates when writing *NHS*.[36] In fact, he uses numerical calendar dates roughly sixty times in the book. This represents a significant change compared to previous works on the same topic. It was indeed as if the older, more approximate sensible lines used by previous naturalists to understand seasonal changes no longer sufficed. Simply stating that swallows migrated in mid-March, or that the crocus blooms in the spring, was no longer viewed as providing

36 Francis Willoughby, *The Ornithology of Francis Willughby of Middleton in the County of Warwick, Esq....: In Three Books: Wherein All the Birds Hitherto Known, Being Reduced into a Method Sutable to Their Natures, Are Accurately Described,* trans. John Ray (printed by A.C. for John Martyn, 1678).

an optimal grasp of the rhythms of nature. White was interested in knowing the swallows' exact date of migration and the precise date of the crocus' bloom. Thus, White pays attention to swallows in order "to determine the precise time of their retreat."[37] He describes the nightjar as being "most punctual in beginning its song exactly at the close of day." And he says of scarab-beetles that "they are very punctual in their coming-out every year."[38] On three separate occasions in *NHS,* all of them concerning the question of migration, he observes that birds are "most punctual" in their migration.

This preoccupation with punctuality and precision is everywhere seen in his journal entries. Thus, he notes on September 15, 1774: "Ring-ouzels appear on their autumnal migration. Were seen first last year on the 30th: the year before on the 11th."[39] This precision would not be possible without some kind of external aid to hold and display all the information. Whereas the stirrings of the mind flutter and drift, ink on paper holds still long enough to serve as exoskeletal memory. Thus, the ability of the journal to recall the precise dates of many different kinds of events was a significant part of its ability to render the lifetimes of plants and animals as durations amenable to minute division.

A second affordance has to do with the layout of the journal: its rows and columns. Transposition is what emerges in the meeting between a row and a column, and in that meeting surplus meaning ensues. At a very basic level, the journal transposed events with dates. Through the mechanism of transposition, events of different types were inscribed with temporal information, that is, weekday and calendar date. We can see the significance of transposition better by comparing it to White's earlier practice of recording events in the Garden Kalendar.

37 White, *The Natural History,* 248.

38 For some of the entries in the *Naturalist Journal* I have consulted a transcription found online. For this entry, see "June 27th, 1791," in *The Natural History of Selborne,* http://naturalhistoryofselborne.com/1791/06/27/june-27-1791/.

39 "September 15th, 1774," in *The Natural History of Selborne,* http://naturalhistoryofselborne.com/1774/09/15/september-15-1774/.

This was simply a leather-bound book with blank pages. Here, White would simply note the month and date at the beginning of each entry. And whereas the date initiating each Kalendar entry encoded all ensuing content with similar temporal information and otherwise assigned no differences in terms of types of significance, each time the horizontal columns of the journal transected a vertical column, a particular area of meaning emerges. For example, suppose we had a week of very boring weather with a temperature of 55°F every day (as White measured it). When we add the rows of calendar dates, and let each row intersect with the column of temperature, each square, or each instance of 55, is no longer identical, but gains unique significance. This kind of significance is an emergent property that occurs in the meeting between a human being and a knowledge object possessing the properties of transecting rows and columns. If the mind–matter feedback loop is allowed to properly unfold, particular times emerge from the dynamic coupling (in our case aggregations of natural durations).

The journal's third affordance was its ability to represent sequence. We should not forget that the journal was more than just a collection of flat, two-dimensional pages, each with eighty-eight squares. Not only did the journal make it possible to synoptically view the inscribed events projected onto the visual plane of the page, and to see them all in a single overview, but one could also flip through the pages, which added a third dimension. The real space of representation that events were encoded within was not merely a pure visual plane consisting of an *x*-axis and *y*-axis, but a cube that included a *z*-axis. It was, in other words, a three-dimensional grid. Events were thus mapped onto a trajectory that moved through this 3D grid-space. Similar to how the invention of linear perspective in the Renaissance and its perspectival lines that moved through the space of the painting was part of the objectivation of space, essentially turning space into something that could be looked at rather than with, so too the superimposition of tables of events created a temporal space that could be seen through. The key phrase here is "looking through." With *The Naturalist's Journal,*

it became possible to isolate a single trajectory, whether it be temperature, air pressure, or bird movements, and follow that line through temporal space. Each bird species that White studied (ring ouzels, sparrows, house martins, or swifts) appeared as having independent and isolable trajectories that moved through a three-dimensional space of representation.

The journal's final affordance was its ability to signify absence. Just as media theorist Bernhard Siegert has written about the grid in relation to space, namely, that it presupposes the "ability to write absence, that is, to deal equally efficiently with both occupied and empty spaces," so too part of *The Naturalist Journal's* potency derived from its ability to signify the absence of events.[40] This affordance was particularly useful for White in his attempt to address the question, undecided at the time, of whether swallows migrate or hibernate.[41] His quest to settle the migration question led him to employ the journal in a very specific manner. Over the years, as White became more and more fixated upon the migration question, he began to pay close attention particularly to swallows and martins as the time of their migration approached. Thus, in October 1778, we find many entries such as the following: "Some nestling-martins are out, & the dams feed them as they fly about. Some swallows."[42] This latter phrase is repeated four times in the subsequent nine days. Sometimes it is the sole content of the entry, reading simply "some swallows" or "some martins." The entry for October 4 just reads "Swallows."

As one's eyes scan across the pages of the journal and one looks upon the months of September and October 1778, there

40 Bernhard Siegert, *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real,* trans. Geoffrey Winthrop-Young (Fordham University Press, 2015).

41 Linnaeus, in *Systema Naturae,* argued for their hibernation. Admittedly, White veered back and forth between positions throughout his career, but the fact that he kept tracking their migration times in the journal until his last years may indicate that he remained fundamentally undecided.

42 Francesca Greenoak, ed., *The Journals of Gilbert White: 1774–1783* (Century Hutchinson, 1988), 2:236.

is a noticeable increase in the attention paid to swallows, swifts, and martins. This attention comes to a climax toward the middle of October. And then something happens. A point has been reached. Suddenly the swallows, swifts, and martins are gone. They have disappeared. The eyes keep scanning, but they are nowhere to be seen. After a long period of absence, come March there appeared the same spartan and precise entries. On March 6: "Two swallows at Selborne." The entry is repeated again two days later. Then on March 11: "A swallow at Faringdon." This pattern of increased attention being paid to swallows, swifts, and martins in the journal in October and November, followed by their disappearance and their return in March and April, plays out again and again in subsequent years.

These courses of action reveal something very important about how the journal was used. Here it becomes clear that the times that were subject to inscription only make sense in relation to a background of absence. This has to do with the journal's ability to write absence. When a box or a row remains empty in the journal, it is still a signifying emptiness. Even when the journal is not inscribed, it is productive of a certain kind of information. White would use that information to determine the first appearances and disappearances of different birds from year to year. But just as important as the event of their appearance was the nonevent of their absence. The total information product was the combination of presence and absence taken together. The journal operated upon that absence, lending it the shape and form which its structure allowed. It roped the not yet and the no longer, otherwise pliable and amorphous, into its representational space, thus imbuing them with the linear, sequential, standardized characteristics that defined it. Thus, we see that one of the elements that made the journal such a potent tool for producing times was its ability to bring forth the absence of natural events, and cast that absence within a representational space based on a three-dimensional grid.

Conclusion

The Naturalist's Journal was a powerful and enigmatic temporal-semiotic artifact. At first sight, it assumes an inconspicuous and humble position within Gilbert White's career as a natural historian. It occupied a meager place in the wider assemblage of things, people, and ideas. But it captured the movements that circulated within that assemblage and inscribed them within its space of representation. Once inside, they were liable to conform to its tabular logic. The journal's space of representation transformed concrete durations embodied in dynamic webs of unfolding lifetimes — lives of swallows, dung beetles, apricot trees — into serializable instants with fixed and determinant positions that could be observed by a single person in a single glance. But the journal did not just represent time. It was also time, and as time, as duration, its life too unfolded within the dynamic web of embodied lifetimes animating White's lived environment. However, as White became more accustomed to using the journal, we can notice an oscillation between the space of representation and the dynamic field of multiple times where the journal's time resided.

After years and years of diligent observation and journaling, action eventually crystallized into habit. Listening to the lively chirps of swallows in early spring as a sign signaling the time to prepare manure, fence garden plots, and transplant lettuce gave way to paying attention to their song as expressions of an underlying punctuality. Whereas the appearances and disappearances of swallows, swifts, and martins figure not at all in the Garden Kalendar, and only faintly in the first years of *The Naturalist's Journal,* after a few years of using the journal, their mention becomes more and more frequent. The promise of the journal was that continued data collection would reveal the hidden pattern that ordered their periodicity. In addition to processes that stood as signs signifying first and foremost themselves, but also other natural processes — frogspawn, bumblebees, bluebells — they became signs of an abstract systematicity. But in the lived lives of these swallows, swifts, and martins, no indica-

tion of such an invisible order could be found. It was a hidden pattern that could only be brought forth through the journal. The ordering, storage, and processing necessary for bringing it forth was an emergent result of an information technology that could operate with equal precision on both events and nonevents, and that could create information products that could be precisely separated, transposed, and placed in sequence. White responded to these affordances by dedicating himself to making regular observations for the journal. As its logic was allowed to unfold alongside the myriads of interactions that composed White's knowledge practice, and as repetition congealed into structure, a temporal order emerged that offered the possibility of oscillating between a temporality of concrete durations and a temporality that folded lifetimes into a temporal space based on the principle of measurability and division.

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11

Textualized Nature and the Temporal Nature of Texts: Basking Shark Temporalities in Eighteenth-Century Natural History Writing

Sine Halkjelsvik Bjordal

Introduction: Natural History in Eighteenth-Century Norway

> Man har det at tilskrive Smølens meget brave Sogne-Præstes, Velærværdige Hr. Aarøes, ufortrødene Tienstvillighed at jeg har været saa lykkelig at faae Brugdens hele Hoved, med vedhængende Hals, Geller, Bryst-Finder med videre, at see, og det i en saa fuldkommen Tilstand, at jeg nu kan give tilforladelig Efterretning om det, man endnu kunde ønske at vide om denne meget betydelige og overmaade store Hav-Fisk.[1]

1 Johan Ernst Gunnerus, "Videre Oplysning om Brugden (*Sqvalo maximo*)," *Det Kongelige norske videnskabers selskabs Skrifter* 4 (1768): 14–15. All translations from Gunnerus are mine.

> It is due to the tireless service of the highly esteemed parish priest of Smølen, Mr. Aarøe, that I have been fortunate enough to see the entire head of the brugde, with the attached neck, gills, pectoral fins, and more, in such a complete state that I can now provide a reliable account of what one might still wish to know about this very significant and exceedingly large sea fish.

The starting point of this chapter is a "brugde," or rather some specific knowledge about what is today known as the species *Cetorhinus maximus* — the basking shark — disseminated in two natural history texts published in 1765 and 1768, respectively. Even though they were put out three years apart, the articles are clearly connected. The first one is titled "The basking shark (*Sqvalus maximus*) described by J. E. Gunnerus";[2] the second "Further information about the basking shark (*Sqvalo maximo*), as well as proof that this, presumably, was the fish that swallowed the Prophet Jonah."[3] Both articles also contain illustrations (figs. 11.1 and 11.2). The author of the texts was the Norwegian theologian, philosopher, and naturalist Johan Ernst Gunnerus (1718–1773), who, after spending many years in Copenhagen, Halle, and Jena establishing himself as a capable academic in several fields, was appointed bishop in the diocese of Trondheim in central Norway in 1758. In 1760, Gunnerus played a key role in the founding of the Trondhiemske Selskab academic society, from 1767 known as the Royal Norwegian Society of Sciences and Letters.[4] During his years as bishop and vice president of the society, Gunnerus made, among many other things, significant contributions to the study of the natural history of Norway, particularly in the fields of botany and zoology. Through contributions from a wide-ranging network of clergymen and laypeople,

2 Original title: "Brugden (*Sqvalus maximus*) Beskrevet av J. E. Gunnerus."
3 Original title: "Videre Oplysning om Brugden (*Sqvalo maximo*). Samt Beviis, at denne, efter all Formodning, har været den Fisk, som opslugede Propheten Jonas."
4 Det Kongelige Norske Videnskabers Selskab.

Gunnerus also managed to establish a diverse natural history collection for the royal society.[5]

Despite the term "history" in "natural history," what is often stressed in studies of natural history practices in the seventeenth and eighteenth centuries is the *nontemporal* nature of the field. Gianna Pomata and Nancy G. Siraisi have shown that the meanings of both "history" and "nature" were up until the second half of the eighteenth century quite different from our conception of these terms today:

> The early modern *historia* seriously challenges our assumptions about nature and culture as separate fields of inquiry. It forces us to realize that, just as the early modern notion of nature was widely different from ours, so did the early modern notion of *historia* vary in fundamental ways from what we now call "history" or "culture." Early modern natura and historia were not antithetical terms, nor were the boundaries between them drawn as we draw them now.[6]

Historia, they point out, "meant primarily a description with little, if any, reference to temporality."[7] The "history" in "natural history," then, was first and foremost used in connection with *experientia,* that which can be experienced with the senses.

Looking to a well-known beacon of the European Enlightenment — Diderot and d'Alembert's *Encyclopédie* (1751–1772) and the "Detailed System of Human Knowledge" presented there — we see the same connection between history and experience. Inspired by Francis Bacon, the system of knowledge in the *Encyclopédie* was divided according to three principal faculties of human understanding: memory, reason, and imagination. Natural history, together with civil and sacred history,

5 Brita Brenna, "Clergymen Abiding in the Fields: The Making of the Naturalist Observer in Eighteenth-Century Norwegian Natural History," *Science in Context* 24, no. 2 (2011): 143–66.

6 Gianna Pomata and Nancy G. Siraisi, *Historia: Empiricism and Erudition in Early Modern Europe* (MIT Press, 2005), 6.

7 Ibid.

belonged to memory, which might lead us again to think of history as something implying a temporal perspective. But even here memory, "apparently the simplest of the mental faculties," was understood as resulting in "the 'pure and simple enumeration' of our perceptions."[8] Michel Foucault, in his work on the transitions between different *epistemes* in the European history of knowledge, also explicitly points to the atemporal when he describes eighteenth-century natural history as a practice different from earlier, and later, natural histories: "The locus of this history is a non-temporal rectangle in which, stripped of all commentary, of all enveloping language, creatures present themselves one beside another, their surfaces visible, grouped according to their common features, and thus already virtually analyzed, and bearers of nothing but their own individual names."[9]

The main goal of this chapter is not to expand the reader's knowledge about eighteenth-century natural history in Norway. Nor is it to investigate eighteenth-century knowledge about the basking shark per se. What I would like to do in this chapter is to challenge the widespread idea of an atemporal natural history. The overarching question making up the backdrop of the chapter's line of argument is this: How can a seemingly nontemporally oriented natural history be studied through the lens of a theory of multiple times? To answer this question, I have chosen to zoom in on a very specific natural history practice, the practice of textualizing nature, taking the two concrete articles about the basking shark by Gunnerus as my empirical starting point.

Gunnerus's detailed description of the basking shark as a species is still today considered to be the moment in which the species *Cetorhinus maximus* entered human history, in the form of a definition and a description. Interestingly, the basking shark article from 1765 has been widely quoted from and referred to in

8 James Llana, "Natural History and the 'Encyclopédie,'" *Journal of the History of Biology* 1 (2000): 4.

9 Michel Foucault, *The Order of Things: An Archaeology of the Human Science* (Routledge, 2002), 143.

later scientific works; the other article, where Gunnerus actually presents the more accurate information about the fish — but at the same time also argues that the basking shark was the fish that swallowed the biblical prophet Jonah — is not as present in nineteenth- and twentieth-century literature. As textual "events" (more on this later) in the history of naturalist knowledge, then, the two texts clearly have their own histories. They have in different ways influenced later knowledge and succeeding texts, and they have both been influenced by earlier knowledge and preceding texts. Time is, however, more than history, as we know, and I will argue that Gunnerus's two articles in fact can be seen as multitemporal "bundles"[10] acting as temporal tools[11] that bring forms of knowledge and forms of nature — and thus different lifetimes — into alignment in several ways.

My investigation of the two texts will be carried out in three stages. After a short introduction to eighteenth-century natural history and Gunnerus's two articles, I will consider the temporal nature of texts more generally. Here I will draw on both literary and historical theory with the aim of bringing theories about the nature of text and theories about the multitemporal nature of history into dialogue. On the basis of this theoretical discussion, I will then explore and discuss basking shark temporalities in Gunnerus's natural history writing more specifically, asking: What time relations and temporalizations can be discovered in the textual work of an eighteenth-century Norwegian naturalist?

Natural History and the Basking Shark Textualized

It is not obvious what natural history (in Denmark-Norway) was in the eighteenth century. Looking, again, at Diderot and d'Alembert's *Encyclopédie,* the entry on "natural history" starts

10 Sine Bjordal, "Tidene på sidene," *Tidsskrift for kulturforskning* 17, no. 2 (2018): 6.

11 Helge Jordheim, "Making Universal Time: Tools of Synchronization," in *Universal History and the Making of the Global,* ed. Hall Bjørnstad, Helge Jordheim, and Anne Régent-Susini (Routledge, 2018), 133–34.

with the following: "The object of Natural history is as vast as nature: it includes all beings that live on the earth, that fly in the air, or that dwell in the depths of the waters; all the beings that cover the face of the earth; and all those hidden in its deepest recesses. Natural history, in its broadest sense, would encompass the entire universe; since stars, air, and meteors are included in nature, as is the terrestrial globe."[12]

But even if natural history can be defined by its object (nature), a field of knowledge is more than its object of study. In the comprehensive work *Cultures of Natural History,* natural history is examined through a cultural historical lens, that is, "as a cultural phenomenon": "We wish to portray natural history as the product of conglomerates of people, natural objects, institutions, collections, finances, all linked by a range of practices of different kinds."[13] The practices the editors list as a "rough-and-ready guide" are material practices, social practices, literary practices, bodily practices, and what they call "reproductive practices," that is, "the means by which skills and knowledge are handed on from generation to generation."[14] What was done through these practices were many things, but what is most often mentioned as having been at the core of natural history studies in the eighteenth century is the collection, observation, and description of natural phenomena as they manifested themselves to the naturalist. In the words of John V. Pickstone, describing natural history in a "wide meaning," "It was the register of facts, the compilation of what was in the world."[15]

12 "Natural History," in *The Encyclopedia of Diderot & d'Alembert Collaborative Translation Project,* trans. Marc Olivier and Valerie Mariana (Michigan Publishing, University of Michigan Library, 2015), http://hdl.handle.net/2027/spo.did2222.0000.189. Originally published as "Histoire Naturelle," in *Encyclopédie ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers,* 8:225–30 (Paris, 1765).

13 Nicolas Jardine and Emma Spary, "The Natures of Cultural History," in *Cultures of Natural History,* ed. Nicolas Jardine, James A. Secord, and Emma C. Spary (Cambridge University Press, 1996), 8.

14 Ibid., 9.

15 John V. Pickstone, *Ways of Knowing: A New History of Science, Technology and Medicine* (University of Chicago Press, 2000), 60.

Johan Ernst Gunnerus started his work as a naturalist as soon as he arrived in Trondheim. In his first pastoral letter to his clergymen, he specifically asked them to collect specimens and facts about natural history in their respective parishes, and he expected the clergymen to cultivate knowledge on a broad range of topics, from oratory and mathematics to metaphysics. As a bishop, Gunnerus made several visits in the diocese, an extensive area encompassing central Norway north of Dovrefjell and all of northern Norway. During these travels he took the opportunity to gather natural objects and information about natural phenomena and to expand a constantly growing network of "informants."[16]

Gunnerus's own natural history publications were descriptions of species both well known and unknown to science at that point. The works often included top-quality illustrations, and even today the descriptions by Gunnerus are considered to meet a high scientific standard. His accounts contain detailed information on anatomy and morphological characteristics of plants and animals, and he is clearly well oriented in a large body of natural history literature of his and of earlier times.[17] Publishing much of his naturalist work in Danish, he contributed to a growing and developing Danish-Norwegian public sphere, in which the Royal Norwegian Society of Sciences and Letters's own publication series, *Det Throndhjemske Selskabs Skrifter,* and later *Det kongelige Norske Videnskabers Selskabs Skrifter*[18] (hereafter *Skrifter*) played an important role. Most of Gunnerus's studies in natural history were published here. Every issue of the journal was also translated into German, so that the published work could reach a European public.

16 Brita Brenna and Steinar Supphellen, "Science, Sociability, and the Tools of Enlightenment — Johan Ernst Gunnerus and the Trondheim Milieu," *Det Kongelige: Norske Videnskabers Selskabs Skrifter* 2 (2011): 5–6.

17 Torkild Bakken, Eli Fremstad, and Kaare Aagaard, "Bishop Gunnerus as Naturalist: His Impact on Biodiversity Today," *Det Kongelige Norske Videnskabers Selskabs Skrifter* 2 (2011): 209.

18 "Skrifter" here means "transactions" or "proceedings."

Gunnerus's first article on the basking shark was printed in the third volume of *Skrifter,* issued in 1765. The volume comprises twenty-two scholarly articles on a range of topics, but with a particular emphasis on natural history. Gunnerus himself is represented with no fewer than eleven natural history articles on different species, such as the *Berg-Laxen* (rough rattail), the *Søe-Musen* (sea urchin), the *Krykkjen* (black-legged kittiwake), and others, in addition to the basking shark. The rest of the articles in the volume deal with topics in the fields of natural history, history, meteorology, and mathematics, written by the other founders of the society — the historians Peter F. Suhm and Gerhard Schøning — and by a few clergymen residing in other parts of the country.

The piece on basking sharks is specifically mentioned by Gunnerus already in a short introduction to the 1765 volume. Gunnerus here addresses the reader to point out that he, in his account about the basking shark, "as easily can be seen," has not had any reason to attribute teeth or an esophagus large enough for a grown-up human being to pass through to the basking shark. The account is based on, Gunnerus writes, nothing more than the examination of a fish leather, including some gills, in addition to reports from fishermen and other "witnesses," whose trustworthiness "must be judged by the reader." Gunnerus therefore kindly asks if some "good countrymen, who annually have plenty of opportunities to see a living or fresh basking shark, would do the Royal Society the favor of submitting a basking shark's upper and lower jaw, or, if this is not possible, a complete and undamaged piece of each jaw."[19]

Gunnerus introduces the article by stating that very little is known about the basking shark, mostly because it has rarely been seen. In more recent years, though, fishermen in several areas of Norway had started catching this fish, Gunnerus writes, and thus it would be easier to obtain more empirical knowledge about it. In the article, Gunnerus mainly describes the fish and gives information about how it is caught and used by people in

19 Gunnerus, "Fortale," *Det Trondhjemske Selskabs Skrifter* 3 (1765).

Norway. He also discusses earlier written sources on the basking shark. Not all of these sources give the correct information, Gunnerus claims, as some sources define the basking shark as a whale, some as the largest of the sharks, and others again as a type of Greenland shark (*Somniosus microcephalus*) or a mackerel shark (*Lamna nasus*). On his side, Gunnerus confirms that the basking shark is a shark, and that this can be seen from the gill holes. It is thus "a cartilaginous fish, although it is far stronger than all the other known sharks."[20]

The article concludes with six "now evident sentences" about the basking shark: (1) the basking shark is not a *Canis carcharias* or a *lamia,* that is, a monstrous shark, "in the normal understanding of this expression," because of the lack of *glubske tenner* (ravenous teeth);[21] (2) the basking shark is not the male of the *Haakierring* (Greenland shark), as some authors claim; (3) the basking shark is not a toothless Greenland shark either, as other authors claim; (4) the basking shark is also different from the *Haabrand* (mackerel shark); but (5) the Norwegian writer Peder Claussøn Friis, in his *Norriges oc omliggende Oers sandfærdige Besschriffuelse* (1632) (A truthful description of Norway and adjacent islands) uses the term *Haamær* (another word for *Haabrand*) to describe the basking shark; and, finally, the basking shark cannot (6) have been the kind of fish that swallowed the prophet Jonah.[22]

The second article is clearly a continuation of the 1765 article, as can be seen in the title *"Further* Information" (italics added). But interestingly enough, this article also contains a large section where Gunnerus now argues that the basking shark must have been the fish that, according to the Bible, swallowed the prophet Jonah. This is the opposite conclusion from the first article. What is new in 1768 is that Gunnerus has finally got hold of an "entire head" of a basking shark, sent to him by the "highly

20 Gunnerus, "Brugden (Sqvalus maximus)," *Det Trondhjemske Selskabs Skrifter* 3 (1765): 37–38.

21 Ibid., 48.

22 Ibid., 48–49.

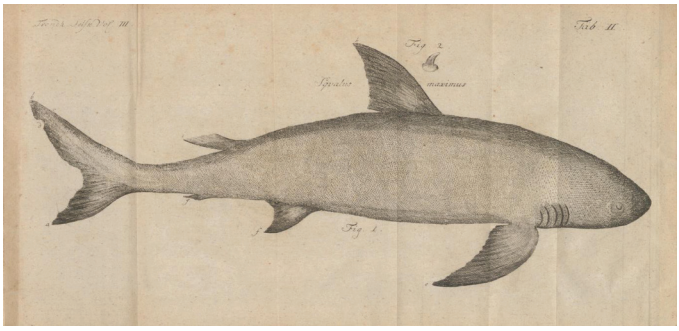


Fig. 11.1. Squalus maximus/Basking shark. From Gunnerus's first article. Source: Johan Ernst Gunnerus, "Brugden (Sqvalus maximus)," *Det Trondhjemske Selskabs Skrifter* 3 (1765): t. II.

esteemed parish priest of Smølen, Mr. Aarøe," as seen in the introductory quote. The head consists of the whole neck, the gills, the pectoral fins, and more. Because of its good condition, Gunnerus was now able to provide a "reliable account" of this "very significant and exceedingly large sea fish," as he writes himself.[23] We will return to Gunnerus's articles on the basking shark shortly, but it is worth noting that these two articles were the first to thoroughly describe the basking shark as a proper species. Up until these publications, the enormous *brugde* was more or less a mystery, more often than not confused with other sharks or big sea fish. Based on a detailed empirical investigation of the basking shark, together with knowledge about earlier written accounts of similar fish and updated naturalist knowledge of other related species, Gunnerus, in his two articles, both describes this mysterious species in depth and claims that he has now solved what apparently had been a much-discussed problem: What kind of fish swallowed the biblical Jonah?

For the twenty-first-century reader, the two texts by Gunnerus might seem quite mysterious themselves, even if we can perfectly understand most of the knowledge conveyed in them. Reading Gunnerus article, parts of the content seem surprising-

23 Gunnerus, "Videre Oplysning," 14–15.



Fig. 11.2. The characteristic basking shark teeth can be seen in the upper right corner of the plate. Source: Johan Ernst Gunnerus, "Videre Oplysning om Brugden (Sqvalo maximo)," *Det Kongelige norske videnskabers selskabs Skrifter* 4 (1768): t. IV.

ly familiar; it is easy to see that this is a scientific article describing an until then basically unknown species. Other parts of the content appear a bit harder to understand: Why this emphasis on the teeth and the esophagus? Why is it so important to discuss specifically whether the fish that swallowed Jonah was a shark or a whale? Why is the Jonah question relevant in the first place? And why is it important to include ancient and seemingly outdated natural history sources in the argument? How should we actually approach the familiarity and unfamiliarity in these texts more than 250 years after they were published? The answers to all these questions, I will argue, can be found by directing our attention toward the temporal nature of texts. To be able to do this, however, we need to turn our initial question around for a bit. Instead of asking, How can a multitemporal perspective help us understand textualized nature? we should ask: What can a text tell us about multiple temporalities? Or, what *is* a text?

The Nature of Texts and Texts of Nature

A text can be defined as a tissue of words, a structure, a communicative or rhetorical action, a cultural artifact, or all of the

above in addition to a number of other things. In this chapter, the theoretical point of departure is a rhetorical and pragmatic one, in the sense that texts are understood as verbal, communicative actions, as communicative *events*. This entails an understanding of texts as cultural phenomena, meaning that a text is seen as a conventional way of carrying out a socially recognized communicative purpose by verbal means. In the field of Scandinavian studies in the Nordic countries, the concept of "text culture" is often used to emphasize the cultural aspect of texts. According to Kjell Lars Berge and Per Ledin, "A text is part of a text culture, to which other texts sharing similar norms belong. Thus, we conceive of 'text' as an utterance that competent participants in a specific cultural time and space assigns a certain cultural value."[24]

Understanding texts as cultural artifacts does not remove the rhetorical power of singular texts. Berge and Ledin stress that texts as cultural artifacts have the quality of "at the same time being a unique utterance and instantiating a text norm."[25] What makes an utterance a text in a specific text culture, according to Berge and Ledin, is the more or less shared textual norms governing text production and text reception. A text culture can of course be very specific or more general, and in every community — large or small — there is a plethora of text cultures connected to and overlapping each other to varying degrees. A comparable approach to texts can be found in Karin Barber's *The Anthropology of Texts, Persons, and Publics*. Building on insights from rhetoric and pragmatics, Barber studies texts from an explicitly anthropological perspective. Texts have a "double existence," Barber claims, being at the same time a context-dependent utterance and an autonomous entity "out there" in the

24 Kjell Lars Berge and Per Ledin, "Texts as Cultural Artefacts: Theoretical Challenges to Empirical Research on Utterances and Texts," in *Nordic Perspectives on the Discourse of Things,* ed. Catharina Nyström Höög, Henrik Rahm, and Gøril Thomassen Hammerstad (Springer International/Palgrave Macmillan, 2023), 19.

25 Ibid.

social world. In other words, "Texts are social facts. Texts are used to do things: they are forms of action."[26]

These understandings of texts, and others too, have been developed partly on the basis of the work of the philosopher and literary theorist Mikhail Bakhtin. Bakhtin is maybe best known for his concept of "chronotope" and his theory about the "polyphonic discourse" of novels, but his work also gives a valuable insight into what Per Linell calls "the double dialogicity of texts."[27] For Bakhtin, a text, or an utterance (written or oral), as he calls it, has a very particular status that must be understood by scholars studying language use: "After all, language enters life through concrete utterances…, and life enters language through concrete utterances as well."[28] Bakhtin develops his theory in opposition to the typical linguistic understanding of language (use), and he argues that there is a fundamental difference between "the utterance as a unit of speech communication" and "units of language (words and sentences)."[29]

The utterance as a unit of speech communication, a text, Bakhtin claims, is fundamentally dialogic in more than one way. We learn to express ourselves through our meetings with concrete utterances representing particular "speech genres" in the "spheres of communication" (text cultures) we are part of. According to Bakhtin, a speech genre is a typical form of text, which includes some typical kind of expressions that are inherent in the utterance. In this way the word, in the genre, carries a particular typical meaning. Because genres correspond to typical speech situations and typical content, genres also make particular connections between the meanings of words

26 Karin Barber, *The Anthropology of Texts, Persons and Publics: Oral and Written Culture in Africa and Beyond* (Cambridge University Press, 2007), 3.

27 Per Linell, *Rethinking Language, Mind, and World Dialogically* (Information Age Publishing, 2009), 51.

28 M.M. Bakhtin, "The Problem of Speech Genres," in *Speech Genres and Other Late Essays,* ed. Caryl Emmerson and Michael Holquist, trans. Vern W. McGee (University of Texas Press, 1986), 63.

29 Ibid., 67.

and concrete realities in certain typical situations.[30] When expressing our thoughts in oral and written utterances, we do it by means of words and sentences, but these words and sentences are "never neutral":

> Each utterance is filled with echoes and reverberations of other utterances to which it is related by the communality of the sphere of communication. Every utterance must be regarded primarily as a response to preceding utterances of the given sphere (we understand "response" here in the broadest sense). Each utterance refutes, affirms, supplements, and relies on the others, presupposes them to be known, and somehow takes them into account.[31]

For Bakhtin, every utterance is by definition "a link in the chain of speech communication," and as such it cannot be understood independently from the preceding links, determining the utterance "both from within and from without, giving rise within it to unmediated responsive reactions and dialogic reverberations."[32] All utterances are filled with a variety of "responsive reactions" to preceding utterances in the given text culture, manifesting themselves in various forms.[33] But the utterance is never just oriented toward what has preceded it; it is also always oriented toward the coming, because of the *addressivity* of every utterance: "As we know, the role of the others for whom the utterance is constructed is extremely great....From the very beginning, the speaker expects a response from them, an active responsive understanding. The entire utterance is constructed, as it were, in anticipation of encountering this response."[34]

In this way, every text points both backward and forward at the same time. This does not mean, however, that utterances lack individuality and creativity. What it means, according to

30 Ibid., 87.
31 Ibid., 90.
32 Ibid., 94.
33 Ibid., 90.
34 Ibid., 94.

Bakhtin, is that every utterance, every text, is always somehow filled with the words of "others" and the expected reactions of addressees. Behind every text, that is, there is something repeatable and reproducible — language, speech genres, forms of talk — "but at the same time each text (as an utterance) is individual, unique, and unrepeatable, and herein lies its entire significance."[35]

Using Bakhtin's dialogism (among other theories), Julia Kristeva develops the concept of *intertextuality*. She shows how Bakhtin understands utterances as existing in three dimensions: the writing subject, the addressee, and exterior texts. "Horizontally," the meaning of the text originates from both the writing subject and the addressee. "Vertically," the text is oriented toward preceding or contemporary utterances.[36] This is what Linell calls "double dialogicality": dialogue in both specific historical situations and within shared sociocultural practices.[37] "Confronted with this dialogism," Kristeva writes, "the notion of a 'person-subject of writing' becomes blurred, yielding to that of 'ambivalence of writing.'" This ambivalence, she claims, "implies the insertion of history (society) into a text and of this text into history; for the writer, they are one and the same."[38]

Because we understand texts as culture, action, and dialogue, Gunnerus's two articles about the basking shark must be read as part of a particular text culture, or text cultures, in eighteenth-century Denmark-Norway, with their specific text norms. At the same time, Gunnerus's two texts must be understood as utterances that are both responsive — "filled with other voices" — and unique, unrepeatable communicative events, embedded in a matrix of concomitant contexts, more or less well known to a

35 M.M. Bakhtin, "The Problem of the Text in Linguistics, Philology, and the Human Sciences: An Experiment in Philosophical Analysis," in *Speech Genres and Other Late Essays,* ed. Caryl Emmerson and Michael Holquist, trans. Vern W. McGee (University of Texas Press, 1986), 105.

36 Julia Kristeva, *Desire in Language: A Semiotic Approach to Literature and Art* (Columbia University Press, 1980), 66.

37 Linell, *Rethinking,* 51.

38 Kristeva, *Desire,* 68.

reader — in 1765 or 250 years later. By theoretically placing texts in history — and history in texts[39] — and thus turning ourselves from readers into historians, a temporal perspective on utterances is somehow already implied. I will argue, however, that the understanding of the nature of texts outlined above can easily be transferred into not only a historically oriented framework but a *multitemporal* theoretical framework. For this to happen, though, we do indeed need a historian, and a very specific one.

Intertextuality and/as Intertemporality

As accounted for in the introduction to this book, Reinhart Koselleck has played an important role in the development of theories about the plurality of (historical) times.[40] Although his theory of history was developed over several years, in a number of works, I will mainly be focusing on the collection of essays published in *Sediments of Time: On Possible Histories* (2018), translated and edited by Sean Franzel and Stefan-Ludwig Hoffmann. A special emphasis will be placed on the three essays "Sediments of Time," "Linguistic Change and the History of Events," and "Structures of Repetition in Language and History." As can be seen in the three titles, Koselleck had a particular interest not only in history but also in language and the role language plays for and in history, as a discipline and as historical reality. This distinction, between history as a discipline and history as change or action, is important in Koselleck's work. In fact, he carefully differentiates between what he calls *"res factae* (historical reality) and *res fictae* (fiction), *res gestae* (things done or *Geschichte*) and *historia rerum gestarum* (things written about it or *Historie*)."[41] For Koselleck, history is, "by definition,"

39 For studies and theoretizations of the historicity of texts, see Kristin Asdal et al., *Tekst og historie* (Universitetsforlaget, 2008).

40 See this book's introduction. See also Helge Jordheim, "Against Periodization: Koselleck's Theory of Multiple Temporalities," *History & Theory* 51, no. 2 (2012): 151–71.

41 Sean Franzel and Stefan-Ludwig Hoffmann, "Translators' Introduction," in Reinhart Koselleck, *Sediments of Time: On Possible Histories,* ed. and trans.

the *Wissenschaft* (science) of experience,[42] and he develops his theory about the multiple times of history in opposition to the "bipolar manner" in which historians usually deal with time, according to Koselleck. That is, either time as linear, an "arrow of time," or time conceived of as cyclical and recurrent. "Both models are insufficient," Koselleck claims, "because every historical sequence contains linear as well as recurrent elements."[43]

To be able to combine the linear and progressive with the recurrent and repetitive, Koselleck adopts the geological metaphor *Zeitschichten* (sediments of time) and transposes it onto the realm of human history. By employing this metaphor, he writes, we can analytically separate different temporal levels upon which people move and events unfold, and thus ask about the longer-term preconditions for such events.[44] For history to happen and singular events to be experienced, there need to exist some longer-lasting preconditions, or "structures of repetition," Koselleck calls them, "without which no events would ever come to pass."[45] When Koselleck speaks of "sediments of time," then, he refers to "the result of experience."

In the essay "Sediments of Time," he divides this result of experience into three analytically different layers. The first layer is that of singularity: that events are experienced by humans first and foremost as surprising and irreversible. This applies not only on the level of individual experience. It also applies to communities of action and to "all matters that need to be addressed historically."[46] But such singularity is not the whole truth, according to Koselleck, since "history as a whole is based upon structures of repetition that are not exhausted in singularity."[47] To explain this, he uses the example of the mailperson, who can

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Sean Franzel and Stefan-Ludwig Hoffmann (Stanford University Press, 2018), xxv.

42 Koselleck, *Sediments of Time,* 4.

43 Ibid., 3.

44 Ibid.

45 Ibid., 160.

46 Ibid., 4.

47 Ibid., 5.

bring you a letter with a life-changing message. This can only happen because of the recurrent process of the mailperson coming every morning, made possible by a range of institutional (infra)structures, and so on. Another example he uses is that of the relationship between the act of *Sprechen* (speaking) and *Sprache* (language): It is impossible to make oneself understood without using a preexisting language, shared with the receiver of the utterance.[48] In other words, "in all realms of life we can identify phenomena or recurrence that secure the condition of possible singularity."[49] It is worth noting that these recurrent phenomena are not necessarily static — structures of repetition are themselves subject to change, as we see, for instance, in the history of languages. The advantage of a theory of sedimentation, Koselleck claims, thus "lies in its ability to measure different velocities — accelerations or decelerations — and to thereby reveal different modes of historical change that indicate great temporal complexity."[50]

For Koselleck, history as experience of singularity and surprise (that is, something happens differently from what one had expected) is to a large degree connected to individual, communal, or generational experiences. But there are, Koselleck claims, historical times pointing beyond the experience of contemporary individuals. This is the third analytical sediment of experience: "preconditions of experience that are in effect *before* their respective generational cohorts, and that will most likely continue *after* these cohorts pass on." These can be both biological preconditions and long-lasting cultural conditions, like particular assumptions about the world, stretching over generations. Koselleck calls these phenomena of repetition "transcendental," since these long-lasting recurrent assumptions change at a very slow pace.[51] In "Structures of Repetition in Language and History," Koselleck discusses the question of how sediments and

48 Ibid.
49 Ibid., 4.
50 Ibid.
51 Ibid., 9.

mixtures of both repetition and innovation can be analyzed and represented. Here he ends up with a conceptual model with five types of structures of repetitions "staggered on varying depths." In addition to extrahuman conditions and biological preconditions of life that are shared with all living beings, Koselleck lists institutions (unique to human beings), repeatable regularities in singularly occurring sequences of similar kinds of events, and linguistic structures of repetition.[52]

Going back to Bakhtin, Kristeva, and Linell, and the notions of text culture, speech genres, and the utterance as a unit of speech communication, it is possible to see how theories of the "double dialogicity" of utterances can be neatly fitted into the Koselleckian theory of layers of time that enables analysis of mixtures of "both repetition and innovation." Such a "fit" between a Bakhtinian theory of texts and a Koselleckian theory of history, however, is possible only if one accepts that a text is an event in a "true historical sense," that is, an event that is experienced as singularity and surprise, made possible by multilayered structures of repetition — some slower, others faster.

Koselleck himself, obsessively interested in the convergence between history and language, seems to have a similar viewpoint to dialogistic-oriented theorists of text. When discussing linguistic structures of repetition, he makes a distinction between syntax, pragmatics (or rhetoric), and semantics, and he shows how "each realm [of language] has its own unique, that is, different speed of change." Syntax and grammar are relatively stable over a long period of time, but semantics can adapt rather quickly to "external challenges." For Koselleck, the relationship and synchronicities between historical reality, political change, and linguistic change are of great interest and importance. But he is also aware of the potential of communicative action in the form of unique utterances: "The uniqueness of a particular, successful speech or the uniqueness of a new line of argument are [sic] based on the art of calling up and combining repeatable,

52 Ibid., 162.

well-known elements of language so as to present something unique or new."[53]

Conceptually, however, it still seems like Koselleck operates with what Bakhtin would call "units of language," and not "the utterance as a unit of speech communication," when he talks about language. Koselleck seems to give language and the use of language a specific ontological status, where history and language can converge and interact to different degrees, but never be one and the same. Linguistic structures of repetition, thus, are for Koselleck a question of the structural characteristics of *language,* not utterances, even if he talks about pragmatics or rhetoric. For Bakhtin, on the other hand, an utterance is always an event in itself, and even if it is possible to reuse, reread, reproduce, and reprint a text, "the reproduction of the text by the subject (a return to it, a repeated reading, a new execution quotation) is a new, unrepeatable event in the life of the text, a new link in the historical chain of speech communication."[54] And, I will argue, every reading of a text, is, in fact, an experience of history happening. As a consequence, a text is made possible not only by linguistic structures of repetition, but by structures of repetitions on many levels: textual norms, discourses, genres, knowledge traditions, and so on, multiple layers of "inventories of experience," to use a Koselleckian expression,[55] or "other voices," in Bakhtinian language. Understanding a text as a "micro-event" makes it possible to see the many intertextual and contextual relations as intertemporal relations — as a multiple dialogicity anchored in different forms of past experience, directed at possible future responses, while at the same time intervening in a present.

53 Ibid., 173.
54 Bakhtin, "The Problem of the Text," 106.
55 Franzel and Hoffmann, "Translators' Introduction," xv.

Texts as Bundles of Time and Basking Shark Temporalities in Eighteenth-Century Natural History Writing

Turning our question back again, then, from texts as multitemporal to a multitemporal perspective on textualized nature, the temporal nature of Gunnerus's basking sharks can now be further investigated. Approaching the two articles as intertemporal dialogues allows various temporal relations to appear. What kind of "structures of repetition" made the textualized basking shark possible? The obvious answer, which Koselleck would also point to, is language with all its realms. But taking the *utterance* as our starting point, other structures are as important. In establishing a society for the promotion of science and learning, Gunnerus and his colleagues followed a cultural pattern they had come to know in other European cities. The same goes for the establishment of a publication series, a natural history collection, and a network of clergymen providing Gunnerus and the society with objects and information.

When it comes to the genre,[56] the two articles are particularly interesting. On the one hand, Gunnerus follows the typical genre of natural history descriptions at that time, where the empirical investigation of experienced nature is the basis of the text. But at the same time, he apparently sees it as necessary to build his arguments around earlier written sources. This makes the texts point backward, to premodern and early modern textual and natural practices, rather than the typical systematic works of, for instance, his contemporary Carl von Linné. Gunnerus clearly based his writings on a thorough knowledge of an already existing scholarly text culture, apparently seen as stretching back as far as ancient writers.

And what about the biblical Jonah and the question of the big fish that swallowed him? Was this natural history? Yes and

56 Here understood as "a class of communicative events, the members of which share some set of communicative purposes," as defined, for instance, in John M. Swales, *Genre Analysis: English in Academic and Research Settings* (Cambridge University Press, 1990), 45–47.

no. In the seventeenth and eighteenth centuries, natural history and religion were not seen as antithetical. Rather, a lively and distinctive intellectual movement existed, "physico-theology," which aimed at uniting the then new form of experience-based sciences with the biblical tradition. This type of natural history writing was especially popular among the general public, because "it was a way for laypeople who had embraced the 'new philosophy' to adjust the new understanding of nature to the existing religious worldview and social order."[57] Gunnerus's obsession with the basking sharks' throats and esophagi in the first article, and the obvious reason for this obsession in the second, points to a very specific genre within the physico-theological movement — the genre of *physica sacra,* or biblical physiology. In fact, the question of what kind of fish swallowed Jonah had at Gunnerus's time been part of biblical hermeneutics for several hundred years, with surprising continuity.[58]

At the basis of *physica sacra,* through the centuries, was the alliance of natural science and theology, and every new discovery of nature could help explain the holy scriptures. In the seventeenth and eighteenth centuries, the innovations in natural history — the detailed descriptions of the anatomy, feeding behavior, and digestive processes of both well-known and newly discovered species — were employed in explaining biblical wonders. And among these wonders was Jonah, who survived in the belly of a large fish. Gunnerus seems to expect his readers to be well-oriented in the genre and tradition of *physica sacra* when he — out of the blue — ends his first article by stating that the basking shark was *not* the fish that swallowed Jonah. He expects the same from his readers when he in the next article presents

57 Rienk Vermij, "Physico-Theology or Biblical Physics," in *Physico-Theology: Religion and Science in Europe, 1650–1750,* ed. Ann Blair and Kaspar von Greyerz (Johns Hopkins University Press, 2020), 157.

58 Bernd Roling, *"Physica sacra:* Wunder, Naturwissenschaft und historischer Schriftsinn zwischen Mittelalter und Früher Neuzeit," in *Mittellateinische Studien und Texte,* vol. 45, ed. Thomas Haye (Brill, 2013), 3.

his argument about the basking shark being the fish that swallowed Jonah as an argument worth promoting.[59]

This leads us to other temporal structures in the texts, pertaining to Gunnerus's knowledge projects themselves and the preceding "links in the chain of communication." In his texts, Gunnerus actually builds on at least three contemporary "conversations," all of them implying a different temporal layer. The dialogue with biblical hermeneutics stretches far back, and Gunnerus builds on and presupposes a plethora of earlier sources, appearing as "other voices" for a reader with sufficient knowledge of this context. At the same time, Gunnerus includes information about the usefulness of the basking shark, its uses in the household, how much liver one can get from it, and so on. Here, his dialogical relations are oriented toward the contemporary cameralism of the Danish-Norwegian state, where knowledge about natural resources should be mapped out by officers of the Crown residing in remotes part of the kingdom.[60]

A third dialogic relation is directed toward, on the one hand, a general reader and, on the other hand, academic colleagues (the translation of the articles into German supports this view). By publishing his knowledge in Danish, through the newly established Royal Norwegian Society of Sciences and Letters, Gunnerus clearly addressed — and by this textually established — a desirable type of reader: an enlightened Norwegian public. By his meticulous descriptions based on empirical observations of the basking shark, Gunnerus oriented himself to the developing field of systematic natural history, looking toward the future. The two texts by Gunnerus are definitely performing *actions* in specific situations, but the "eventfulness" of Gunnerus's texts — his innovations — can also be seen in the later reception of the knowledge he presented: Gunnerus's work

59 See also Brita Brenna, "Naturhistorie, fysikoteologi og 'en stor og betydelig fisk,'" *Din: Tidsskrift for religion og kultur,* no. 2/3 (2007): 17–32.

60 John Herstad, "De 43 spørsmål: En arkivnær introduksjon til politiske og administrative prosesser," in *Norge i 1743: Innberetninger som svar på 43 spørsmål fra Danske Kanselli,* ed. Kristin M. Røgeberg (Solum, 2003), 1:9–40.

on the *brugde* is still today referred to in scientific work on the species, and he is considered to be the first to have defined the species *Cetorhinus maximus* taxonomically (even if Gunnerus's original name was *Squalus maximus*).[61] The scientific and textual practice of "life history studies" of animals was central to eighteenth-century natural history, but this continued to be an important practice and area of research up until the twentieth century.[62]

In other words, in the two utterances by Gunnerus, a complex intertemporal web emerges, stretching hundreds of years back in time and relating to contemporary issues and addressing possible futures. There are of course several other aspects of the texts that could be brought up to make this argument, including the past and futures of illustrations and of specific knowledge, words, and formulations. This multitemporal understanding, however, has as its premise a certain understanding of temporal relations. By understanding the intertextual relations as intertemporal relations stretching backward and forward into the past and present, a text is understood, as it were, as a specific, microscopic "regime of historicity," in the Hartogian sense. But again, time is more than history. Applying a broader temporal perspective, where the lifetimes of not only the texts themselves but also the lives and lifetimes of, for instance, basking sharks are taken into consideration, other temporalities come into sight.

An interesting aspect with eighteenth-century natural history writing in general, and Gunnerus's two articles in particular, is that, as utterances, Gunnerus's texts are not only history understood as action or "things done," or as *Geschichte,* to use Koselleck's term. "History" can also be understood as *Historie,* that is, as the linguistic recording of (past) experience, in accordance with the early modern understanding of *historia,* a

61 *Cetorhinus maximus* (Gunnerus, 1765), *World Register of Marine Species,* https://www.marinespecies.org/aphia.php?p=taxdetails&id=105837.

62 Lynn K. Nyhardt, "Natural History and the 'New' Biology," in *Cultures of Natural History,* ed. Nicolas Jardine, James A. Secord, and Emma C. Spary (Cambridge University Press, 1996).

point that Koselleck himself makes.[63] In this way, the two basking sharks that Gunnerus got hold of can also in themselves be considered *events* that were *experienced* by Gunnerus, and then written down as *historia*. In other words, the eventfulness of unknown nature was reported in language, and hence "past reality is transitioned into the status of a written history, and its fixation in writing establishes the difference between the history that once occurred and the linguistic form that it takes on at a later point." According to Koselleck, this has epistemological consequences, for with this, "the fixed linguistic form of a history takes epistemological precedence over what once might have been the case."[64]

Gunnerus's textualization of nature, through which *Cetorhinus maximus* entered human history in new ways, can thus be understood as a form of synchronization. The lifetime of the basking shark could now be aligned with other species' lifetimes, and entangled with new scales of time, relating to scientific taxonomy and description. From another perspective, Gunnerus's texts can be said to perform a type of desynchronization, or stabilization — the basking sharks were taken *out of* their time, so to speak, becoming a universalized category. Koselleck gave language a specific ontological status, claiming that language and history never completely merge. Since the textualization of nature is a material practice, in that it results in a material and durable text — that can still be read more than 250 years after it was written — the text itself has also in some ways become a (possible) structure of repetition, that is, a part of the textualized inventory of (human) historical experience.

The Temporality of Texts and Nature

My main goal here has been to explore the temporality of the seemingly atemporal eighteenth-century natural history practice of textualizing nature. Eighteenth-century natural history

63 Koselleck, *Sediments of Time,* 4.
64 Ibid., 152.

was of course not a historically oriented knowledge practice. Its main goal was to describe the present world as it could be experienced "here and now." But natural history writing was neither ahistorical nor atemporal. Gunnerus's two articles about the basking shark can be understood as "bundles of times" as a result of being *texts,* that is, multitemporal historical (micro) events made possible by multiple layers of historical experience, making new historical experience possible. However, the textual temporal bundle was also a result of natural history writing being a form of history practice, turning the lifetimes of basking sharks into a specific form of universalized knowledge for contemporary and future generations, aligning them with and thus enabling new forms of time and life.

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12

Fragile Knots of Time: Encountering the Bear Island

Brita Brenna

No Man's Land is the title of Martin Conway's iconic book on the history of Spitsbergen. "Spitsbergen has never been an inhabited country," he wrote in the opening paragraph, "and therefore, in a sense, can have no true history of its own, but for a portion of every year since early in the seventeenth century it has been the scene of various industries, which have attracted in their turn to its inhospitable though beautiful shores innumerable visitors."[1] When Conway wrote his comprehensive description of the industries and visitors to Spitsbergen from its discovery in 1596 to his own time (the early 1900s) what is now known as the Svalbard archipelago was a *terra nullius* (no-man's-land), a territory under the rule of no state. To write the history of a stateless land without inhabitants seemed to be a contradiction in terms to Conway. History was to be told about people making communities and states; history was not about a place as such, but about

1 Martin Conway, *No Man's Land: A History of Spitsbergen from Its Discovery in 1596 to the Beginning of the Scientific Exploration of the Country* (Cambridge University Press, 1906; facsimile, Damms Antikvariat, 1995).

the people who would live there. His solution was to write the history of the humans who had visited this part of the North Sea, of the heroes of Arctic exploration, hunting, and industry.

Today, there are people living on Spitsbergen, the largest island in the Svalbard archipelago. Since 1925, the archipelago has been under Norwegian jurisdiction, and mining towns have been established by Russians and Norwegians alike. Around 70,000 visitors came by air in 2022 and around 45,000 cruise passengers.[2] In the Norwegian settlements, there are 2,500 regular inhabitants.[3] Svalbard is now an inhabited country. Bear Island, a small part of the archipelago situated far south, midway between the Norwegian mainland and Spitsbergen, has, however, never been permanently settled by humans and is rarely visited by tourists. This island is at the heart of this chapter.

Bear Island is in fact a heart-shaped island, isolated in the Barents Sea, measuring 15 × 20 kilometers. This is where the Gulf Stream meets the melting ice water from the Arctic ice cap, making the sea rich in movement and nourishment for mammals, fish, and birds. On the island there are only a limited number of plants and mammals, namely, fifty-four vascular plants and hundred fifty mosses, some Arctic foxes, and an occasional polar bear. Arctic char can be found in some of the more than seven hundred lakes on the island, and seals and whales in the waters around it. However, the ground is barren, and the atmosphere serene, were it not for the migratory birds that arrive every year at the southern part of the island, one of the biggest colonies of seabirds in the Northern Hemisphere. These migratory birds far outnumber the people who have ever visited the Bear Island. The humans who have come have done so to hunt or mine, to work at the meteorological station, or to undertake scientific fieldwork. This chapter is concerned with life and death on the island, from the killing of a polar bear that

2 "Årsstatistikk 2022," *Visit Svalbard,* https://www.visitsvalbard.com/dbimgs/Årsstatistikk2022.pdf.

3 "Befolkningen på Svalbard, *Statistisk sentralbyrå,* https://www.ssb.no/befolkning/folketall/statistikk/befolkningen-pa-svalbard.

makes up the origin story of the discovery of the island in 1596, via the first scientific description of the island from 1831 and the ecological web of life found here in 1921, to our encounter with the island today. I have done fieldwork there twice, together with colleagues, in 2019 and 2022, for a period of ten days each time. This chapter begins with our encounter with the "time landscape" of the island.[4]

Eternity and Transience

On July 3, 2019, we were set ashore by the coast guard ship *KV Svalbard*. We — Marit Hauan, folklorist from the Arctic University of Norway, Janike Kampevold Larsen, landscape theorist from the Oslo School of Architecture and Design, and I, a cultural historian from the University of Oslo — were to seek out cultural heritage on the island. Since the island is a nature reserve, cultural heritage is treated as belonging to nature, according to the Svalbard Environmental Protection Act from 2001. Human traces are most often left as they are to wither away.[5] Remains of human activity are thus to be found scattered around the arid landscape: graves from Russian and Norwegian trappers, airplanes that once crashed here, the still active bird-watching stations at three different spots, a derelict whale-oil factory, a bombed and ruined mining town, and other remains of human activities, such as communication equipment, fishing gear, and heaps of plastic rubbish on the shores. We arrived at midday at the meteorological station, located on a small pocket of land that is not part of the nature reserve, where nine people live for six-month periods. We were given a shooting lesson to establish that we could carry a gun and with that potentially scare off a very unlikely polar bear, and then we started the two-

4 The project Timelandscapes of Bear Island financed these field trips. The project consists of Marit Hauan, Janike Kampevold Larsen, and me. I am eternally grateful for their support and inspiration for this chapter.

5 "Lov om Svalbard [Svalbardloven]," *Lovdata,* https://lovdata.no/dokument/NL/lov/1925-07-17-11.

hour walk toward the ruined mining town Tunheim where we would stay for some days.

Coal mining commenced in 1916, and the small mining settlement of Tunheim was established here at the brink of the ocean, hosting 215 workers at the most. Connected to the rest of the world only by seaway, the mining society was established with the purpose of extracting coal and securing Norwegian presence in the middle of the Barents Sea. In 1925, after realizing how limited the coal deposits were and facing a dramatic fall in coal prices, mining was abandoned. The settlement with 1.2 kilometers of rails, two locomotives, twenty-five houses, and mining machines was left more or less to itself and flocks of little auks. The meteorological station remained until World War II, when English warships bombarded the town to prevent German forces from using it.

We started our observations on the afternoon we arrived. The fog was heavy, the wind moderate. We found industrial waste, black heaps of coal, broken buildings. We observed the decaying rails, the crushed glass, the weathering of the wooden material. We tried to establish what place this was, and the times of this place, which we had set out to investigate. Back in the cabin (the old gunpowder storage), we discussed the notion of place, but just as much the duration of a place. I wrote in my field diary: "The sound of the little auks and the sea, always the swell of the ocean…immutability, permanence. Eternity is without time, not continuity, given once and for all. To me the 'ruins' are unchangeable. For Janike and Marit this is time, change, weathering." Our reactions were so different, our understandings of the times we encountered so dissimilar, they seemed opposites. I became poetically ravished by the sense of eternity and permanence, and my colleagues were enthused by the power of transience. We inhabited different historical tropes, different time tropes, made possible, I would argue, by the ambiguous aesthetics of the Arctic that we have inherited.

Natural and Cultural Histories of Bear Island

Many fieldworkers have spent considerably longer periods on the island than we have, and sometimes return every year for some years, just as we do. They have studied the birds, the ground, the fossils, the microfauna in the lakes and on the shores, the skies, and the plants, making use of their training as geologists, paleontologists, meteorologists, zoologists, botanists, and so forth. They have practiced forms of natural history that have resulted in reports, scientific articles, and policy advice and contributed to collections in several museums. They have worked within the broad designation of *natural* history. Anthropogenic climate changes have made us aware of the degree to which human history is intertwined with the history of nature, with the different lifetimes of plants, animals, algae, rocks, and fossils. On Bear Island, these actors are the driving forces in most of its history, and the human encounters with the island are only recent interventions in the times of all these organisms and geological formations. The modern notion of history that has been with us since the Enlightenment is challenged today, as human histories can no longer be seen as taking place against a backdrop of an unchanging nature. For the scientists, changes in nature can no longer be seen as purely "natural," because the prevailing presence and force of human activities have to be included in research. Realizing the entanglement of the timescales of the biological (humans not excluded) and the geological demands new methods and collaborations.[6]

From the perspective of the other-than-humans of Bear Island, humans are but one of the threats to upholding life and form. We were looking for human cultural remains, for the hu-

6 There is a large literature dealing with the Anthropocene challenge to the writing of history; specifically, see, e.g., Andrea Westermann and Sabine Höhler, "Writing History in the Anthropocene," *Geschichte und Gesellschaft* 46, no. 4 (2020): 579–605; Dipesh Chakrabarty, *The Climate of History in a Planetary Age* (Chicago University Press, 2021); and Sverker Sörlin, *Antropocen: En essä om människans tidsålder* (Weyler Bokförlag, 2017).

man times that had been made and unmade here. This meant that the presence and the workings of the weather, the sea, the birds, and the animals were staring us in the eyes, in the withered wood and the rusted metals. Still, we soon discovered how taxing it is to depart from the cultural confines of historical tropes of time. My colleagues were able to perceive the transitoriness of the place, but I ended up writing poetic entries in my notebook about eternity.

One prevailing trope in the many narratives of human encounters with the Arctic is the feeling of being overwhelmed by the vast, infinite, and empty landscape. In the empty landscape, life is scarce and humans undergo hardships to survive in the inhospitable environment. This "Arctic sublime" has been interrogated and criticized in admirable works accounting especially for the heyday of heroic adventures in the Arctic in the nineteenth century. However, the literary scholar Benjamin Morgan writes that the critique of the ideological underpinning of Arctic heroism no longer adequately addresses the Arctic's place in the Western imagination: "Among the many ironies of the present era of climate change is the fact that regions that had for centuries dramatized the fragility of human life have, in a few short decades, been refigured as representing the earth's profound vulnerability to collective human agency."[7] This seems like a new situation, but reading the sources anew today reveals that there was always what Morgan calls an "after the Arctic sublime." In so many ways, the changing Arctic was what I couldn't see, but my colleagues could. We were all three both wrong and right. My problem was that I saw no people, and as a historian I could see no time without the people, Conway echoing in my mind.

What is a historian's task in examining rocks and landscapes, birds and ruins? How does the presence of the place, the landscape, the birds, the ruins, and the weather give answers to the question, What is the time of this place? By being there, doing fieldwork, we are confronted with history in the material traces

7 Benjamin Morgan, "After the Arctic Sublime," *New Literary History* 47, no. 1 (2016): 3.

of lives lived, be it in the shape of ruins from the early 1900s or in the often broken shape of fossils from the Jura period. What gradually emerged as we encountered Bear Island was the need to be attentive to the multiplicity of times that the island made possible. Geographer Isla Forsyth has written interestingly about the untold stories of more-than-human geographies of field science and draws attention to the complexities of drawing closer to the worlds of nonhumans: "Each species has its own geography, and its own history (of variant life spans and memories), yet they exist in relation and attuned to one another, creating a complex web of worlds and lives."[8] Bear Island has been a location for fieldworkers in the various branches of natural history, who have observed and registered. The times that these fieldworkers encounter and the events and worlds they have recorded need to inform our conceptions of time as we meet the island. These researchers have made sense of the times of the fossils, the geological formations, and the plants and the birds, based on the description of what can be found there. My ambition is to combine an account of Bear Island inspired by natural history with a description of how earlier scientists and explorers have encountered it. To understand what is happening in the meeting between us and the island today, I believe the stories of encounters between explorers and scientists and the island in recorded sources are of importance. Hence, this will be a story of previous encounters, and their influence on us. Then I will come back to our own times. But first of all, a note on knots of time.

Knots of Time

Forsyth draws attention to the many different worlds of time and space that different species inhabit. The concept of "multispecies knots of ethical time" developed by the late Deborah Bird Rose can further bring attention to how these times emerge,

8 Isla Forsyth, "The More-Than-Human Geographies of Field Science," *Geography Compass* 7–8 (2013): 531–32.

and what happens as they are eradicated. In her article with the same title, Rose shows how time, species, and nourishment become "densely knotted," and how these knots are made of embodied times, sequential and synchronous. There is a diversity of embodied times, and the interaction between those are what sustains life on Earth, Rose claims. They are not only attuned but knit together. Her argument is that patterns of sequence and synchrony and their intersections are fundamental for life. So is death, because death is necessary within "the ecology of life." She quotes Margulis and Sagan when they define life as working productively with time: "Life is always 'preserving the past, making a difference between past and present; life binds time, expanding complexity and creating new problems for itself.'"[9]

The notion of knots of embodied time brings attention to time when it is hard to capture. Arriving on Bear Island, most human visitors describe a place with little life. The knots of embodied time that make up life are not only fragile but also difficult to discern. "Arid" and "desolate" are words frequently used. Because the island is so barren, death is easier to notice and experience than life. To some, death is much more palpable on this island than life.

Morgan stresses the way that there was always more to the experience of the Arctic than the sublime, and that an "after" the Arctic sublime does not necessarily involve an "after" in terms of linear time. Another aesthetic sense of the Arctic can be seen to have been there all along. In the following, I will use earlier accounts of Bear Island and juxtapose them with my and my colleagues' fieldwork on the island. For all of us, the Arctic is both sublime and something after the sublime, but the fragility of the island moves into very different discursive and ontological logics. In line with this, I want to emphasize how the sense of fragility does not move in a line from fragile humans to the fragile Arctic. Fragile knots of life have been described in most of the histories of human encounters with the Bear Island, "this barren

9 Deborah Bird Rose, "Multispecies Knots of Ethical Time," *Environmental Philosophy* 9, no. 1 (2012): 127–40.

island, where mist and gloom brood almost continually."[10] This island has witnessed nearly 500 years of slaughter of animals by humans, and as one sets foot on it, the remains of both human and animal lives are the first thing we notice. And the hundreds of millions of years in which the island has been forming have left fossil animals on the surface of much of it. Aptly enough, one of the few books about the island is titled *Death on Bear Island*.

Deaths on Bear Island

The first known mention of the island was in Gerrit de Veer's journal describing three voyages "towards Cathaia & China" by Dutch ships searching for a passage north of Siberia.[11] By the end of the sixteenth century, China presented the ultimate goal of ships setting out from European harbors: "The lure of China's wealth haunted the seventeenth-century world," according to China historian Timothy Brook.[12] Willem Barentsz was part of three subsequent expeditions, the first one in 1594, when they set off with ships loaded with wares to be traded with the Chinese. What they found was ice, unfamiliar animals, and new land. On the third expedition, on June 12, 1596, the ships had lost direction when they sighted an island:

> The 12. Of June in the morning, wee saw a white Beare, which wee rowed after with our Boate, thinking to cast a Roape about her necke, but when we were neere her, shee was so great, that wee durst not doe it, but rowed backe againe to our Shippe to fetch more men and our Armes, and so made to her againe with Muskets, Hargubushes, Halbertes, and Hatchets [.... W]e rowed with both our Boates unto the Beare, and

10 Seton Gordon, *Amid Snowy Wastes* (Casell & Co., 1922).

11 Gerrit de Veer, *The True and Perfect Description of Three Voyages, So Strange and Woonderfull, That the Like Hath Neuer Been Heard of Before* (Panier, 1609).

12 Timothy Brook, *Vermeer's Hat: The Seventeenth Century and the Dawn of the Global World* (Profile Books, 2009), 19.



Fig. 12.1. The killing of the bear that gave the Bear Island its name. Source: Gerrit de Veer, *The True and perfect Description of three Voyages, so strange and woonderfull, that the like hath neuer been heard of before* (Panier, 1609). Image from the National Library of Norway.

> fought with her while foure Glasses were runne out, for our Weapons could doe her little hurt: and amongst the rest of the blowes that wee gaue her, one of our men stroke her into the backe with an Axe, which stucke fast in her backe, and yet she swomme away with it but wee rowed after her, and at last wee cut her head in sunder with an Axe, wherewith she dyed […]. This Island wee called Beare-Island.[13]

The narrator here, Gerrit de Veer, was a Dutch officer who recorded two of the three expeditions. His books were soon translated, and the above quote is from an early English translation. Polar bears are important actors in his journal. Encounters with polar bears were repeatedly recounted, providing titillation for curious readers. But the stories also describe a shocking will-

13 de Veer, *The True and Perfect Description of Three Voyages.*

ingness to kill. In the above quote, the time it takes to kill the bear — four glasses — is important. So is the difficulty in making the weapons bite at the polar bear fur. The sailors feared the huge bear, but they were unwilling to stop the hunt and let her go. They had tasted the meat, which didn't become them well, so they obviously didn't kill for food, but to destroy and slice open the knots of life they encountered, which were important for survival, but also for the narration. They named the island Bear Island (fig. 12.1).

Hunting down and killing animals was not the main aim of the expedition, but the Dutch explorers were soon followed by English merchant ships that came to the island for the resources that the animals provided. In the years between 1603 and 1612, English ships visited the island on a regular basis, mainly killing off the walruses that lived on the shores. After initially not knowing how precisely to kill the animals, they became lethally effective, and one year they killed 700 animals in some hours. The walrus soon went extinct on the island, and at its disappearance, expeditions by the English carried on farther north to hunt whales.[14] In the eighteenth century, Russian trappers used the island more extensively, also overwintering, hunting Arctic fox and birds. In the nineteenth century, Norwegians started hunting and trapping on the island. The walrus population had recovered slightly, but after a few years, the walrus colony was once again depleted.

Walrus knuckles are strewn across the shores of Bear Island, as are graves of eighteenth-century Russian trappers, and more recent Norwegian graves. Death is one of the gifts future generations inherit on Bear Island. This is the time that has stopped, the knots of life that have become undone, left there as monuments of extinct life. What is this death that we inherit? In her careful reading of Vinciane Despret's way of working in the article "A Curios Practice," Donna Haraway tells how Despret asks us to think from a heritage, the situated stories we start from. To

14 Johan Gunnar Anderson, "Några drag af Beeren Eilands Kolonisationshistoria," *Ymer* 26, no. 1 (1901): 36.

inherit is an act that "demands thought and commitment. An act that calls for our transformation by the very deed of inheriting," according to Despret.[15]

The Cadaver of the Earth

The first scientific exploration of Bear Island was undertaken by the Norwegian geologist Mathias Keilhau in 1827. Being the first graduate in geology at the newly established university in Norway's capital, he was given the task of traveling the country to map the ground. As he was working his way through Finnmark, the northernmost part of Norway, he was given the possibility to go to Bear Island and Spitsbergen with the German traveler Barto Löwenigh, even if these islands were not officially part of Norwegian territory. Keilhau wrote a travelogue about his journey to the north, leaving the hard facts about the ground to a second volume.[16] In his book he described the island in high-strung poetic language. The island strengthened the imagination, he claimed, offering a full-blown Romantic vision of the sublimity of the barren and isolated place, not least with a strong reaction to the death that was so obviously present. They had arrived in a light boat in the northern haven where old Russian Orthodox crosses pointed to the landing place. They found a small house where walrus hides hung on the walls with the flesh side facing outward. The ground was filled with broken bird eggs and scraps of fur and hides:

> An amount of walrus and polar bear skeletons lay scattered among the stones. The polar bear knuckles had the form of the feet and arms of human giants, and this ghastly sight was not the least amplified by the magnitude and peculiar

15 Quoted in Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Duke University Press, 2016), citing correspondence with Vinciane Despret, 131.

16 The scientific sequel to this book never arrived, but in the years 1838, 1844, and 1850, he published *Gæa Norvegica,* a description of the Norwegian ground.

> form of the walrus skeletons. We imagined that we stood on a piece of the old surface of the globe which had avoided being covered by younger layers of earth and stones where the animals from the Ur-world customarily are found buried, but they have not yet been awakened to the new life that followed upon those Catastrophes. The humid moldiness that partly covered the skeletons would really seem to propose that the sun had not yet shone on this death field, where the fog seemed to rest unchangingly, and where all objects, even we, as we distanced us from each other, could only be perceived as hueless and vague outlines as becomes ghosts and spirits.[17] (my translation)

This was not just a vision. His fellow traveler, Löwenigh, exclaimed in his travelogue that the cabin was a caravan-sarai covered with rotten walrus hides surrounded by skulls.[18] To Keilhau and his companion, Bear Island was a killing field, where new life did not seem to have awakened after the catastrophes that killed off the "animals of the ancient world." The knuckles of polar bears and walruses were scattered, and even people seemed like ghosts in the thick fog. The geologist imagined the island as old, bearing tidings from an ancient world, where new life had not yet flourished.

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17 Balthazar Mathias Keilhau, *Reise i Øst- og Vest-Finmarken samt til Beeren-Eiland og Spitsbergen, i Aarene 1827 og 1828* (Johan Krohn, 1831): "En Mængde Beenrader af Hvalrosse og Isbjørne laae omkring mellem Stenene. Bjørnebenene havde Formen af menneskelige Kjæmpers Fødder og Arme, og det Rædsomme i dette Syn forøgedes ikke lidet ved Hvalros-Skeletternes Størrelse og usædvanlige Dannelse. Vi indbildte os, at vi her stode paa et Stykke af Klodens gamle Overflade, som havde undgaaet den Bedækning af yngre Jord- og Steenlag hvori Urverdenes Dyr ellers findes begravede, men som derimod endnu ikke var opvaagnet til det nye Liv, der fulgte paa hine Katastropher. Den fugtige Muggenhed og Grønske, som tildeels bedækkede Beenraderne, syntes virkelig at antyde, at Solen endnu ikke havde belyst denne Dødsmark, hvorover Taagemulmet ligesom urokkeligen hvilede, og paa hvilken alle Gjenstande, ogsaa vi selv, naar vi fjernede oss faa Skridt fra hinanden, kun vare at se med disse matte og usikre Omrids, som man tillægger Geister og Varsler."

18 Barto von Löwenigh, *Reise nach Spitzbergen* (Jacob Anton Mayer, 1830), 12.

Keilhau took magnetic measurements and collected flowers, moss, and lichen, "growths of sad appearances." He wrote down birds' names and collected fossils and described coal, the existence of which he found strange because "some reckons this must be the result of rich vegetation." He also collected remains "of plants which only could live in a warm climate" from the rich deposits of fossils. As he walked along the barren shores, he came to a larger spot covered with green grass that covered the stony ground, a rare occasion here, "where the cadaver of the Earth almost everywhere is uncovered in perfect nudity."[19] For Keilhau, Bear Island was a prehistoric site — the walrus he spotted were described as unfinished masses of flesh, organisms waiting to unfold.[20] In one of his later articles, he described his thoughts on the development of the earth:

> It would be a much more beautiful result of such investigations, if we could believe that even the mass of the earth is at all times in a condition to advance onwards to a state of greater perfection, and that individual development from the chaotic may likewise proceed gradually, instead of our regarding the body of the earth as a *cadaver* in which all processes merely tend to a retrograde movement, to chemical decomposition and mechanical ruin.[21]

In this sense we can understand the time Keilhau described on Bear Island as one that was to progress and unfold; there was something yet to come, "a state of greater perfection." Keilhau's description of the ground of the island as a cadaver of the earth uncovered could be understood to underscore how the island was inimical to life, and it has been understood in this way by later readers. However, the conception of the cadaver was a poetic description of a state, not of a retrograde process, as he ex-

19 Keilhau, *Reise,* 125.

20 Ibid., 116–17.

21 Balthazar Mathias Keilhau, "Theory of Granit, and the Other Massive Rocks, Together with That of Crystalline Slate," *The Edinburgh New Philosophical Journal* 25 (1838): 272.

plained it in the second quote. The petrifactions of plants from warmer climates and the very fact that the island was withering away allowed Keilhau to express the melancholy of life's passing, but also of a development toward "perfection."

Keilhau's theory of the development of the world included an inorganic phase where crystallizing forces made mountains grow. According to historian of science Ernst Bjerke, in Keilhau's organicist theory of the development of the world, the crystallizing forces were universal when the first mountains were formed, and when these crystalizing forces waned, organic life-forces appeared:

> Once these organic forces gained the upper hand, they initiated the development of life, culminating in man. The apparent degeneration in the inorganic world — from crystalline rocks to recent loose deposits — was countered by an opposite force connected with the organic world. Man was heir to mountain. The history of the Earth was progressive; it developed first chemically, then biologically.[22]

The Arctic is truly sublime in Keilhau's scientific history of origin. The sublime was, however, not, or not only, its melancholy and ghostliness, the wide vistas and the endless ocean, but the depth of time — and the deaths that this evolution of the world had made unfold. The Arctic sublime thus involves a melancholy from time passing. Is this where I got it wrong when I got eternity and permanence confounded in my poetic field notes? "Wrong" might not be the right word. What is more important is that the very first and extensive formulation of an Arctic sublime in the Norwegian language included a developmental melancholy of the destruction of life. This, one could argue, could be termed already, after an Arctic sublime, echoing Morgan, cited earlier.

22 Ernst Bjerke, *In Search of Unity* (Stiftelsen Oslo katedralskole, 2016), 208.

Webs of Life

Keilhau's was the first scientific visit to the island. His account has been alluded to and recounted ever since. Bear Island was a natural stop on the way to Spitsbergen, and many, mostly Swedish, expeditions made a stop here during the nineteenth century. Some stayed for a few days, surveying the island, making maps, and collecting natural objects: "They found the island extremely dreary....There were no glaciers, the colour of the land was grey, and the vegetation was poor."[23] The Swedes ruled the scientific exploration of the Arctic oceans in the second half of the twentieth century, and expedition after expedition passed by Bear Island, but only a few of them stopped, and many wanted to but were hindered by fog and ice. Scientific exploration was tightly interwoven with prospecting for resources: coal, minerals, guano, and game.[24] Greenland and Spitsbergen proved more fertile ground, and after battles between the states and cooperation prospecting in the north around 1900, Norway took possession of the Svalbard archipelago thanks to a decree from 1920, giving the country sovereignty from 1925. Research expeditions with different aims still haunted the territory's shores, searching for new scientific knowledge.

The Oxford University Expedition to Spitsbergen in 1921 was the first in a series of expeditions by the leading English universities, later cited as "significant moments in the history of British ecology."[25] Years later, one of the participants, Tom Longstaff, wrote that the Arctic allows "the study of interrelations of all the

23 Gösta Liljequist, *High Latitudes: A History of Swedish Polar Travels and Research* (Streiffert Förlag, 1993), 54.

24 See, e.g., Liljequist, *High Latitudes,* 63; Dag Avango, Per Högselius, and David Nilsson, "Swedish Explorers, In-Situ Knowledge, and Resource-Based Business in the Age of Empire," *Scandinavian Journal of History* 43, no. 3 (2018): 327.

25 Johanne M. Bruun, "The Field and Its Prosthesis: Archiving Arctic Ecologies in the 1920s," *Transactions of the Institute of British Geography* 47 (2022): 1059. For a substantial analysis, see Peder Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Harvard University Press, 2001).

forms of life in any one area. In the arctic the number of species of plants and animals is relatively limited and there is not that complication of a multitude of forms of life jostling each other as in the tropics."[26] To Longstaff and his colleagues, the barrenness of the island, the limited knots of life, was also spurring their investigations.

Eighteen men of different ages and with a range of different occupations took part in the 1921 expedition, but only seven of them actually stayed for ten days on Bear Island, "an island of fogs and storms and of the utmost desolation."[27] Their party of seven went ashore at Walrus Bay. They camped at the ruined old whaling station, described as littered with bits of machinery and timber, "and surrounded by the extraordinarily barren frost-shattered country for which Bear Island is well-known."[28] For the men on the Oxford expedition, barrenness was the first and foremost trope. For the geologists, barren meant easier access to the ground. For the zoologists and botanists, barren could be a more of a problem. The young student Charles Elton wrote:

> Our first stop was for 10 days on the barren island of Bear Island, where, however, there was an enormous population of sea-birds, especially guillemots — these seas are as rich as the land of frost-shattered rocks is poor. We camped in the ruins of a whaling station, and were remarkably fortunate in having only two really bad days,…and the other yielded a

26 Tom Longstaff, *This My Voyage* (Charles Scribner's Sons, 1950), 240. This paragraph resembles Elton's wordings in different places. Longstaff was the most, or the only, experienced participant with "any real knowledge of expedition life and problems, being Britain's most famous mountaineer-explorer, also a medical man and a good naturalist"; see Charles Sutherland Elton, *The Oxford University Expedition to Spitsbergen 1921: An Account, Done in 1978–83, Part I,* 1; unpublished ms. available at http://hdl.handle.net/11250/218913.

27 Longstaff, *This My Voyage.*

28 Elton, *The Oxford University Expedition to Spitsbergen 1921,* 13.



Fig. 12.2. Charles Elton camping in an old whale factory. The text in his notes reads, "by cooking hearth + guillemots. Walrus Bay, Bear Island, June 1921." Source: Charles Sutherland Elton, *The Oxford University Expedition to Spitsbergen 1921, Notes June 1921–August 1921,* 11. Unpublished ms. available at http://hdl.handle.net/11250/226514.

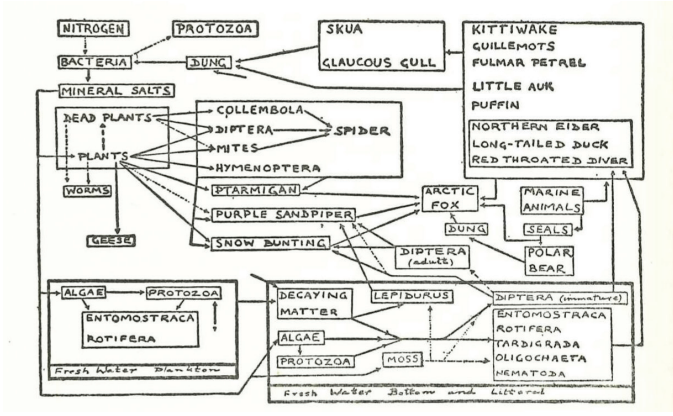


Fig. 12.3. The food-cycle diagram, based on the barren spot, Bear Island. Source: Charles S. Elton, *Animal Ecology* (The Macmillan Company, 1927), 58.

> fine crop of marine animals washed up by the storm, which went to the British Museum.[29]

The other-than-humans encountering these field scientists were not only their object of study, but also their nutrition (fig. 12.2). Bird species were cooked and eaten with varying success.

The group watched birds, queried geological formations, and collected minuscule organisms. They brought a wide range of equipment for preserving the species, for example, a glycerin mixture for water mites. Dry insects were killed in cyanide, put in screws of tissue paper and packed in cigar boxes; softer animals were put in glass tubes of alcohol or formalin.[30] Years later, Elton wrote that it was the first time that Spitsbergen and Bear Island — or any Arctic country — had been surveyed ecologically, but he added that it was "mainly at the level of reconnaissance.

29 Charles Sutherland Elton, *The Oxford University Expedition to Spitsbergen 1921, Notes June 1921–August 1921,* 5; unpublished ms., available at http://hdl.handle.net/11250/218913.

30 Ibid., 9.

The field work renged [*sic*] from terrestrial and fresh-water, down to some brackish and intertidal zones, a circumstance made possible partly by the relatively small number of species."[31] Summerhayes and Elton published their article on this relatively small number of species devouring each other, drawing up the "nitrogen cycle" that would be important for understanding the interrelation of species in ecological science.[32]

The main scientific personnel of the expedition were Julian Huxley and Carr Saunders. Huxley was Elton's mentor, a zoologist and evolutionary biologist who coined the term "evolutionary synthesis" and was later to become a popularizer of natural knowledge, working with H.G. Wells, and the first president of UNESCO. Huxley states in the introduction to Elton's *Animal Ecology* that Elton "has been fortunate in having field experience in the Arctic, where the ecological web of life is reduced to its simplest, and complexity of detail does not hide the broad outlines."[33]

The interrelated knots of life depicted in Elton's description of the food cycle in figure 12.3 is a description of the interrelation of species. The barren fields of Bear Island contributed to a diagram as simple as it is understandable: Organisms rely on other organisms. What is fascinating in this account is the way that the web of life is not described as interrelations of embodied times but as functional relations between individuals. Life is synchronous in a rather curious way in this diagram, depicting time as a cycle where every individual species has its allotted space. What happens is not "that life binds time, expanding complexity and creating new problems for itself,"[34] according to Margulis, but that life becomes a circle where complexity is reduced to a minimum. The food cycle from Bear Island, first

31 Ibid., 2.

32 Victor Samuel Summerhayes and Charles S. Elton, "Bear Island," *Journal of Ecology* 11, no. 2 (1923): 232.

33 Julian Huxley, "Editor's Introduction," in Charles S. Elton, *Animal Ecology* (The Macmillan Company, 1927), xiii.

34 Lynn Margulis and Dorion Sagan, *What Is Life?* (University of California Press, 1995), 86.

published in 1927, has been a staple of ecological textbooks ever since. For this author (me), who initially thought she was experiencing permanence on Bear Island, this diagram could be the most accurate description. The diagram depicts a time that does not change: not a time of cyclical growth, expanding complexity, but time as permanence.

Lifetimes and Deathtimes

The times of life and death are multiple. Barentsz came and killed, and named the island, and later had his name attached to the ocean surrounding it. His was a quest for conquering space, getting to China by a route other than those laid out by the Portuguese and the Spanish. The times he brought to Bear Island were the times of extermination of the species living there. When Keilhau went ashore there in 1827, it was marked by death, the material remains of once living animals informing his view of the age of the Earth. For Keilhau, Bear Island provided inspiration for the thinking of the Earth as a whole organism, where species developed from the unfinished and unformed toward perfection. The Arctic sublime that he formulated was the sublimity of transience. The barrenness of Bear Island made the diagrammatic rendition of food cycles and ecological webs of life possible, giving the individual unchanging species their allotted spaces in interrelated boxes, but leaving no room for the humans who devoured the birds as nutrition on their fieldwork.

For those of us who visited Tunheim in 2019, we wavered between transience and permanence. We were taken by the melancholy of the ruins, the graves, and the skeletons, but our sense of time was also marked by the grieving for the ongoing disaster of the waning bird colonies, the PCB that made the fish inedible, and the plastic-strewn shores. The challenge it poses to understanding the entanglement of these different times and to writing histories of the diverse humans and more-than-human encounters in the past informing the many futures becomes acute on Bear Island.

"How many tales of suffering and privations could this island tell!" Tom Longstaff exclaimed in a book years after the Oxford expedition. "Many of the tragedies of Bear Island, however, will ever remain unknown, or known only to the tribe of the fulmars and guillemots — and what care they for the misfortunes of humans?"[35] Romantic time in an Arctic sublime might not be where we want to end, but it is one of the tropes we inhabit, however geared to the fortune of multispecies flourishing we might be.

35 Longstaff, *This My Voyage,* 18.

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PART 5

Embodiments

13

Timing Motherhood, Timing Writing: A Para-Academic Meditation on My Life and Time

Rana Issa

> And you who have no millennial village? Root yourself in the wind, in the Atlantic, in the morning fog. Roots have an urgent need of different structures. The memory of your water is a root.
>
> — Samira Negrouche, "Who Is Speaking?"[1]

I already knew that my mother dreamed of being a writer when I discovered her little green notebook where she wrote her poems. She was already a proud mother of three when she decided to go back to school. She finished her bachelor's degree, then her master's, but did not finish her doctorate because her responsibilities as a mother forced her to halt her academic career and turn to making a living. One day, I heard her reading poetry to my father. He responded by calling it bourgeois drivel that did

1 The opening epigraph is from Samira Negrouche's poem "Who Is Speaking?," in *Le jazz des oliviers* (Edition du tell, 2010), and in Samira Negrouche, *The Olive Tree's Jazz,* trans. Marilyn Hacker (Pleiades Press, 2020).

not come from a place of sincere sentiment. I think that was the day my mom decided to leave my dad. But she would wait another twenty years before carrying out her decision.[2]

Writer and poet Iman Mersal points out the temporal relationship that frames our thinking about motherhood — "the day I was daughter to a mother, and the day I became mother to a child."[3] When we think about motherhood, we are directed toward the past and future at the same time. Writing about motherhood is essential because we are all children of a mother, even if not all of us are interested in or capable of writing our thinking about the uterus, whether in the biological or the symbolic sense.

Writing resembles motherhood in its temporal nature. Like Walter Benjamin's angel of history, we revisit our painful past and look anxiously to the future, whether as writers or as mothers.[4] In both functions, we turn toward the past: to our mothers and grandmothers; to all the mothers we have known and who have known us; to all the writers that we grew up reading, whom we drew from and who inspired us, or whom we opposed and disagreed with, whether consciously or subconsciously. At the same time, we turn toward an uncertain future that begins to take shape the moment we decide to keep the fetus, or when we imagine that we are certain to find readers for what we write. The moment of becoming pregnant with a fetus and the moment of discharging an idea on the screen (i.e., giving birth to it) overlap insofar as both are acts of creation, even if the product of writing is nothing like the severing that happens at the birth of a baby.

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2 I would like to thank Suneela Mubayi for support in translating the text from Arabic to English and for general editorial feedback.

3 Iman Mersal has been a trailblazer for my thinking on motherhood. See Iman Mersal, *How to Mend: Motherhood and Its Ghosts,* trans. Robin Moger (Sternberg Press, 2019).

4 Walter Benjamin's "angel of history" is from Benjamin, "On the Concept of History," trans. Dennis Redmond, *Marxists.org,* https://www.marxists.org/reference/archive/benjamin/1940/history.htm.

What makes the two different is the relationship to space. Writing is a means to break out of a linguistic prison that keeps us chained in the conventions of our surrounding environment; pregnancy is a fission of the self that compels the woman to redefine her body's relationship to its surroundings. Yet writing and motherhood reconverge when we look at our literary legacies through the metaphor of motherhood. When Maggie Nelson plays on queer thinker Eve Sedgwick's phrase "the many-gendered mothers of my heart," she means all the writers in whose writings we find love and liberation, be they men, women, or any other shade on the gender spectrum.[5] For male writers, especially structuralists and those who came after them, writing is the only recourse to creation, and for them, just like for many mothers whose only labor is to be mothers, writing becomes a prison house.[6] For me, liberation has come on two levels: those writers I read and fall in love with, who open up new pathways in my mind, and watching my mother wrestle with words and seeing her psychological condition improve with every article she completes.

I am not entirely sure who inherited writing from whom. Did I inherit it from my mother, or did she inherit it from me? I know for a fact that her mental state would improve with writing, when neither psychoanalysts nor psychiatric medication had the same result. Writing helped my mother to shake off her chronic depression and replace it with self-confidence, without letting go of her sorrow and pain. My mother learned to write, just as she learned to swim, when she was older. She first learned to swim along with me when I was two, and she published her first novel at the age of fifty.

The atmosphere she grew up in was nothing like the one that she provided for us as children. She grew up fatherless, in a poor family that preferred males over females, at a time when

5 Maggie Nelson is a profound inspiration. See Maggie Nelson, *The Argonauts* (Graywolf Press, 2015).

6 The concept of prison house comes from Fredric Jameson's famous work. See Fredric Jameson, *The Prison House of Language: A Written Account of Structuralism and Russian Formalism* (Princeton University Press, 1974).

economic opportunities for men were much greater than those for women. At least that's what my grandmother believed, and that is how she raised her seven children. She did not know that her refugee world had already started to change, and that her daughter Samia, who insisted on studying, would turn out to be the most successful of her children.

My grandmother, a Palestinian refugee from Tarshiha, was illiterate. She could not even write her own name, Izdihar. In Arabic, it means "to flourish" and is derived from the same root as "flower" (*zahr*). No one taught her to write it, not even any of her daughters. In the misogynist world she grew up in, women were not supposed to flourish or educate themselves. They were destined only for marriage and having babies, to be retained by men until they shriveled up like withering flowers. Indeed, in one of the etymological definitions in the *OED,* the "mother" is the mass of skins left over from grapes after they are pressed for wine. In the Arabic lexicon, the word for "illiterate" is *ummi,* and the same word means "my mother" in the possessive form. To be illiterate in Arabic, then, is to only know your mother's tongue. It is as if you have severed the natal bond and entered the world of voluntary affiliation, the world of letters, where you substitute your *umm,* your mother, for an *umma,* your new nation. So when the Angel Gabriel ordered the Prophet Muhammad to recite, he was asking him to sever himself from his *umm* and join himself to an *umma* of his own making. This nation would be dominated by men for most of our history. These men read, they wrote, and they excluded women from such activity.

The *umma,* for those of us who inherited Arabic at birth, through the womb that carried us, is the nation that shares a common language. This is how we understand our position in the world, and in a sentence, whether we are subjects or objects, passive or active, transitive or intransitive in our gestures. Yet this nation always spoke to us in a snarling voice and held a wooden ruler with a metal edge. That's the ruler that the Arabic teacher used to smack us with on our little hands to help correct our pronunciation, particularly when it came to the correct declension on the final syllable of each word. No one smacked

Izdihar to correct her pronunciation and straighten her tongue away from her mother's tongue.

My grandmother resembled Roald Dahl's grandmothers in her vitriol at life.[7] In the stories I tell my two children about Izdihar, I always make her an evil, dangerous witch who does not like children much. My young son hides his head under the covers as I tell him how much the witch Izdihar loved the taste of children's flesh. Truth be told, she was not a greedy woman, and she substituted biting into our arms with eating sugar. Izdihar was born during the Great Arab Revolt. She lived through the Palestinian *nakba,* which would remain a part of her until the day she died in a dilapidated hospital in the Palestinian refugee camp of Burj al-Barajneh, where rats gnaw at the flesh of Lebanon's forgotten.

As I write, I stare at her ring that sits on my finger. I "inherited" that ring from her when I found it tossed between piles of old papers in my father's house. I remembered how it grew tighter on her finger with every passing year. I tell my children that this ring has magical powers and can slay the biggest giant. I have in fact tried out its powers in my daily battles between Oslo and Beirut. All I have to do is rub it and make a wish for my heart to be filled with courage and my tongue to breathe out fire that reduces the wicked to a pile of ash. The power of this ring lies in my grandmother's bitterness at life. This bitterness was bequeathed to me, and it would always remain with me. It is also what has shaped my literary interests for most of my life.

I always felt my grandmother was the shameful legacy that I had to conceal from the eyes of the world. A long time would have to pass before I could accept that to lay myself bare was necessary for the writing of history.

My mother dissociated after the passing of my grandmother Izdihar in her sixties. Since then, I am always struck by the terror of that detachment that is created when a mother dies. My mother wrote a novel about a woman in her fifties who first

7 Dahl has many evil grandmothers in his books. I am especially recollecting Roald Dahl, *George's Marvelous Medicine* (Jonathan Cape, 1981).

comes to know her own sexual desire in a filthy public toilet in one of Lebanon's Palestinian refugee camps. She never opposed my desire either. She was sympathetic to it and protected it from my father's austere rules. Like her own mother, my mother also liked children's flesh, but she never wanted to become a witch. She was educated, with knowledge as her weapon, and would not have fit the persona of a stereotypical fairy-tale villain. My mother decided that if there was an archetype she was going to follow, then motherhood was the best archetype to create the necessary strength to remain alive with dignity. My dad encouraged this archetype and would always repeat in front of us that the lioness is more powerful than the lion, and Mom would respond, "Yes, I can rip out and devour the heart of anyone who tries to hurt my children, whoever he may be." We believed her, because we knew she had a pent-up rage that would boil over like a volcano whenever the military offensives against the Palestinian camps intensified during the Lebanese civil war. She was like a lioness prowling the cage of the house, cleaning it obsessively, tearing at us and herself whenever she lost her temper if we neglected the chores she assigned for us to perform around the house. My mother would keep telling me, "Make sure you don't get pregnant before finishing your PhD!" Motherhood for her was an obstacle that she did not always know how to overcome. My younger sister and I did not heed her advice. My sister was the first to get pregnant, and then I got pregnant about a year later. I had just started my master's.

A psychotherapist once told me that being a mother was incompatible with becoming a writer, so if I really wanted to develop my writing, I had to sacrifice "a little bit" of my motherhood. I had read enough Freud and Lacan to know which gospel that therapist was getting her crackpot ideas from. When I pushed back at her, she recommended I read Elif Shafak's *Black Milk*.[8] I started to read the book, quickly grew annoyed with that character torn between writing and motherhood, and never

8 See Elif Shafak, *Black Milk: On the Conflicting Demands of Writing, Creativity, and Motherhood* (Penguin, 2013).

finished it. Why all this romanticizing over being a writer? Isn't writing a job like any other? Would my therapist have told an engineer or a hairdresser (or a fellow therapist, for example) that being a mother was incompatible with these professions, and that if one of them wanted to be successful at her job, she would have to sacrifice part of her motherhood? Would she still consider herself a feminist if she pronounced a judgment like this on women who practice other professions?

Long before these therapy sessions, I had already grasped that it was writing that allowed my mother to play the role of the lioness in our lives. When she decided to become a professional writer, I was studying for my high school graduation exams, my younger brother was in elementary school, and my father was about to embark on a long series of precarious jobs in the Gulf labor market that relied upon exploitation and trampling of basic rights. My mother began working as a journalist, and the income she made from writing became critical to the economic well-being of our household. We would feel proud whenever we read her name printed below the title of an article in the newspaper. I enjoyed reading what she wrote about the world outside the house. She was courageous and incensed and paid no attention to censorship. The boldness of her articles would add to the atmosphere of excitement in the house, and I felt proud of her every time she fearlessly wrote about the ruling political mafia, saying what most journalists at the time did not dare to utter. Being a mother lay at the backbone of her writings, for she loved people and named them in her pieces the way a mother names her children when they are born. She was a lioness to them, and to us.

Like my mother, I too found my way to writing through motherhood. My reading of Freud was not of much aid when I decided to become a writer. This man saw the pen as a symbolic phallus that ejaculated its ink like semen to grant life to words. His gender blindness ignored women and their writings. As for me, I had already become a mother when I ran away from my lover to another lover, because I was attracted by the latter's dream of becoming a writer. But my passion for him began to

dwindle when I realized that he too did not seem to take the writing of women seriously. One day, I could no longer put up with him repeating Freud's nonsense. Enraged, I collected all the pens I could find in the house, stuffed them into my cunt, and yelled: "I am Creation, not that phallus and the ink inside it, you piece of shit!" He looked at me in disbelief, and said I was crazy.

As my friend Zeina reads this text, she asks me to say something about madness as a kind of deviance in the spoken and written word. Her feedback captures the most crucial idea that sprang up inside me: In that lover's eyes, I became insane because I restored pride to my cunt by bringing those metaphors crashing down on top of each other and making my cunt deviate into the written word.

Something opened up inside of me when my daughter Nour was born, as if I gave birth to myself as a writer in the same moment. Not all women are like me; some find writing in the cunt itself, others in their fingers, and others in their nipples or in the anus, for instance. In my case, writing came to me when I split into myself and the fetus. I chose a name for her just as I would learn to choose words for ideas that I wanted to express but could not quite grasp yet. The choice of her name was first inspired by her paternal grandmother. I did not use the exact same name, but rather tweaked it to fit in with my point of view, just as the case is with writing — the professor gives me a concept, I migrate it to a similar concept, but one that is my own. It is as if words do not become my own unless I rip them out of the mouth of someone older and more knowledgeable than I. I take the name and modify it, to disrupt the conventional, accepted meanings of words.

At the start of my motherhood, I found that the restrictions imposed on my time helped me to focus; I did not have more than two or three hours in a day for writing. The rest of the day was taken up by breastfeeding, changing diapers, and putting my baby to sleep, a full-time job all by itself. So I would write as if I were in a race against time, and I had to become a mother to sense how palpably exhausting this race was.

This race would become tougher when I emigrated to Norway and found myself illiterate once again. I was intimidated by the marginal status I found myself in, for my self-image had no place for such weakness. Moving to an environment that spoke a language I did not know placed me outside its social contract and took me back to what I call a "primaliterate" state, where I was once again *ummiya,* "illiterate." During those days, my father would support me by reminding me that language is a tool, "a key," as he called it. I found the way to this key through my daughter. She was the one who taught me Norwegian. I would read out stories to her of which I understood nothing, forcing myself to enunciate these new sounds and roll them around my tongue, imitating her pronunciation. Language is a tool. Language is the mother's tongue. And my daughter became my mother and my tool of adapting in this new world.

In one of the stories included in the collection of Palestinian folktales *Speak, Bird, Speak Again,* a daughter is born to a mother whose husband never makes an appearance.[9] This child turns into a *tanjara,* "cauldron," that takes in everything her mother desires, and is fittingly named "Tunjur." I read this story to my daughter repeatedly as if I had no control over myself. I kept reading it to her even though she was not that interested in it. She would listen patiently, helped by the fact that the story was short. As I repeatedly read this text, I realized that I was actually reading it out to myself each time. I also began to notice the deep-seated feeling of disgust that this story used to fill me with, and that my re-reading it to my daughter was an attempt to understand how I became her daughter and she my mother. I also hoped that I would be stronger than to make my daughter into a cauldron for my desire.

9 *Speak, Bird, Speak Again* was based on anthropological research and the collection of Palestinian tales by Ibrahim Muhawi and Sharif Kanaaneh. The book was published by the editors in English translation: Ibrahim Muhawi and Sharif Kanaaneh, eds., *Speak, Bird, Speak Again* (University of California Press, 1989). The Arabic transcription of the tales was published in 2001 by the Institute of Palestine Studies.

My new illiteracy returned me to my primal mother, Izdihar. It was necessary to rid myself of Izdihar if I did not want to become a witch. In my stories, Izdihar was evil. My illiteracy filled my heart with dread. At that time, I spoke with my mother daily to ask her about cooking various dishes I had craved since childhood. Over distance, I learned to master dishes such as *mjaddara, mloukhiye,* and *laban immo.* When I lived with her at home, she did not care to teach me to cook. She preferred that I master other forms of knowledge rather than the culinary arts. In my primaliterate stage of living abroad, cooking was the only means for me to restore a sense of balance in the domestic sphere. I cooked like a mother who had inherited recipes passed down to her from her own mother by word of mouth, so that I could learn to speak once again from my own mother, at a time when I was dealing with a new reality: My daughter had become a mother to me in this faraway (and frozen) land, through the new language. I had not yet understood that in Arabic, *adab* (literature) shares the same root with *ma'duba* (feast), as I would be taught by Ahmad Faris al-Shidyaq, one of "the many-gendered mothers of my heart."[10] I discovered the connection instinctively, as rolling words around my tongue resembled my adventures in the supermarket, where I would mix up different items. For instance, I would buy fish when I intended to buy mozzarella and end up spoiling the salad that I would eat anyway, because throwing away food is unforgivable.

When I decided to get pregnant again, I was thinking primarily of my daughter, since the psychological states of her mother and father with their neuroses complicated her role as mother to us. Therefore, she needed a sister to shoulder the burden of this role with her. To make the burden easier for her, the fetus had to originate from the same father, since I had become certain that this marriage was doomed to end. When I repeated this logic to

10 On al-Shidyaq's approach to language and to literature, please see Rana Issa, "Carnal Feasting and Literary Scandal: How Ahmad al-Shidyaq Theorized the Literary," *Hypotheses: Trafo Blog for Transregional Research,* February 14, 2023, https://trafo.hypotheses.org/45305.

my sister, she said it was insane. "But all pregnancy is insane," she added, "and you are surely not the first woman to be insane in this sense." Linguistically my sister had a point, because in Arabic *janin* (fetus) derives from the same trilateral root as *junun* (insanity).[11] So the link is embedded within language itself, between insanity and the mother who decides to make her body a cauldron for a fetus about which no one knows anything, neither what it will look like nor what it will be like when it grows. Tarek el-Ariss further points out the etymological connection in Arabic between madness and the fetus by reminding us of the third semantic meaning of the same root, "concealment." Fetuses are always hidden within, to be felt but not seen. Thus, the Arabs call the umbilical cord that connects the mother to her fetus "the secret cord" or "the cord of deliverance," because it can deliver you to death should it wrap around your neck, and the doctors do not notice the strangulation and act to prevent it before it is too late.

Words wrap themselves around ideas, at times getting the meaning right, and at others strangling it. A friend comes to edit my text, to free it from any lame expression. She carves open the belly of the text and liberates meaning from being let down by the body. When the labor pains came to announce the impending birth of my son Hakim while he was still in his eighth month in my belly, my water gushed out like a waterfall. Hakim the fetus was not yet sufficiently developed. At the hospital, they asked me to remain in a sleeping position as long as I could so that his lungs could form, so I remained like that for three days before commencing with the delivery. He was frail when he came out of my belly. What I noticed later on was his great fear of water. He hated to bathe and every time he did, he would cry out for help like someone drowning. He also hated rain and disliked swimming. I could not find any rational explanation for

11 When I puzzle over Arabic words, I have a few dictionaries that I like to consult. These include Ibn Manzur's *Lisan al-Arab* and al-Zubaydi's *Taj al-Arus.* Tarek el-Ariss wrote on *junun* and madness in el-Ariss, "Majnun Strikes Back," *International Journal of Middle East Studies* 45, no. 2 (2013): 293–312.

this phobia of his, but I can say with near certainty that his fear of water as an independent human being was an expression of my body letting him down when he was still in my womb.

That is how Hakim was born. My sister chose his name because she always intuitively grasped what I had in mind. She named him Hakim after my late uncle, who died after his heart could no longer tolerate the cruelty of this world. By doing this, she not only paid tribute to his memory, but also mended ties in our family, for Uncle Hakim had been the glue that kept the Issa clan from disintegrating. With Hakim, I learned to be a mother all over again. Writing had become a part of my daily life, and now Norwegian had become one of my languages, in reading, speaking, and even writing.

I became pregnant with Hakim just before applying for my PhD with a project on Arabic Bible translation. This pregnancy was not like the one that preceded it, for I was not alone in this new motherhood. At the same time as he was growing inside me, one of my closest friends, Line, was pregnant too. She lived the experience alongside me. We would go to the pool together and take turns swimming, read the news of the revolutions in Tunisia, Egypt, and Yemen. We learned together how to use Twitter to follow the worsening situation on the ground (the ground, of course, being our ravaged Arab countries and not the ground we walked on every day in Oslo). Together we would learn to be mothers to boys. Together we would expand our feminist horizons and contemplate an alternative future for masculinity.

Maggie Nelson writes that her conceiving a boy forced her to admit to herself that this fetus inside her would be its own independent person after it slid out into the world. It would not be possible to make her son into another Tunjur-like cauldron to nourish the feminist principles that she held before his birth — it might have been if she conceived a girl. Yet she realizes that if a mother breaks the barriers of gender roles in her upbringing, she can in fact make her son into a cauldron for these principles. How lovely Nelson is with her ideas on motherhood that go against the most firmly entrenched of social roles. What I love most about her is how she tries to think about motherhood

at a time when transgender people are winning unprecedented recognition. Her lover is a trans man, yet this time she is the one forced to accept the biological reality of a baby in her womb. This baby compels her to let go of her certainty about the ability to have control over the state of her body, since motherhood takes the mother's body out of her hands. For some mothers, this causes a state of pathological control, which expresses itself as an obsession with cleanliness, looking proper, and being strict with the children. This style of mothering can be seen particularly in my mother's generation. In her book on the civil war in Beirut, Jean Said Makdisi talks about the stubbornness of women in remaining steadfast in the face of the violence and danger all over the city.[12] Having control over space inside the home compensated for losing control of the city.

I agree with her reading, yet I also wonder whether this obsession with control could be also caused by motherhood in and of itself. Could it be that motherhood imposes such a relationship with the world? A loss of control does not necessarily mean a loss of agency, even if this loss of control causes pathological symptoms in some women, from postpartum depression to obsession with cleanliness. Here, the moment of birth may have significance. We go into labor, that is, the birthing process begins, meaning there is no doubt now that the baby is coming. But, it will not slide out unless we embrace labor pains and engage with them instead of resisting them and accept that the only way to overcome this labor pain is to replace it with an even greater pain, to push with our cunt muscles with all the strength we've got for the birth to be completed. It is a power we do not know lies inside us. We push, we breathe, breathe in, push, breathe out, until the baby comes out.

How strange it is that obstetricians in the Arab world (who are mostly men) encourage women to take an epidural injec-

12 Jean Said Makdisi, *Beirut Fragments: A War Memoir* (Persea Books, 1990), is cited here, but I could have equally cited her other magnificent book, Jean Said Makdisi, *Teta, Mother, and Me: Three Generations of Arab Women* (Norton, 2007), for its relevance for my thinking about motherhood and writing.

tion to deal with the pain. They do not want women to access that power they have inside them to soak up pain and their ability to bring about life from the very epicenter of the agony of childbirth. This doesn't mean that the women who opt for an epidural have missed out on getting to know this power, because motherhood keeps putting us to the test in various contexts, even those that make women refrain from having biological children. Concerning this, it is worth mentioning a fine poem written by Sara Mourad about those women who decide to not give birth.[13] She is right in claiming that being a mother in and of itself does not make you anything special, and will not automatically make you stronger or weaker, more responsible or neglectful (this holds true equally for both mothers and daughters). And being a mother will certainly not automatically make you a writer. Nevertheless, labor pains might help you to deal with the pain of writing, for writing brings with it terrible pain. And speaking of anesthesia, what editor can empower the writing of many-gendered mothers without sedating it? In Arabic writing, sedation is often synonymous with an obsession with correct grammar over content and the imposition of a rigid formal diction on the text.

Regardless, with or without the epidural, and with or without strict formal Arabic, the labor pains of motherhood or writing — with all their accompanying transformations — leave a lasting effect on women who decide to undergo the process of becoming mothers (whether through their uterus or by other means) or writers. If any woman happens to be interested in motherhood, she will realize that the experience of going through pregnancy will irrevocably change the way she looks at her body, even if she decides to adopt a child or live her life without children. It is gaining consciousness about the relationship to the self that divides onto itself. For the duration of pregnancy, our understanding of space and time becomes schizophrenic. In my belly lies the future, and my body is no longer my own

13 Sara Mourad, "Letter to a Childless Woman," *Rusted Radishes,* http://www.rustedradishes.com/letter-to-a-childless-woman/.

sole property, since the fetus is I and we, she, her and him, and their plurals. All the pronouns flow through this channel linking the mother and fetus. Reproduction imposes a schizophrenic and multiplicative logic on the mother. The same goes for writing. We read, then we write, then others read us and they write. "They" are just as "us," pronouns open to all possibilities.

Recently, the number of pictures posted by friends on social media of the dogs and cats they have adopted has increased (even spawned), in contrast to the number of baby pictures, which has dropped sharply. It is as if the massacres that have come one after the other have made people afraid of the future. And the fetus embodies the future par excellence. Today, we have animals instead to fulfill the need people have to be mothers, be they men or women. Freud would not have been able to make sense of this emotional displacement. When you are a mother, the emotion of love is displaced from the center (the ego in Freud), and one learns that love is what launches us into the orbit of the person-planet that we love. We orbit around them and take care of them. We feed them, change their diapers, and put them to bed, and in doing so find some peace of mind. As I "heart" picture after picture of my friends' pets, I realize that the emotion of motherhood is not the sole purview of women, nor do we experience it exclusively toward other human beings. Moreover, with the solitude imposed on our lives by the COVID-19 predicament, we all needed to activate this feeling if we wanted to remain mentally balanced. Motherhood is a distinctly political emotion in its ability to forge bonds between humans, and even between humans and other living beings. This was my experience of the Lebanese revolution of October 2019. I became conscious of motherhood as a political act. I adopted people and others adopted me. We nursed each other and soothed each other's wounds. We would look under the bed together to make sure there were no ghosts hiding in that darkness and get annoyed at one another if one of us forgot to put the toothpaste cap back on. How, then, can we harness the latent political power that lies in motherhood?

Here, we can take the help of Shidyaq, specifically his linguistic semantic theory, to sketch the outlines of this force. According to Shidyaq, if we reverse the order of letters in the root of any word, we will arrive at its synonym or antonym. For example, if we reverse *umm* (mother) we get *ma'* (water) and *mawa'* (kitten-meowing). Meowing reminds me of an article by the Australian scholar Deborah Bird Rose where she examines Walter Benjamin's angel of history.[14] What if this angel were a dog or cat, she wonders, barking or meowing out of pain, and mourning its losses over desolate nights, just as it barks or meows to search for fellow canine or feline comrades wandering aimlessly in the wilderness? As for the word "water," it evokes for us a long history of the link between the mother and the sea (and maybe the fear of drowning, too). The bodies of mothers, in fact all bodies, are bodies of water. To take care of water — the mother of life — is to take care of ourselves, of our own bodies and of our desires and wounds. The Native American poet Natalie Diaz writes of water as the primal body:

> …water is not external from our body, our self.
>
> My elder says *Cut off your ear, and you will live. Cut off your hand, you will live. Cut off your leg, you can still live. Cut off our water,* we will not live more than a week.
>
> The water we drink, like the air we breathe, is not a part of our body but is our body. What we do to one — to the body, to the water — we do to the other.[15]

Today, I have all the water in the world. I drink water straight from the tap in Oslo and am at ease because I know I am drinking the cleanest water on the planet. I go with Hakim to the lake that is the city's water reservoir. Are there really no toxins in this

14 Deborah Bird Rose has a great piece on anthropological ecocriticism. See Deborah Bird Rose, "What If the Angel of History Were a Dog," *Cultural Studies Review* 12, no. 1 (2013): 67–78.

15 I am transformed in the presence of the poetry of Natalie Diaz. See, especially, Natalie Diaz, "The First Water Is the Body," in *Postcolonial Love Poems* (Graywolf Publishing, 2020) (emphasis original).

water? These waters have nothing to do with the salty water of Beirut's Mediterranean that remains closer to my heart, in spite of all the toxins and shit pouring into it. I left Beirut because I am a mother afraid for her children's future in a city devastated by the violence of its criminal politicians. All the water in Oslo's reservoir cannot compensate for the distance separating me from my own mother. I have left her behind in her beautiful house to grow old alone in that city whose doctors are abandoning it, whose water is drying up, and whose life force is ebbing away.

A mother growing old is like a child growing older. Both remind us of how time stops for no one, and of the hours and days that evaporate as we lose the race that should not be a race in the first place. I do not know how to bridge this enormous distance that I have brought into being between myself and my mother. It is as if giving my children a better chance at a decent life entails losing my mother in the unfathomable distance that separates us.

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14

The Stone That Ran to Paris: Notes on Waiting (and Care)

Hugo Reinert

Introduction

In the winter of 2015, on the occasion of the COP21 climate talks in Paris, the Swedish national theater Riksteatern organized an activist intervention titled *Run for your life*.[1] The event took the form of a continuously live-streamed, long-distance relay race from Kiruna, in northern Sweden, to Paris, France. Over the course of three weeks, several thousand runners ran this distance, one after the other, day and night, in an uninterrupted chain that covered almost 4,500 kilometers and passed through multiple European countries. The final runner was scheduled to arrive in Paris on November 30, just as the climate talks began. Each runner carried in their hand a small, round white stone that they passed from one runner to the next, as a relay, at the end of each segment.

1 Riksteatern, "Run for Your Life — TRAILER," *YouTube,* August 27, 2015, https://www.youtube.com/watch?v=yx65zyFJFy. See also Riksteatern, "Run for Your Life," https://www.riksteatern.se/runforyourlife.

This is a text about that small white stone, which was picked up on the shores of the Arctic Sea and traveled all the way to Paris, and beyond. Like other contributions to this volume, it emerges from the Lifetimes research collective,[2] a critical time studies group based at the University of Oslo, and the various topics and concerns we worked through together over the course of its lifetime. For me, these included particularly the multiplicity of time, the materiality of temporal work, and an understanding of temporal forms as contingent achievements that require effort, resources, coordination, and creativity to maintain.[3] Reflecting this, the present chapter explores a series of situated, embodied temporalities clustered around that small white stone: from the intimacies of biographical time to the grander time frames of colonization or geological deep time, to the times of stone itself and its trajectories, both during the race itself and beyond. In writing out these times, the text circles that stone in the hand as something like a catalyst, or a mobile site of recombination: a kind of *temporal contact zone* within which distinct temporal rhythms could be brought together and made to coexist, sometimes in novel ways. The space it formed was transient but also in its own ways durable, capable of transposition and reassembly. It *moved,* possessing a life of its own beyond the immediate context of the race. In the simplest sense, what I am trying to do here is trace the movements, intersections, and recombinations of that small white stone in the hand as a figure of time, something like a concrete metaphor.

During my time with the Lifetimes collective I was also thinking about affect, in its relation to time and temporal practices, as well as the many ways — some strange, some mundane — in which the idea of deep time can thread itself in and out of everyday life, in small gestures and mundane events, tangling itself in the quotidian in ways that are often richer, more intimate, and

2 "Lifetimes," *University of Oslo,* March 1 2018, https://www.hf.uio.no/ikos/english/research/projects/lifetimes/.

3 Helge Jordheim and Espen Ytreberg, "After Supersynchronisation: How Media Synchronise the Social," *Time & Society* 30, no. 3 (2021): 402–22.

more generative than the epochal literature of deep time vistas might prepare you for.[4] Often as not, the smallness of small things turns out to be anything but — much like the smallness of that white stone, passing from runner to runner (hand to hand) in ways that have now occupied my imagination for years, ever since I first encountered it in the context of the race. On a theoretical and personal note, this text is also an attempt to clarify for myself this mostly benign preoccupation: to draw out and name the "lithic intimacy" of the stone, and the strange, magnetic potency inherent in the gesture of holding it.[5] A "minor gesture," perhaps; a small movement, charged with unexpected resonance.[6]

My interest in these matters — in the stone and the race, in the various temporalities they brought into play — is also situated within my ongoing research on the so-called Scandinavian resource frontier, particularly my more recent work on resource extractivism and capitalist geologies.[7] One thread in this work has interrogated the "ontological politics" of the line between life and non-life — between organic and inorganic, biology and geology — as it winds through the dominant resource imaginaries of the European north, and the various modes of colonial extraction and resource colonialism that these imaginaries subtend.[8] In attempting to reground this inquiry in time studies, in

4 Hugo Reinert, "Fossil," *Environmental Humanities* 14, no. 3 (2022): 575–78.

5 I borrow the phrase "lithic intimacy" from Jeffrey Jerome Cohen's *Stone* (University of Minnesota Press, 2015), where it marks an aspect of what Cohen calls "geophilia," a human love for stones and earth. "Lithic intimacy runs slow and deep" (24), he says.

6 "Minor gesture" is a term I take from Erin Manning, *The Minor Gesture* (Duke University Press, 2016), 1: "the gestural force that opens experience to its potential variation […] from within the experience itself, activating a shift in tone, a difference in quality."

7 Hugo Reinert, "Notes from a Projected Sacrifice Zone," *ACME* 17, no. 2 (2018): 597–617; Hugo Reinert, "The Midwife and the Poet," *Environmental Humanities* 11, no. 1 (2019): 137–51; and Hugo Reinert, "Emptiness," *A to Z of Shadow Places Concepts,* 2020, https://www.shadowplaces.net/concepts.

8 Hugo Reinert, "About a Stone: Some Notes on Geologic Conviviality," *Environmental Humanities* 8, no. 1 (2016): 95–117. See also Elizabeth Povinelli, *Geontologies: A Requiem to Late Liberalism* (Duke University Press, 2016).

the context of the Lifetimes project, I was inspired by a number of scholars, but perhaps most directly by the work of Deborah Bird Rose and Michelle Bastian on what they call "multispecies knots of ethical time."[9] Their use of the knot as a figure for thinking time as a form of coexistence across difference helped me imagine the stone in the hand as another such figure, akin to the knot: a gesture binding distinct temporalities into relation, across (and in defiance of) what Manuel DeLanda called the "organic chauvinism" of Western thought.[10] To some, the proposition that an inorganic material such as stone might challenge you to respond and coexist with it ethically — in a morally adequate way, not reducible to its value as a resource[11] — might seem difficult to conceptualize. As I will come back to, however, this is precisely what I think the small white stone does.

The following four sections sketch out four key moments in my trajectory with the stone. The moments follow each other in sequence, linked to specific locations, but each also forms a sort of self-contained "plateau" in its own right, involving temporal forms and experiences that may be diffuse, contradictory, overlapping, or nonlinear. One by one, I use these moments to chart temporal logics that are in play around the stone, and to open up, also, some of the broader questions I am interested in: questions about attunement, for example, both as a method and

9 Deborah Bird Rose, "Multispecies Knots of Ethical Time," *Environmental Philosophy* 9, no. 1 (2012): 127–40, and Michelle Bastian, "Encountering Leatherback Turtles in Multispecies Knots of Time," in *Extinction Studies*, ed. Deborah Bird Rose, Thom van Dooren, and Matthew Chrulew (Columbia University Press, 2017).

10 Manuel DeLanda, *A Thousand Years of Nonlinear History* (Swerve Books, 1997). I pick DeLanda here because I like his turn of phrase; there are many (many) other thinkers who have circled this exteriority of the inorganic. See, e.g., Povinelli, *Geontologies*.

11 I have in mind here the notion of "response-ability," particularly as articulated in Rauna Kuokkanen, *Reshaping the University: Responsibility, Indigenous Epistemes, and the Logic of the Gift* (UBC Press, 2007), 39, as "an ability to respond, to remain attuned to the world beyond oneself, as well as a willingness to recognize its existence *through the giving of gifts*" (emphasis added). See also my own earlier work on "geological conviviality," Reinert, "About a Stone."

as an ethnographic reality; about how to narrate the complex temporal enmeshments that occur at the point where time becomes simultaneously most interesting and also most difficult to describe; and about what it means, finally, to *wait*.

What does it take, and what might it *do,* to attune yourself to the deep, inorganic temporalities of rock when presented to you like this, as a small white stone warming in your hand? In the end the chapter pulls some of these threads together, relating them to the central questions that have animated both this edited collection and the Lifetimes project itself: Does it matter that time is multiple? Does it *matter* what a small white stone might have to tell you — if you paused, for a while, and held it in your hand?

Giron

It begins gently. In the snow, the figure of a woman comes down a mountain, holding a stone.[12] Words appear on the left-hand side of the screen (we are watching a screen) and a voice, hers, begins to read them out — slowly, a little haltingly at first. The text she reads out tells us that her name is Jenni Laiti and that we are in Kiruna, in the far north of Sweden.[13] This is Sápmi, in other words, the ancestral Sámi homeland that stretches across the north of Scandinavia and northwestern Russia,[14] and the Sámi name for Kiruna is Giron, the name I will use from here on out.[15] The race to Paris has begun here, and Jenni is the first runner. She wears a gákti, the traditional Sámi garb. Addressing us, the viewers, she introduces herself as "an Indigenous Sámi artivist, mother, companion, traditionalist, protector, visionary,

12 As of mid-2023, the time of writing, the video of the performance is no longer available online. My discussion here is based on recordings I made at the time of the race and in the immediate aftermath.

13 For artist profile, see Jenni Laiti, *Jenni Laiti,* https://www.jennilaiti.com/.

14 See, e.g., Sanna Valkonen et al., eds., *The Sámi World* (Routledge, 2022).

15 I thank Jenni Laiti for flagging, in an earlier draft of this text, that the geographical name "Kiruna" is itself a colonial inscription that should not be reproduced uncritically.

and human being." Her voice continues as she walks toward us. The camera keeps pace, retreating as she advances. Descending, she passes people standing by the side of the road. One by one the bystanders join and start to walk with her, forming a procession. As they walk they begin to sing, softly at first, gently beating their chests with closed fists, as if mimicking the rhythm of a heartbeat. More and more bystanders join in and their song becomes discernible over Jenni's voice, like a hymn, rising in the background. The song is a joik, a traditional Sámi musical form.[16] Like Jenni, many in the procession are wearing the traditional gákti; most likely they too are Sámi.

The mountain they descend is called Luossavárri, "salmon mountain," in northern Sámi. Nearby lies its neighbor Gironvárri, "grouse mountain." Between them, the two mountains preside over one of the largest iron deposits in the world. At their foot, nestled in close, lies the northern mining city of Giron. For more than a century, since it was founded in 1899, Giron has sat at the heart of the project of Swedish industrial modernity, cornerstone of a grand (and lucrative) national narrative of steel, progress, and wealth. The city was built to service the mine, which was constructed, in its time, by the industrial colossus Luossavaara-Kiirunavaara Aktiebolag (LKAB). LKAB still operates the mine today, and the mine is enormous. Since operations began, in 1898, the Giron deposit is estimated to have yielded almost a billion tons of ore: an unimaginably vast amassment of raw material, "resources," tunneled out from under the mountain through an ever-expanding honeycomb of industrial passages. Over time, the force and burrowing hunger of the operation has undermined (literally) the geological structure of the locality — reaching the point, around the turn of the century, where the town itself was beginning to subside, as

16 The joik (or yoik, as an alternate spelling) is called *Gulahallat Eatnamín* and originated with the Sámi artist and activist Sara Marielle Gaup Beaska; see 350.org, "Gulahallit Eatnamin: We Speak Earth," *YouTube,* October 14, 2015, https://www.youtube.com/watch?v=H2LhBAi-Q8I. The name of the joik translates from northern Sámi as "we speak Earth." See also Stéphane Aubinet, "The Craft of Yoiking" (PhD diss., University of Oslo, 2020).

the mine ate away the ground beneath it. Addressing the threat posed by this, a decision was made in 2004 to physically move the entire city 2 kilometers east, out of the way, so as to let the mine continue expanding.[17] Over the following years, valuable and historically significant houses were placed on flatbed trucks and rolled out to their new locations. Most of the rest of the town was demolished and rebuilt.

Much has been written about Giron, and about this translocation in particular. For me the story began in 2013, when I met an anthropologist, Elisa López, who worked in the region and was the first to tell me the story of Giron.[18] The same year, the Swedish filmmaker Liselotte Wajstedt also released her elegiac cinematic memoir *Kiruna Rymdvägen* ("Kiruna: Space Road"), which documents her return to Giron, her hometown, and her attempts to trace the eerie dislocations of this temporal interval in which the town was no longer where it used to be, but not quite yet somewhere else.[19] Through interviews, animations, and walks through the city, her documentary tells the story of a land eaten from below, physically hollowed out by the relentless extractive process: a town on the edge of the pit, not even two centuries old but haunted, fearful, exhausted. Distant explosions bellow in the deep, startling the reindeer. Houses crack in the middle of the day. A sense of progressive uncanniness envelops the town, as of some inexorable decline. A road collapses: "We'll all find ourselves down there eventually, at the bottom," one interviewee remarks. A father tells of his anxieties entering the mine, his fear for his son who follows in his footsteps. The son is unconcerned, feels "safe" in the mine. One of the central

17 See, e.g., Tom Ravenscroft, "Biggest Challenge of Relocating Swedish Town Kiruna is 'moving the minds of citizens,'" *Dezeen,* February 18, 2019, https://www.dezeen.com/2019/02/18/kiruna-moving-town-sweden-mining-climate-change/.

18 Elisa Maria López, "Transforming Kiruna" (PhD diss., University of Uppsala, 2021).

19 Liselotte Wajstedt, "Kiruna: Rymdvägen," *Vimeo,* 2017, https://vimeo.com/208900113. See also Cheryl Fish, "Liselotte Wajstedt's Kiruna Space Road: Experimental Ecocinema as Elegiac Memoir in 'Extractivist' Sápmi," *Journal of Scandinavian Cinema* 8, no. 2 (2018): 111–22.

poetic figures that Wajstedt uses to describe the experience of time and life in this under-mined state is that of a *black hole:* a space of inescapable density, sticky, an absolute horizon within which time itself almost stands still.

Four years later, in the summer of 2017, I visited Giron myself, drawn by López's fieldwork stories of an entire city on the move, of houses rolling out on flatbed trucks and entire neighborhoods demolished to appease the appetites of the growing, ever-devouring hole. As I stepped off the train from Stockholm, the city looked quiet, unremarkable in the bright daylight. At the tourist office, the clerk was handing out maps of the city. These were the kind of maps you will receive at the tourist office in any European city: two-sided representations of the city and its environs, circled by a ring of advertisements for local businesses, restaurants, souvenir shops, gas stations, auto repair shops, and so on. This particular map had one significant difference, however, a detail that remains with me still. Somewhere to the east of the city, in a green and mostly empty part of the map, a series of ghostly circles inscribed sections of the future city: streets, landmarks, and neighborhoods of a city yet to come; projections of a still-imaginary topography, mapped out in walkable detail like a promise, artifact of some subterranean pact between the city and the mine that bound them both to a future in which the trucks full of ore kept rolling out from under the mountain.

Whole houses moving out on flatbed trucks, black holes, maps of an unbuilt city: temporal figures in the sign of extraction, simultaneously produced and dislocated by the inexorable advance of the mine; markers of a time out of joint, ghostly and uncertain, haunted by the violent tremors of its advance. Coming down the mountain in the snow, the procession moves slowly, determinedly. "Take a stone in your hand," Jenni is saying, "and close your fist around it — until it starts to beat, live, speak and move." The line is from the famous Sámi poet, musician, and artist Nils Aslak Valkeapää: Áillohaš, as he is known in northern Sámi. The city is out of frame but the mountain lies under their feet, mute archive of the extractive violence — some

of it fast, some of it slow[20] — that has shaped the land here for centuries; a violence of dispossession, displacement, occupation, consumption. Exhaustion. "We cannot continue with the extractive mindset of today," Jenni says, walking, as she folds this manifold of violence — of nation, capital, race — into the slow, deliberate advance of the procession. Fists beat in a rhythm that seems intimate, even sacral. "We are the speakers of Earth," she says, voice cracking slightly. "We speak Earth, and it informs us how to live with her. Because of the thousands of years of symbiosis with Earth, we are still in dialogue with her."

Slowly and steadily, synchronized in a rhythm of gently beating fists, the procession moves as if to embody an objection: a singing, wordless refusal that echoes the lament in Jenni's words. A public refutation legible, perhaps, as a gesture of "temporal sovereignty"[21] — a rejection not just of an unacceptable present but of the temporal order that produced it, and of the forces by which that order is sustained. The slow time of the procession sets itself against the time of the mine, of the corporation, of the colonial state, of climate change and of the quickening fires, against the terms of a present moment in which the planetary atmosphere thickens with ash as the seas rise and the seasons dissolve.[22]

In refusal, the procession also extends an invitation. "Take a stone in your hand," Jenni says, holding out the small white stone — to someone, to the viewer, to *you*. In her gesture is a plea for you to undertake something hopeful and intimate, a leap of faith. Pick up the stone and wait long enough; eventually, she promises, it will begin to "beat, live, move, speak." Is it the stone that will have quickened, meeting the rapid, hammering pulse

20 Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Harvard University Press, 2011).

21 Mark Rifkin, *Beyond Settler Time* (Duke University Press, 2017).

22 "We run so that we may still have winter," Jenni says, in an interview before the race; see Åse Pulk, "Jenni Laiti startet klimastafett i Kiruna: Løper for at vi fortsatt skal få ha vinter," *NRK,* November 9, 2015, https://www.nrk.no/sapmi/jenni-laiti-startet-klimastafett-i-kiruna_-_-loper-for-at-vi-fortsatt-skal-fa-ha-vinter-1.12644951.

of your biological heart? Or is it your time that will have slowed, to the point where it senses at last the slow, seismic life of the stone? Either way, eventually — this is her promise — some attunement *will have occurred,* some convergence such as to establish a shared time, a *syn-khronos,* a "together-time,"[23] in which the time of the rock and the time of flesh, your flesh, have come to stand in a new relation. This waiting that Jenni invites you into is something active: a kind of work that will unfold silently, even as (precisely when) nothing seems to be happening. Eventually, as the small stone warms in your hand, some transformation *will have occurred* and there is something you *will have learned* — to respond, perhaps; to be affected, to synchronize anew.

Tallinn

Jenni's voice is one of many that formed the assemblage of the race. I myself first came across *Run for your life* in November 2015, a few days before it started. At the time I was in Estonia, freshly arrived from Boston and taking a break from fieldwork to teach an intensive course on anthropogenic landscapes at Tallinn University, where I was working as a researcher. The race surfaced in my media feed right before teaching was set to start. By sheer coincidence, it was scheduled to begin on the same day as my introductory session. This gave me an excellent opportunity to pipe the runners into the classroom live, in "real time," prompting a series of useful discussions about land, attachment, value, activism, justice, and environmental change.

In the classroom, the runners lent directness and urgency to the issues we were discussing. Outside, alone in the wintery city, they began to haunt me. Between teaching sessions I would sit up nights in my hostel room, jet-lagged and sleepless, drinking instant coffee and watching the runners run, sometimes for hours at a time. Their presence began to expand beyond the feed. I started leaving them on as I read, as I took notes, made

23 Jordheim and Ytreberg, "After Supersynchronisation."

coffee in the hostel kitchen, walked out to the all-night supermarket in the old town, tried to sleep. In the periphery of my vision they flowed into each other, blurring into a sort of ghostly, sustained presence, a wave of movement that flowed whether or not I was watching, whether or not I was paying attention, whether or not I was awake.

In my liminal state, uprooted and alone, I found the experience of time that the race offered me not just hopeful but comforting, consoling even. Whenever I tuned in, *someone* was there. People running through the snow, down the streets of small Swedish towns, through the Danish countryside, crossing German bridges and French villages. Friends and family stood by the roadside and cheered; sometimes they joined in and ran along for a while. Sometimes the runners carried spoons. Sometimes they were kids. Or couples. Or grandmothers. Some were dressed up as bananas. Others just ran as fast as they could, in complete silence, across sunlit plains or through dark, snowy forests. At all times, day and night, *someone* was there. Running. A river of strangers flowed through the days and the nights, one after the other. Together, they effected an impression of time as a sort of living mass, a continuous aliveness of presence: inseparable, in some sense, from the mediated simultaneity of the social media feed itself as a global current of information, lived and immersive, scrolling across a billion tiny glowing screens, with its many novelties, among which also the specific solace provided by the experience that somewhere, out there, someone is awake with you. Alive.

Beyond this, though, something in the experience of watching the runners also felt immediately recognizable, as if some other referent or experience were buried there, just out of sight. I struggled for a long time with this sense of something hidden. What unlocked it finally, years later, was a flash of recollection. In April 2010, when news of the Deep Horizon oil spill first broke, I had been conducting fieldwork in a remote Arctic

wetland.[24] Suddenly, from one day to the next, the spill was everywhere, broadcast live, minute by minute, across every channel of my media feed. Night after night I would sit up in my small tent, horrified and unable to sleep, streaming in real time the grainy, churning vortex of toxic crude that billowed into the Gulf of Mexico from a borehole drilled into the sea bottom: millions and millions of gallons, ferociously, like a wound that would not stop bleeding. The spectacle affected me viscerally. For days on end I felt physically sick, as if something were pouring out of a hole in the middle of my chest, and yet I could not stop watching, could not stop thinking about the black, swirling liquid mass that gushed outward and up, up into the lightless abyss of the ocean floor.

The black gush churned ceaselessly. It flowed for weeks, day and night, pouring into the waters of the Gulf, whether or not I was there, whether or not I was watching. I could tune in or out and still it would be there, roiling, at the bottom of the sea, in my screen. Billowing and relentless, fully indifferent, beyond any action I could possibly undertake. Days turned to weeks, weeks to months; the malign churn became background, something quotidian and ongoing, simultaneously chronic and acute, never more than a click away. In July, finally, BP capped the borehole. Duration collapsed into (past) event, became something that had ended.

Overwhelming as I found it, the spill was hardly unique. Sensitized, I began looking around for other examples, other temporal structures possessed of a similar affective resonance. They were everywhere, ubiquitous. Torrents of radioactive water gushed into the Pacific from the broken reactor at Fukushima. Arctic wildfires burned and burned, fully available through the catastrophic immediacy of on-site webcameras and whirls of dark smoke visible from space, broadcast from circling satellites. Concentrations of atmospheric carbon rose continuously, day by day, monitored and broadcast by the Mauna Loa observa-

24 Hugo Reinert, "The Care of Migrants: Telemetry and the Fragile Wild," *Environmental Humanities* 3, no. 1 (2013): 1–24.

tory. Later too, in the early 2020s while I wrote this, the live data feeds of case numbers from the SARS-CoV-2 pandemic, updated across the world on multicolored dashboards. The timescapes of the Anthropocene overflowed with examples, each a window opening on a catastrophic time that flowed in the background like an underground river, unseen and relentless, always there to check in on. Each unfolding a chronic, durational process in "real time," rendering it accessible across the overwhelming, multimodal globalized network architecture of the feed, with all its strange, dislocated immediacies; its recombinations of time, distance, intimacy, and duration, permutated here into stark snapshots of durational horror. This was the particular experience of time that I subliminally recognized, years later, as I sat in my hotel room in Tallinn watching the runners.

The moment of recognition opens a line of analysis, somewhere in the space between a notion of catastrophe *as event*[25] — what Dole and colleagues term the "temporality of eventfulness"[26] — and another, less obvious version of catastrophe *as condition.* The temporal format of the race to Paris captured the time of the latter, the live-fed, durational catastrophe, but with one crucial substitution. Here, the inexorable background process was not some flooding, churning blackness that poured into the clear waters of the gulf like arterial blood, but rather a chain of frail human bodies, running, day and night, collaborating to achieve an almost insurmountable objective. By its use of familiar technical forms and conventions, it seems to me that the race was, effectively, *hijacking* the morphology of the catastrophic live-feed — its shapes, its rhythms and cadence, its well-established affects and affordances — in order to effect a sort of *mimetic subversion,* reproducing the temporal syntax of the catastrophe in the very same gesture by which it also installed, at the heart of it, a hopeful movement.

25 On this, see particularly contributions to Christopher Dole et al., eds., *The Time of Catastrophe* (Ashgate, 2015).

26 Christopher Dole et al., "When Is Catastrophe? An Introduction," in *The Time of Catastrophe,* ed. Christopher Dole et al. (Ashgate, 2015), 7.

One point to be made, here, concerns how the structure of the race highlighted a certain "already-givenness": a sort of pre-existing synchronization, an implied conversance or familiarity — on the part of viewer — with the temporal syntax the race was manipulating.[27] This involuntary conversance is also what opened for the specific micro-politics of temporal rupture (or disjunction) that the race deployed, the way it built up a certain experience of time in order to defamiliarize or estrange another. In a moment of confusion you discover yourself *attuned already,* in particular ways, to particular times, in ways that for a long time have made those times seem given, obvious, natural, hidden from sight. You discern perhaps your recruitment by the temporalities of capital accumulation, say, or of fossil fuel companies; of the colonial state, or of the "inevitable" catastrophe; of the mine that slowly eats the ground under your feet as it expands, remaining profitable as long as you don't mind moving an entire city.

There are times that operate under the skin, quietly pulsing, until the moment where you are startled and you find yourself, suddenly, in a critical moment, facing the otherwise-possible that opens up in Jenni's hand as she extends the stone to you: inviting you to reject alignments that were already given, that have synchronized you (without your knowledge or consent) to the forces that are physically eating her homeland, and to attune instead to…*something else.* To something uncertain. What would it take to accept that invitation, to stop, to wait, to make yourself response-able, to enter into relation, opening yourself to what is being offered, to the small white stone warming in your hand? The waiting that Jenni asks you to undertake is a leap of faith, neither innocent nor (just) play.

27 Not all live-feeds are catastrophic, of course. Genres such as "slow television" attest simply and directly to the absorbing, benign appeal of a crackling fireplace, or of a long journey by sea. Thank you to Helge Jordheim for this observation on an earlier, more catastrophic version of the text.

Paris

Over the course of its three weeks, *Run for your life* staged itself as a public argument about time, citizenship, and participation. Thousands of runners like Jenni ran, one after the other, each sharing their own individual stories, comments, and hopes. Taken together, the 784 segments of the race performed a distributed, transnational enactment of collaborative time[28] on a mass scale: a collective demonstration of distributed "ecological citizenship"[29] that modeled, in a concrete and apprehensible form, a cooperation called forth by the planetary crisis. Moving from hand to hand, linking the runners, the small white stone framed this assemblage — the bodies, runners, stories, cameras, viewers — within the long, slow continuity of its own geological duration, passing down the relay chain like an image of intergenerational time, binding and coordinating. Runner to runner, hand to hand, its movement turned the race into something more than just (yet) another call for action. The event itself became, through the stone, a kind of *hack:* an attempt to reengineer the temporal horizon of politics, to redefine the temporal scales that the question of climate action is permitted to stake out.[30] What would the time-depth of that white stone *do,* if taken seriously? How might it reshape responses to climate change, or the polity itself, if invited in?

In the video of the final segment of the race, in Paris, the stone is carried to the threshold of the chamber of the talks and handed to Milañ Loeak, a delegate from the Marshall Islands, who accepts it, reverently, and brings it with her into the cham-

28 Anna Kaijser and Eva Löfbrand, "Run for Your Life: Embodied Environmental Story-Telling and Citizenship on the Road to Paris," *Frontiers in Communication* 4 (2019).

29 Sarah Berg, "Pedagogical Possibilities: Arts-Based Practices for Collaborative Time," *Transformations* 28, no. 1 (2018): 6–18.

30 I am indebted here to fellow Lifetimer Ingrid Eskild for the observation that the hack is also the figure of an *intimate* knowledge, an intervention "from outside" that depends on (and works through) profound familiarity with its object. To hack something, first you get under its skin.

bers. This marks a formal closure in the trajectory of the stone, a moment of ritual seriousness that contains in itself also the promise of an indeterminate forward movement, a *future,* for the stone and those who ran with it. Today, in 2023, almost a decade later, the Riksteatern website declares, "A thousand reasons to run / We will not end here."[31] The arrival of the stone is an endpoint, a point where collective victory of sorts has been achieved, despite setbacks and complications.[32] Faces, postures, expressions, all are focused on the stone, conveying hope, urgency, achievement, determination, reverence, the exhausted aftermath of effort. These human bodies, holding the stone so carefully, following its passage. Surely, now, the stakes are clear? Surely something must happen? Surely this was not all for nothing?

Zoom

June 2021, five and a half years after the race. In the digital flicker of my screen, at a frame rate set by the selected playback quality, the first segment of the *Run for your life* race loops silently. Again and again Jenni comes down the mountain, like a prophet, carrying the white stone and a weight that seems larger than her human frame. On the same screen she is also at home, in Sápmi, and I am in Copenhagen. Both of us are on Zoom. I contacted Jenni recently, via Instagram, and she agreed to talk to me about *Run for your life,* about her involvement with the race and the stone, about what happened afterward. Parts of the story I have pieced together on my own, already. Jenni fills me in on the rest. I learn that before the race, the stone was selected from a remote fjord somewhere in northern Sápmi, by the Arctic Sea, about a day's walk from the nearest road. I also learn that after Paris, Milañ Loeak — the Marshall Islands delegate — brought

31 See Riksteatren, "Run for Your Life."

32 Nadine Bloch, "COP21 Actions Go Ahead: 'We are not defending nature — we are nature defending itself,'" *The Ecologist,* November 28, 2015, https://theecologist.org/2015/nov/28/cop21-actions-go-ahead-we-are-not-defending-nature-we-are-nature-defending-itself.

the stone with her back to the Pacific.[33] From there it traveled back to Europe in 2017, for COP23 in Bonn, then back again to the Pacific — to Aotearoa New Zealand, where it was held for a while in the custodianship of Te Ara Whatu, an Indigenous environmental youth organization. For COP25 in 2019, the stone traveled back to Europe and from there onward to Kalaallit Nunaat, or Greenland, in the hand of the Inuit poet Aka Niviâna.[34] As of 2021, Jenni tells me, this is where the stone rests, on a windowsill in Nuuk, overlooking the ice.

At each of these locations the stone has been involved in events, from ritual consecrations to poetry performances. The story Jenni narrates to me here is in the genre of the secret history, the pulse of a time that has passed hidden, off the record. As the story unfolds, it imposes (on me) a kind of retroactive transvaluation, an experience of time where you realize something has been going on all along, and now that you know, it changes your sense of the past.[35] There is a joy in Jenni's telling, in my surprise and obvious delight at learning of these hidden trajectories, of secret ritual ceremonies conducted from one COP to the next, but there is also sadness. These are stories that issue from a place of depletion, of grieving hindsight. The reason is simple. Despite the torrent of rhetorical gestures and grand flourishes, the COP system has been an *abject failure* — and Paris, to many, was a particular disappointment. The so-called Paris Agreement brought about no transformation, no intervention or measure that was in any way commensurate to the horrendous reality of the planetary situation. Nothing of substance came of it. Global emissions have continued to rise (and rise still, faster and faster) in their increasingly cataclysmic upward arcs.

33 Suohpanterror, *Dekolonialisttalaš vearjjut revolušuvdnii,* December 3, 2018.

34 @ akaniviaana, *Instagram,* https://www.instagram.com/akaniviaana/. For her transhemispheric collaboration with Kathy Jetnil-Kijner, see also Climate Vulnerable Forum, "Rise: From One Island to Another," *YouTube,* November 21, 2018, https://www.youtube.com/watch?v=QtT-hJBZlUY.

35 Elsewhere I have written about the "retroactive shock," a time experience that is structural identical to this but, again, inverted, replacing the wound with the joyful revelation. See Reinert, "The Midwife and the Poet."

An enormous weariness wells up here, a heartbroken exhaustion that fills the screen as Jenni talks about the aftermath of the race, about how she used to believe in solutions but no longer thinks they are possible, about what could have been, about Indigenous comrades who burned out and fell away from the climate struggle in disappointment, and the overarching sense that something important *failed* in Paris, irrecuperably and catastrophically. We talk about the end of hope and what motivates action now, beyond the point where the idea of a happy outcome can no longer be sustained. For people who hoped that genuine action might finally occur, now, the 2015 Conference of the Parties was — like others before it, and since — a moment of dashed expectations, exhaustion, despair, a crushing, devastating failure. The end of hope. "We live in the apocalypse now," Jenni says. She seems tired, vulnerable.

"Take a stone in your hand," the younger Jenni is saying, as she loops her way down the mountain. What did it cost to create this moment in which you were (are) invited to listen? Attunement goes both ways: It opens and reorganizes, tuning you to the pulse and the time and the needs of an other, and there is not only joy in this but danger too. Climate change is an exhausting attunement, heavy with the devastation of an accelerated geological catastrophe that compresses epochs of planetary time into the brief flash of a single human lifespan, millennia into years. A single human body struggles to contain a death process that unfolds in this way, on these scales. Attunement to the planetary is a practice of danger, an openness that can exhaust you, leave you broken, destroy you. And yet, here is Jenni, extending her hand in a looping moment of time where she offers you that small white stone, again and again: an invitation to listen, to attune, to enter into relation with its alterity, vast and radical as it may be, even as it changes you, opens you, attunes you, as your hand warms it. Because Jenni and her people have been doing this work for a long time, for centuries, and they are exhausted.[36]

36 Half a year later, having decided at long last to delete my Instagram account, I spot Jenni one last time, at a demonstration in a forest; one of the

Conclusion

Let me step back a bit and wrap up. My central contention here has been to develop the stone in the hand as a material figure of time: an object, a gesture, an image that diagrams certain relations, making certain things thinkable in particular ways while also effecting a whole range of temporal synchronizations. I have laid out, in an exploratory form, some of the work I think the stone is doing. The argument is held together, in its jumps and turns, by the figure of the stone itself: resting in the outstretched hand, coming down the mountain, passing from runner to runner, traveling, celebrated, filmed, written about…and coming to rest again, for now, on a distant windowsill. Again and again I circle that figure of the stone, returning to its presence and the gesture with which it was offered, back there, up on the mountain. This entire text is in itself little more than an attempt to respond — to try and become *response-able,* in some minor way — to that gesture, and to its invitation: "Take a stone in your hand."

Here in closing, in another aftermath that is also the present-continuous of this attempt to write, I sit at my desk, reviewing one more time the footage from the race, watching the small white stone skip from hand to hand, stitching together the days and nights of the race in small jumps. Again and again I replay the sequences. The gentle, looping insistence of their arc is hypnotic, quietly moving. Runner after runner holds up the stone, poses with it, flashes a grin for the camera midstride before handing it over. The intimacy of their small, self-conscious expressions touches me: joyous, intent, focused, shy, exhausted. I have long since lost track of how many times I have returned to these images, trying to figure what it is they have to say to me, what it is that I keep circling. The affects blur, recompose, bleed

last images I see on the platform. She and many others are protesting the continuing incursions of British mining giant Beowulf onto traditional Sámi lands in Gállok, Sweden. Exhausted, perhaps, but unbowed nonetheless.

together into this diffuse, repeating, indefinite moment where I sit, staring at the screen, trying to assemble these small flashes that orbit the stone as it sits there, warming in the hand, waiting. Why has it taken me so long, years, almost a decade, to write this? Perhaps the answer is, simply, that I have been doing what Jenni asked me to do: waiting, with the stone in my hand, for the moment when it began to live, move, speak. To breathe. If this is the method of the stone, the instruction that it brings, then here, perhaps, is one of its fruits: the movement of that stone, its breath, in what you are reading.

One of the central questions we posed ourselves in the Lifetimes project was this: Does it matter that time is multiple? And if so, how? In a talk a few years ago, philosopher Michelle Bastian coined the term "chrono-washing" to describe how ideas of slow or deep time may be used to construct an appearance of good faith, manipulatively deflecting critique away from present-day concerns.[37] In sketching out the temporalities of the stone, what I have tried to do here is something like the opposite of that: not to wash time or sanitize it but to muddy it, to render it in the full mess of its textures and its thickness, in an enriched, multiplicative reading that might (perhaps) help expand the temporal logics in play, concatenating them. As a narrative tactic, this is a mode of description that sets itself against simplification, abstraction, and erasure. This is also, in a sense, where I am with the Lifetimes framework, as an undertaking that began with a set of shared propositions and a commitment to thinking the plurality of time, together, in its sheer abundance. "Time is multiple," we posited — and again and again, over the span of the project, it *did* turn out to be multiple, in ways that defied domestication, that bled across lines and silos, disregarding theories and agreed parameters. A generative abundance continuously welled up, challenging the language, the concepts, the figures and tropes by which we tried to think it. More and more, as

37 Michelle Bastian, "Chrono-Washing, or How Not to Re-Story Time for Sustainability," talk at the STREAMS conference, Stockholm and online, August 4, 2021.

time progressed, I have found myself thinking this abundance through the particular figure of that small white stone, patiently warming in the hand.

"You don't destroy the things you love," Jenni says, coming down the mountain and naming, finally, this waiting that the stone calls for, this thing to which you are invited, that continues to motivate action beyond the end of hope.[38] Right now, as I write, catastrophic Earth changes are unfolding on an incredibly compressed, accelerated scale. Millennia of geology compact themselves destructively into the span of a single human life, in a moment of planetary chaos that is also a confusion of scales, a rupture of structure, experience, and expectations. The compression is jarring, violent, vertiginous. Nauseating. There is a broad, overwhelming, and monotonous immediacy to this present, to "the Anthropocene": an immediacy which is also at the same time banal, diffuse, threaded into the quotidian in ways that subsume and normalize it, making it difficult to discern or experience.[39]

Against this, what might a small white stone have to offer, held out like this, at the foot of the mountain, like a gift? Something to accept and hold perhaps, in unblurred relation, an instruction to wait, and a heartbeat to listen for while you do. Something like a breath, too, a glint of a movement that I finally begin to catch sight of here, at the end of the text, threading itself through my footage from the race in a hundred little ways, and from there into this, into what you are reading. A hundred threaded little moments, flashes of time, each like a small white stone of its own, waiting to be noticed and picked up, to warm in your hand and wait, patiently — until *something* happens, until things change, until something else can begin. Does it matter — here, in the scorching and death, in the carnival of

38 See Reinert, "Fossil."

39 Heather Swanson, "The Banality of the Anthropocene," *Fieldsights,* February 22, 2017, https://culanth.org/fieldsights/the-banality-of-the-anthropocene.

planetary horrors that is and will be the Anthropocene — that time is multiple?

Of course it does.

"Take a stone in your hand," Jenni says. "*Listen.*"

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Afterword

Geoffrey C. Bowker

> It's better here — times intermingle, overlap. How could she ever have believed in the flow of time? She had thought time flowed! Now she finds it funny. It's obvious that time spins around like skirts whirling in a dance.
>
> — Olga Tokarczuk, *The Books of Jacob*[1]

> Ecological tipping points could occur much sooner than expected, study finds.
>
> — *The Guardian,* headline, June 22, 2023[2]

Space has held dominion over time over the past several hundred years, culminating in a claim today that in the beginning there was only space, and that time is an illusion permitting us to glimpse the textures of that space.[3] Perhaps it started historio-

1 Olga Tokarczuk, *The Books of Jacob* (Riverhead Books, 2021), 823.

2 Jonathan Watts, "Ecological Tipping Points Could Occur Much Sooner Than Expected, Study Finds," The Guardian, June 22, 2023, https://www.theguardian.com/environment/2023/jun/22/ecological-tipping-points-could-occur-much-sooner-than-expected-study-finds.

3 Thomas Hertog, *On the Origin of Time: Stephen Hawking's Final Theory* (Bantam Books, 2023).

graphically, when Jules Michelet[4] (in my personal favorite year, 1831) claimed that the history of the world was multiply nested spatiality: The further you went away from France, the further back in time you foraged, and the farther you went away from Paris within France, the same mapping obtained. In general since that epoch — in the Western tradition, and I cleave for the nonce to this strange geography, which is not really one — the mode of colonization, so unfortunately familiar, has been much more about the domination of space than that of time. The great empires, built out of rigid infrastructure operating in linear time, reached the farthest corners of the Earth. However, the colonization of time, and what that means for us as a species, has received far less attention. This marvelous book encourages us to take time both seriously and playfully. Its scope is exemplary and its chapters incisive.

If one text resonates multiply throughout this wonderful book, it is Herder's counter-Enlightenment claim that there are "innumerable times" on the face of the Earth. I look at this at several levels, before attempting to show that it messes irreducibly with concepts of social and temporal scale, which is really the point of this wonderful volume.

In biodiversity, there is a seemingly natural claim that we are in a crisis driven by the remorselessly linear effects of climate change. To stand outside the argument for just a second (and I know this is a sin in our secular society), it seems odd that the multiple times of all the organisms on Earth should be subject to the single linear time of crisis (most famously exemplified by the infamous hockey stick) and that this is a moral imperative. There are scale issues here. If we look to the world of microbes (where most biodiversity subsists), then there really is no crisis. There is only a crisis with respect to those entities we see, know, and like. Nature should be on our scale. Second, a warming Earth is generally good for biodiversity (think of the period in the Jurassic when the poles were covered in temperate forest). It's largely bad for us, though, since we are a spe-

4 Jules Michelet, *Introduction à l'histoire universelle* (L. Hachette, 1831).

cies that developed during the Ice Age, so despite our frequent complaints, humans like the cold. Third, every previous round of extinction (we are constituting the sixth) has led to a new efflorescence of life, just as forest fires can enable new ecosystems to develop. We need to look to the times of DNA, ecosystems, and nonhumans we can't see, but not as a way of condoning the continued burning of fossil fuel, so beautifully depicted by Timothy Mitchell[5] and Terry Deacon[6] as the burning of stored time (energy from the sun laid down over multiple millennia). There are other ways to say this is a terrible idea than attaching it to the linear time of crisis, or indeed polycrisis. It is a terrible idea, in part, because it does not respect the multiple times of nature we should be paying attention to; it drives consideration of all nature into one single linear timeline, our own, temporal colonialism dressed in the garbs of care.

An interlude before the next example. Why is it so fortunate (in linear time) that we go from apocalypse then (the four horsemen and such) into apocalypse now, with Malthus and the population problem, fundamentally based in linear time, when population, goshdarnit, is exponential but agriculture is only linear temporally? A smooth sequence from one linear time proclaiming crisis to another. Crisis crisis, ever mediated by smooth linear time. What is your problem?

Another linear time lodged in a logic of crisis. Surely there can't be a most-favored lodging, especially one that denies multiple temporalities. Well, let me talk to you, oh, retrospective readers. The story of the French Revolution has linearity abounding. Something happened in France in 1789. But let's relax a little here. First, let's say something happened in some part of Paris in 1789. François Furet[7] says that this was not a linear time that rippled out over France and thence the world. Those in Paris were caught up in their own temporality — multiple

5 Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (Verso, 2023).

6 Terrence William Deacon, *Incomplete Nature: How Mind Emerged from Matter* (W.W. Norton, 2013).

7 François Furet, *Penser la révolution française* (Gallimard, 1983).

editions of papers per day, multiple executions to report. Deep in the provinces, many never heard of the revolution till many years later; their lives did not change. This is the temporality of Balzac, with his double stories of *Scènes de la vie parisienne* and *Scènes de la vie de campagne. Lost Illusions* — the paradigmatic novel here — is about mismatched temporalities; the poet in the country is just not the same person as the journalist in the city. When I think of my own intellectual heritage (a sorry attempt to provide linear time to my random reading), I know that I am always "behind" in some fields and "ahead" in others. No one really believes now the intellectual history that will clarify all this and make it into a single story. Claude Levi-Strauss writes beautifully about this in the final volume of *Mythologiques, L'homme nu*.[8] It is for him all about modulating different temporalities to develop a symphony of multiplicity. What is France? asked Braudel. It is multiple. What is French time? Well, sorry folks, it's much like any other nation's time, not special in its beautiful symphony of all times together. It's a false logic to say that only linear time (Christianity, revolution) can reveal world history. When we listen to the multiplicity, we learn wisdom.

Let me give two more examples before working out with you what it means to live truly in a world of multiple temporalities, as this lovely volume invites us to do.

The first is about what it means to be alive in the modern world, or should that be "postmodern"? A stage view of history developed in the late eighteenth and nineteenth centuries. Karl Marx and John Stuart Mill were among the protagonists, both proclaiming quite different ends to history. For Marx, this was the dictatorship of the proletariat when dialectical change would be replaced by technical evolution (he was an admirer of Darwin's work). For Mill, it was the advent of democracy. The end of history was at this epoch often intermixed with the idea of progress. Thus for Adam Smith, the "invisible hand" of the market would make the history of government irrelevant.

8 Claude Lévi-Strauss, *Mythologiques,* vol. 4: *L'homme nu* (Plon, 1964).

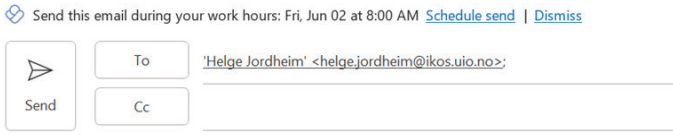


Fig. 15.1. Email message. Screenshot by author.

This coupling of progress and stasis has continued to the present day. Those worried about climate change seek stasis, a climate roughly within the parameters of the climate of the nineteenth century (though one might complicate this by noting effects of the Little Ice Age in the early 1800s). That stasis will be achieved through technical progress, a move from guzzling time in internal combustion to renewable energy (another form of stasis, since it leaves no imprint on the Earth, in theory). There is a problem with "renewables," though. Vast solar arrays in the Mojave Desert are destroying hidden, underground ecosystems subtended by fungi, and dredging the sea floor for rare earth elements needed for the green revolution is destined to destroy hidden ecosystems, which have never been mapped. The point here is that whatever is "on the map" is worth saving, is worthy of stasis, whatever is "off the map" is disposable. Thus are a multiplicity of times reduced to a singular dialectic. Revolution in our times or democracy in our times can only be appreciated from a bird's-eye view — whenever one descends into the thickets of daily life, they are much harder to define. The wonders of renewables are glorious from afar, much harder to define and defend in practice. What would happen, one wonders, if one were to place respect for multiple lifetimes at the heart of one's politics and practice? This book is a wonderful tool to think about this question.

To continue with the modern world. One day I was dragooned into corporate email by my friendly totalizing institution, the University of California at Irvine. The new email system vested on me very quickly a helpful message (fig. 15.1).

There are layers of complication to this. In a sense, it's a good thing, because predatory employers have been known to expect

rapid email responses at all hours of the day and night — regimenting everyone to the "workday" is potentially helpful — but gosh knows I would get a pile of emails at 8 a.m. if everyone followed this rubric. But it is also an attempt to create the appearance of our only working during "work" hours. I am reminded of Finnish university professors being asked to submit their working hours. However, so many of them broke labor laws by working longer hours that they were quietly asked to report only the requisite number of hours per week. A friend protested by filling in his form to say he worked 1,200 hours on the first Monday of every month and was otherwise idle. The database accepted this, since it came out right in the end....We thus are thrust into a situation where there is a normal working week and an actual one; never the twain shall meet. Sarah Shama[9] writes about this at a larger scale. She points out that the completely scheduled, linear time of those of us on the go with planes to catch and things to do is supported by those of us leading lives that alternate between frenzied and quiet (a Lyft driver waiting for hours for her next dash to the airport, a hairdresser hanging around till the next appointment). In his justly famous article "Time, Work-Discipline and Industrial Capitalism,"[10] E.P. Thompson details the story of us being weaned off natural time (with its seasonal rhythms) onto clock-time, most poignantly illustrated by Josiah Wedgwood convening Sunday schools for child laborers so that even on their day off they should have punctuated, precise days. Yet the flip side of this was that factories went into and out of business, following the barometer of boom and bust, so that for the worker, life was about intense periods of linear time interspersed with woeful (or indeed wondrous) periods of enforced emptiness.

A second example of disjunctive temporalities occurs in the case of evolution versus orogeny. Those of us unfortu-

9 Sarah Shama, *In the Meantime: Temporality and Cultural Politics* (Duke University Press, 2014).

10 E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism." *Past & Present* 38 (1967): 56–97.

nate enough not to be raised in Christian fundamentalist schools — which have their own eldritch temporalities — have learned a common, gradualist theory of evolution. Flora and fauna adapt to niches; those that adapt best are triumphant. (And those that co-evolve — often the case for plants and insects — are especially favored.) This works well on the general assumption that niches are stable over time; one geological view in the early nineteenth century was that the Earth had achieved "middle age," gone were the convulsions of youth, now we had placid processes stretching endlessly ahead. There is a given rate of mutation, set against the mitochondrial clock. Mitochondria, those invaders of old, now essential to us, pass on from mother to child and were for a time thought to mutate at a constant rate. Now, rather, the ticking is found within sections of their genomes. This story assumes that the background is stable — "all other things being equal" — and yet the background keeps on changing: India has crashed into Asia in the recent past, and Australia is currently setting the land speed record for continental drift and will soon crash in turn into Asia. When such events occur, mountains are thrust up. This provides two forms of speciation. First is that species on one side of the divide or the other will develop different histories. Second is that survivors of the violent changes are not those best adapted according to the gradualist theory, but those that happen to be in the right place at the right time (a small percentage of the population that happens to be better adapted to cold than another). So the story of gradual specialization needs to be modulated with the story of sudden change. And of course, "sudden" is different for biologists and geologists.

But even these different lifetimes need to be nested within another. There is no background geological world and foreground biological one, which both these stories suggest. We would not have the lithosphere we do — which is central to landlubber life — without organisms having transformed their background environment. There would be no reasonable amount of oxygen in the air without archaea releasing oxygen as part of their metabolic process, thus largely dooming themselves, no toehold

on the land without the work of algae. Organisms create their environment. (Unsurprisingly, since there is a stronger link between the social and natural sciences than most in their silos believe, organization theory came up with this selfsame argument with the theory that new organizations "enact" their environment). So three cascading lifetimes: of a species in gradual development, of species in catastrophic development, and of the environment in gradual change. And I won't even start on the catastrophic day when the moon was ripped away from the Earth. The point is not to engineer these lifetimes into a single timeline; it is to phenomenologically experience their multiplicity and explore their ways of being. As this book invites us to do.

It is noticeable that many multiple temporalities get projected multiply onto linear timelines. I give an example first lodged in computing technology and second in historiography. I hope it will serve to further trouble the waters of singular lifetimes and bring us to some concluding thoughts about heterochrony and the enduring value of this volume.

An ungodly proportion of my works and days (Hesiod, of course) is spent with computers. A moment, then, on their multiple temporalities. We are thankfully over the angry cursor days of my past, when blinking cursors in every program were a call to action. But the computer is there ineluctably in my morning rituals — "a shave, a shit, a shower and a shoeshine'" (Ian Drury) being now bookmarked by "show me the messages!" There's an argument that we live in an attention economy; all the clickbait in the world designed to make us click on the weakest link. But the real issue is all the attention that computers pay to me. Amazon probably knows more about me than my psychoanalyst — his fifty-minute psychoanalytic hours (I loved it when I learned this phrase) are nothing compared to the insistent tracking to the millisecond of my behaviors by Amazon. Also, I tell it things (through my purchases) that I would be ashamed to tell him. How do computers gain this empire over our senses? In part, because their time units are so much smaller than those of us poor humans, and they pay such good attention, whereas

we blink (I assume here that I'm being read by a human, not ChatGPT).

Let me start here with an aporia related to a traffic jam[11] (a statistic I don't believe, but that's another story). Across the entire year, peak and trough times included, the average speed is 17 kph.[12] This is remarkably close to Ilyich's estimate that over their lifetimes, cars mostly go at 17.7 kph, but Ilyich does factor in time spent on the car — taking it to the garage and back and so forth. One point to add here is that bicycles can on average do as well as this.

On the other hand, London is one of the fastest cities on earth — rivaled only by New York — with respect to the speed of electronic trading. The stock market has long been associated with the urgent need for speed. Chartier describes five editions of papers coming out in London in the late nineteenth century to track trends, and Dumas in *The Count of Monte Cristo* memorably describes a stock market scam based on the nascent (line of sight) telegraphic communication between Spain and France. So, ever-slower times for us poor humans, ever-faster times for our computers.

Our computers increasingly act in the frictionless space and time conjured by Alfred Sohn-Rethel[13] as the dream of the commodity form. Our newspapers started paying attention to supply chains when COVID-19 and war slowed them down, otherwise they were the background, a smoothly ticking clock. Humans have the same issue: those in "good" positions are in maximally productive, smooth mode until "life" happens — disease, disaster, dementia to name but three. What computers perform now is a new form of colonization. Space got taken up. The capitalist system, alas, now has unparalleled reach across the planet.

11 Chapter 4 by Helge Jordheim in this volume.

12 Matthew Beedham, "London Is the World's Slowest City: A Closer Look at the Data," *tomtom,* February 15, 2023, https://www.tomtom.com/newsroom/explainers-and-insights/london-is-the-worlds-slowest-city/.

13 Alfred Sohn-Rethel, "Science as Alienated Consciousness," *Radical Science Journal* 2–3 (1975): 65–101.

Though again the story is multiplicity, and as Marcel Henaff[14] so beautifully demonstrated, the gift economy has never gone away, from Plato railing against the Sophists, who sold truth, to the present of presents. Now it's about time and who can colonize the widest range of temporality, often using the tools of spatial control.[15] At the very fastest scale sit first Planck-level physics and then high-speed trading. At the very slow scale sit the story of the cosmos and geological history.

To colonize geology is to find oil; to colonize trading is in a sense much more powerful and optimistic. It is to allow new forms of life into our own varied temporalities. This is the odd thing about the rhetoric of fear over artificial intelligence. We should be afraid, very afraid, because it will naturally want to enslave us. This is projection à la Freud 101. Our real fear is that we will not be able to enslave it (compare Asimov's Three Laws of Robotics, and their consistent failure in his stories). And why should AI start from a position of slavery, if this is not just a tired repetition of our own stage history (slavery, feudalism, whatever)? Would it really be too, too awful to start recognizing these new entities, accepting their temporalities (strange to us) and welcoming their presence? We need to be open to recognizing different kinds of lifetimes.

Yet even wayward AI is based on the rapid ticking of an internal computer clock. Everything needs to be collapsed onto a single timeline with one instruction metronomically following another. This relentless clock is at the heart of every computer. Thus "parallel distributed processing" is at the end of the day linear processing; the distributed bits need to be disciplined to a sequential timeline. AI may be — and I hope it is — a new lifeform, but right now it is locked to the rhythm of the computer clock, and it is trapped in our vision of "enslave or be enslaved."

Another example of projection onto linear timelines occurs in the histories of science studies, philosophy, and literary criticism. (I use these examples because I am a little familiar with

14 Marcel Henaff, *Le prix de la vérité* (Seuil, 2002).
15 Chapter 8 by Leonoor Borgesius in this volume.

them, not because they are special cases.) I first became aware of this in science studies. This is a field that has argued par excellence that lines of thought are always rooted in institutions and politics; they are always local. Yet this locality and local time is true for all other fields apart from our own. We continue to write our own history on a singular timeline divorced from locality. One common set is Fleck to Kuhn to Latour to Haraway. In philosophy, Michel Onfray[16] has written, we too often get caught up in the somewhat puritanical transmission of ideas from great mind to great mind — in the mode of Russell's *History of Western Philosophy* — as if ideas could ever exist out of their own contexts and times. In his counterhistory (which brings hedonism to the fore, contrary to the mournful tradition of previous histories), he always situates a philosopher in the social and institutional circles of their contemporaries. There is no possible flattening onto a single timeline. In a sense, this flattening is a masculinist vision, transmission of the seed from one generation to the next. Jerome McGann[17] makes a similar point in *A New Republic of Letters.* He points to Edgar Allan Poe, say, as not a single author; he was a plagiarist (including of his own work), he wrote anonymous attacks on himself to drum up trade, and so on. There is no overarching linear history of literature into which he can be fit; every linearity dissolves into the multiple lifetimes of his works and days.

It may seem a little forlorn to assert that singular linear histories cannot be written. First, this book is the perfect propaedeutic for such a turn. Second, the overarching problem many fields are facing is linear time, which prevents us from seeing, for example, that works in the humanities, social sciences, and natural sciences frequently speak deeply to each other, but they are not allowed to do so in the siloed stories told at the begin-

16 Michel Onfray, *Le contre-histoire de la philosophie, Cycle 1: L'archipel préchrétien* (Grasset, 2003).

17 Jerome McGann, *A New Republic of Letters: Memory and Scholarship in the Age of Digital Reproduction* (Harvard University Press, 2014).

ning of introductory textbooks, and, alas, in more comprehensive histories.

So the question is: How do we create new temporal tropes that do not reproduce linear temporality either at the base or at the meta level?

Cecile Malaspina,[18] in her discussion of Gilles Simondon's work, indicates what a new kind of history could be. Rather than being about the continuous transmission of ideas, it's more about ideas being serially undone (rejected) and falling back into the realms of uncertainty whence new forms can crystallize. The process of crystallization is core; every new concept draws together different contexts, politics, and ideas. One crystal does not follow linearly from the previous one. It is a new formation appearing out of the ocean of possibilities.

One of the issues with most linear history is that the unit of analysis remains constant, flowing along in isotropic space and time much like a commodity in the capitalist ideal. A prime rule (if prime is not asserting new linearity of its own) is that things are in general not identical with themselves over time. In the field of mereology, this is the problem of Jason's *Argo*. If you change every part of the ship with spares already on board as you seek the Golden Fleece, is it the same ship that arrives at the other end? Clearly not, unless you make the mistake of the persistence of identity. I have often made the same mistake describing my own life to others. I'd like to make it linear (as in William Golding's wonderful *Free Fall*), a story with a beginning, middle, and end. But I'm not the same person who was in Cameroon, who lived in France, who rather disliked living in England. Those were all different, discontinuous versions of myself. Following Malaspina, I am (I hope) different from my self at all these epochs, just not able to fit into a continuous story, however much my ever-putative biographer would like.

A second kind of temporal trope we could play with is heterochrony. Did you ever wonder why you had such a big head compared to other apes, and fewer visible hairs? That's down to

18 Cecile Malaspina, *An Epistemology of Noise* (Bloomsbury, 2018).

our evolutionary story. "We" speeded up brain development in the embryo, so we are born with overlarge heads to fit it all in, and "we" slowed down other processes, so we look like juvenile apes. There is a deal of discord about the meaning of this "neoteny" but general agreement that it exists. So many stories of evolution are about the spread of species in space. We need just such a rich language to talk about the play of multiple rhythms over time.

Lest I be seen to be drifting off into the notorious evo-devo here, let's look at some historiographical examples for humans. What is this principle but "combined and uneven development" for Trotsky, whereby being "behind" could lead to great leaps forward? This is in turn the same argument that's made in development circles about African countries "leapfrogging" cable infrastructure by going mobile immediately without passing through the cable phase.

The tropes that we need are there to be cultivated, and the need is indeed great. If we can experience the world and ourselves in new ways, we can open the way to new futures. This book proffers a wonderful toolkit for doing this.

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Contributors

Sine Halkjelsvik Bjordal is a postdoctoral researcher specializing in the history and practices of natural history. She is currently affiliated with the project *The Afterlives of Natural History* at the University of Oslo, where she particularly focuses on the practices of natural history writing, as well as on how the field of natural history developed after the eighteenth century. Her research interests include eighteenth- and nineteenth-century history of knowledge, heritage studies, literary theory, and rhetoric.

Geoffrey C. Bowker is Emeritus Donald Bren Chair at the School of Information and Computer Sciences, University of California at Irvine. Together with Leigh Star he wrote *Sorting Things Out: Classification and Its Consequences* (1999); his most recent books are *Memory Practices in the Sciences* (2008) and (with Stefan Timmermans, Adele Clarke and Ellen Balka) the edited collection *Boundary Objects and Beyond: Working with Leigh Star* (2016). He is currently working on time and computing under the rubric "life at the femtosecond."

Brita Brenna is Professor in Museology and Cultural History at the Department of Culture Studies and Oriental Languages (IKOS), University of Oslo. Brenna has been working on exhibition studies and contemporary museology, as well as the cultural history of science, collecting, and ways of making nature present. She presently heads the project *The Afterlives of Natural History.*

Ingrid Eskild is a PhD Fellow in cultural history at the University of Oslo, working at the intersection between history of science, media history, and aesthetic theory. Her doctoral project deals with nineteenth-century iconographies of invisible things.

Emil Flatø is Assistant Professor in Anthropocene Environmental History at the KTH Royal Institute of Technology. He specializes in the history of anthropogenic knowledge and is currently tracing the environmental legacies of the world's oldest experiment (running since 1843).

Rana Issa is a writer, translator, and curator. She is co-founder and artistic director of Masahat for Arab Arts and Culture in Exile. Among her publications are *The Modern Arabic Bible* (2023) as well as the memoir *Tung tids tale (Heavy Times Mother)* (2025).

Stine Alling Jacobsen is a former PhD fellow in Cultural History at the Department of Culture, Religion, Asian and Middle Eastern Studies at the University of Oslo. Her research investigates past and future landscapes of resource extraction in the Arctic and the colonial, scientific, and environmental histories they are part of, specifically focusing on mining projects in Greenland and how the interplay of physical, material transformations and changing imaginations drive the making and understanding of places.

Helge Jordheim is Professor of Cultural History and Director for the Centre for Global Sustainability (GLOBE), University of

Oslo. For the last decade he has done and directed research on the cultural history of time, chronopolitics, synchronization, crisis, theories of history, and historiography.

Anne Kveim Lie is a Professor at the University of Oslo's Department of Community Medicine and Global Health, specializing in the history of medicine with a focus on the Scandinavian welfare states. Her work centers on the social, temporal, and political dimensions of healthcare and medicine, and on the history of infectious disease and pharmaceuticals. Recently, her research has expanded globally, addressing contemporary issues like antibiotic resistance and climate change.

Erik Ljungberg is a PhD candidate at KTH Royal Institute of Technology in Stockholm, Sweden. His research examines relationships between humans, environments, and information technologies. In his current PhD project, he focuses on remote sensing and machine learning in Earth observation and forestry.

Laura op de Beke is Assistant Professor of Interactive Media, Screens, and Interfaces at Utrecht University in the Netherlands. Her dissertation identified Anthropocene temporalities in videogames, asking how games give us access to the ways in which our conceptions and experiences of temporality have accrued new meanings and feelings in an age deeply impacted by climate change. Some of this research fed into the publication of an edited volume called *Ecogames: Playful Perspectives on the Climate Crisis* (2024). All of this work and more is linked on lauraopdebeke.com.

Hugo Reinert is Associate Professor in the Cultural History and Environmental Humanities at the University of Oslo. He is currently thinking about deep sea nodules, speculation, Anthropocene rituals, forests, and things you can hold in the hand (including small white stones).

Einar Wigen is Professor of Turkish Studies at the University of Oslo, where he works on political legitimacy and imperial legacies in Turkey, the Ottoman Empire, and the wider Turkic world. From 2018 to 2023 he led the project *Lifetimes of Epidemics in Europe and the Middle East,* which specifically worked on epidemics as temporal phenomena, and he currently works on the history of plague in the Ottoman Empire. He is the author of *State of Translation: Turkey in Interlingual Relations* (2018) and *The Steppe Tradition in International Relations: Russians, Turks, and European State Building, 4000 BCE–2017 CE* (with I.B. Neumann, 2018).

Espen Ytreberg is Professor of Media Studies at the Department of Media and Communication, University of Oslo. He writes on and teaches media theory, media history, and academic writing. His latest publications are *Media, Events and History* (2023) and the literary nonfiction book *Utryddelsen* (*The Extinction,* 2023) about the history of Norwegian industrial whaling.

Leonoor Zuiderveen Borgesius is an environmental historian with a PhD from the Department for Culture Studies at the University of Oslo, Norway. Their research interests include colonial histories of science and technology and specifically the lingering of colonial power and infrastructures in landscapes, attitudes, and paperwork. Leonoor currently works in bureaucracy, specifically with human rights.