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Cold Storage
A Media History of the Glacier

By

Alexandra H. Bush

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Film and Media

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Anton Kaes, Chair

Professor Jacob Gaboury

Professor Deniz Göktürk

Professor Kristen Whissel

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Abstract

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This dissertation consists of five chapters in two parts. In the first part, I argue that in the early 20th century (1910-32), moving images and communications technologies like the radio and telegraph functioned to bring glacial environments into historical thought, breaking with a popular understanding of nature as eternal or cyclical. In order to do so, I draw on four case studies: two documentaries of early Antarctic exploration in Chapter One (*The Great White Silence* (1924) and *With Byrd at the South Pole* (1930)), and two exemplars of the interwar German *Bergfilm* in Chapter Two (*Avalanche* (1930) and *SOS Iceberg* (1933)). In each chapter, the films are read in conversation with archival sources found through original research. Taking up theories of modernity from cinema studies, I contend that like film itself, glacial temporality is characterized by radical contingency, as well as a tension between stillness and motion, the animate and the inanimate. Even as media technologies helped to reframe notions of cryospheric time, they were also encouraging an important shift in the spatial terms in which glacial regions were understood. Rather than geographically isolated, icebergs and ice caps appear in films & journalism of this period as part of an interconnected global environment. They must thus be understood not as distinct from, but as part of, broader developments in notions of space and time in the early twentieth century.

In the dissertation's second part, which focuses on twenty-first century cinema and digital media, I analyze the glacier itself as an archive of climate history. I begin my discussions of the archive with an analysis of Werner Herzog's *Encounters at the End of the World* (2007), which I read as a media archive that poses important questions about the methodological distinctions and overlaps between history and science. I then turn to questions of automated vision and temporal manipulation in *Chasing Ice* (2012), which makes dramatic use of time-lapse videos of glacial recession to provide visual evidence of global warming. Whereas the ice is often seen as a tool for preservation, guaranteeing the long life of that which it encases, *Chasing Ice* dramatizes its vulnerability to epochal change, thus invoking anxiety over historical loss that informs discourses of environmental crisis. In my last chapter, taking up various modes of data visualization that draw on information extracted from ice cores to access the deep past, I draw out this tension between the preservational and precarious in the nature of ice. I argue that the glacier both resembles other

archival media in its capacity to preserve and index records of bygone events, and differs in its status as both a representation and a presentation of climate conditions, one whose loss threatens not only environmental but also informational devastation. The glacier thus operates as a medium in at least two senses: as an archive of the deep climatic past, but also as a visible index of presently changing conditions (and thereby an augury of the future). Ultimately, I argue that the competing logics of glacial temporality and indexicality—its dual status as an accumulation of records and a record of depletion—puts historical thought into an impossible bind, forcing us to contemplate the devastating internal contradictions of a historicist epistemology.

for my families

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Introduction
A Clash of Titans:
A Ship, an Iceberg, and the Historicity of Nature

Shortly before midnight on April 14, 1912, the largest ocean liner ever constructed was sliced open like a can of sardines by a massive iceberg and sent, along with over 1500 passengers, to a watery grave. The event's symbolic import was immediately apparent: already in the weeks following the disaster, the sinking of the *Titanic* became emblematic of human hubris and nature's power, the tremendous risks of speed, and the material vulnerabilities of modern technology to natural forces. In a thorough account that covered several full pages two weeks after the ship's demise, a writer for *The New York Times* mused, "those who would moralize over the great ship's loss can see in such a meeting [between ship and iceberg] the hand of Fate, which required the greatest example of man's handiwork afloat on the sea to point its protest against his ambition."¹ For all the investigatory work done in the aftermath of the catastrophe to determine who bore responsibility and how such a calamity might be prevented in the future, the popular interpretation of events evidenced a remarkable note of fatality. The sense of the disaster's inevitability arose in part from a conceptualization of nature as a vengeful deity, troubled by human overreach, which must intervene to demonstrate its dominance in an eternal contest of wills.

This tragic narrative could hardly help but inspire dramatic re-enactments in what was rapidly becoming the preeminent entertainment form of the urbanized West that was rocked by the *Titanic*'s loss. Well before a year had elapsed, the *Titanic* had already begun to inspire narrative

¹ "The Tragedy of the Titanic," *The New York Times*, 28 April 1912, p. S1.

cinema: its first fictionalized treatment, *Saved from the Titanic*, premiered a mere 29 days later. This film is now lost, but it was not the only attempt at near instant capitalization on this international disaster. Appearing later that year, *In Nacht und Eis* (1912), the earliest still extant *Titanic* film, already has many hallmarks of what has meanwhile become a kind of mini-genre unto itself. The film begins as crowds wave goodbye in Belfast; characters' introductions and actions play to the audience's knowledge of their fate; a contrast is set up between hard labor in the furnace rooms and luxurious entertainments above. The wireless room receives special attention, as does the band that plays on even as the ship disappears beneath the icy waves. In the decades that followed, the *Titanic* received filmic treatment in 1929's *Atlantic*, 1958's *A Night to Remember*, and 1997's *Titanic*, among many documentaries for film and television. Although details vary, all display a fascination with the complex of technologies that failed the ship, from steel to radio, and the drama of human lives cut short in the icy sea. Indeed, by 2010, the event's symbolic significance was so firmly established that a brief shot of a newspaper headline in the opening minutes of the enormously popular series *Downton Abbey* was enough to signal to viewers the program's central theme: of the rapid decline of familiar social forms in the face of an aggressive, and often ruinous, techno-industrial modernity.

The *Titanic*'s status as an icon of modernity and its discontents extends beyond the popular sphere to academic analyses of the early twentieth century as a period of rapid and radical cultural, political, and technological change. Both Stephen Kern and Jeffrey Sconce identify the *Titanic* as a central symbol of a shift to a virtually interconnected world. Each lays focus on the wireless technology that, as Sconce notes, "suddenly became inextricably and vividly bound to the public's

imagination of a tangible disaster.”² He quotes radio scholar Susan Douglas, who observes that “wireless emerged as the invention that had both permitted many to survive and caused many more to die.”³ More than just symbolic, Sconce notes that the *Titanic* disaster was a concrete participant in establishing the infrastructural regulations that would come to govern wireless radio, leading to the passage of the Radio Act of 1912 on maritime wireless guidelines. For Kern, the *Titanic* is an emblem of a new conceptualization of time, an extended and shared present in which the virtual co-location enabled by wireless brings people together across vast distances into an expansive and far-reaching now.⁴

These assertions of the *Titanic*’s cultural import offer incisive analyses of contemporary reactions to the event, and lucid interpretations of the socio-technological transitions it heralded. But I am interested in looking at the *Titanic* disaster from a somewhat different perspective, one that was largely ignored for the first century after its foundering. Rather than offer another meditation on what the *Titanic* can tell us about cultural receptions of industry, capitalism, and human innovation, I want to shift emphasis and ask what it can tell us about Western conceptualizations of nature. The stories of people and their technologies are broadly and deeply inscribed in the annals of visual and communications media, but what of the iceberg that sent them to their doom? For as much as it is a story about a ship, the sinking of the *Titanic* is a story about ice—and it is a story that can tell us much about how we understand our natural environment through processes of mediation.

² Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television* (Durham, NC: Duke UP, 2000), p. 73.

³ *Ibid.*

⁴ For Kern’s primary discussion of the *Titanic*, see Stephen Kern, *The Culture of Time and Space* (Cambridge, MA: Harvard UP, 2003), pp. 65-67. The disaster makes several appearances throughout the book as a touchstone of modern temporality.

In thinking about the *Titanic* from the perspective of the ice, I am engaging in a conversation that has emerged in the last ten to fifteen years in reflections on this historic moment. In 2006, the BBC produced a TV documentary called *The Iceberg that Sank the Titanic*.⁵ In this program, contemporary scientific methods are used to reconstruct the probable history of the offending berg, which likely existed as part of the Greenland ice sheet for some thousands of years before breaking off into the Arctic Ocean and being dragged by the Labrador Current to its fateful encounter. The documentary establishes a parallel structure between the formation of the iceberg and the construction of the ship, “two giants on a collision course.”⁶ The three years spent on the building of the *Titanic*, the film notes, comprise roughly the same amount of time that it takes for an iceberg to travel from the calving face of Ilulissat—the immense Greenland glacier that likely produced the fatal formation—to the North Atlantic. Thus “the iceberg that sank the *Titanic* would have calved in 1909—just as work began on the ship itself.”⁷ Here, the ice is drawn into the same logic of simultaneity that wireless produces for ship and land in Kern’s formulation. Rather than some extension of a cruel and eternally watchful destiny, awakened at any moment by the excesses of human ambition, the iceberg enters the historically contingent chronology used to track the ship’s emergence. As it weaves both ice and vessel into a single temporal web, the film also deploys metaphor to highlight other similarities, referring to the glacier as a “production line” for icebergs, and noting that before they could meet, “both giants” had to “break their ties with the land.”⁸ It is an approach to the natural world that emphasizes its connections with, rather than its isolation from, the historical currents that flow around it.

⁵ Cluny South, “The Iceberg that Sank the Titanic,” *Natural World*. BBC, London: 2006.

⁶ *Ibid.*

⁷ *Ibid.*

⁸ *Ibid.*

Yet even as the documentary invokes similarities between iceberg and steamer, it simultaneously highlights the enormous disparity of scale between the historical temporality of the ship and that of the ice. Although the time taken from calving to meeting site roughly equals the construction time of the *Titanic*, the program also notes that the iceberg “had been conceived 15,000 years earlier—back in the Stone Age, before man had ever taken to the sea.”⁹ This interest in scalar disjuncture is echoed by an article from *WIRED* magazine noting the hundred-year anniversary of *Titanic*’s demise, entitled “What Happened to the Iceberg that Sank the *Titanic*?” As the author of this article explains,

If you were to trace the story of the *Titanic* to its earliest human origins, you couldn’t really go much further back than 1907...But by comparison, the iceberg began its slow journey to the North Atlantic over three thousand years ago.... When they finally reach the coast of the Arctic Ocean, the lapping tides break off chunks of the ice, and icebergs are calved from the glacier, some 30 centuries after their source water was first deposited. The iceberg that sank the *Titanic* began its journey as a rough contemporary of King Tutankhamun, entire civilizations rising and falling while it made its slow march to infamy.¹⁰

This impulse to return and fill in the details of a natural history that has heretofore been treated separately from the human says much about the era in which we find ourselves, designated as “the Anthropocene” by an increasing number of scholars across disciplines. It is an era in which, as historian Dipesh Chakrabarty has so presciently noted, “anthropogenic explanations of climate change spell the collapse of the age-old humanist distinction between natural history and human history,” forcing a reconsideration of how we mediate the natural world.¹¹ Rather than a random roadblock on an accelerating track to technological innovation, the *Titanic*’s fatal iceberg is included in a historical frame that captures—or attempts to capture—a complex web of constantly moving parts.

⁹ Ibid.

¹⁰ Alasdair Wilkins, “What Happened to the Iceberg that Sank the *Titanic*?” *WIRED*, 16 April 2012, <http://www.wired.com>.

¹¹ Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry* 35.2 (Winter 2009), p. 201.

This dissertation takes up the history left out of the typical *Titanic* narrative: the story of the ice, or rather, the story of how the ice is received and understood, and the implications of that understanding for Western conceptualizations of nature. I examine the media history of the glacier in order to elucidate the role played by visual and communications media in human understandings of the natural environment, and how a re-examination of environmental mediations can help answer some of the challenges posed to historical thought by climate change. The dissertation is divided into two parts, each focusing on a period of heightened popular fascination with polar and glacial regions: the early twentieth century (1910-1933) in the first part, and the early twenty-first century (2007-2018) in the second. In each period, attention to icy environments corresponds with a period of rapid technological change in media culture, but the tone is markedly different: excitement and a somewhat jingoistic pride at exploration and discovery in the early twentieth century gives way to persistent anxieties over global ecological collapse in the early twenty-first. In the dissertation's first part, I focus on how changes in the media representation of glacial space and time helped to bring the glacier into the spatial and temporal logics of modernity. In a break from Romantic notions of remote and timeless regions, cinema and wireless radio contributed to a reconceptualization of glacial environments as dynamic, interconnected, and contingent—all hallmarks of contemporary discourses of climate change and cryospheric degradation. I base this argument on close readings of several films from 1924-1933, which I put into conversation with contemporary film theory and newspaper reporting of this transitional era. I argue that a sense of natural historicity in fact emerges in the popular imaginary several decades before the conversation around climate change and the Anthropocene, laying the groundwork for later ideas about the climatic past and future.

By the early twenty-first century, the idea that nature is historically contingent, and subject to change over time, is no longer controversial: indeed, it is foundational to the very discourse of climate change that preoccupies an increasingly broad swath of academic disciplines. Rather than a blank void, the glacier has become a kind of historical archive, one haunted by the scalar disjuncture between geological and human temporalities. My exploration of contemporary glacial historicity begins with Werner Herzog's *Encounters at the End of the World* (2007), which I read as a media archive that poses significant questions about the methodological distinctions and overlaps between history and science. I then turn to questions of automated vision and temporal manipulation in *Chasing Ice* (2012), which makes dramatic use of time-lapse videos of glacial recession to provide visual evidence of global warming. Whereas the ice is often seen as a tool for preservation, guaranteeing the long life of that which it encases, *Chasing Ice* dramatizes its vulnerability to epochal change, thus invoking anxiety over historical loss that informs discourses of environmental crisis. In my last chapter, taking up various modes of data visualization that draw on information extracted from ice cores to access the deep past, I draw out this tension between the preservational and precarious in the nature of ice. I argue that the glacier both resembles other archival media in its capacity to preserve and index records of bygone events, and differs in its status as both a representation and a presentation of climate conditions, one whose loss threatens not only environmental but also informational devastation. The glacier thus operates as a medium in at least two senses: as an archive of the deep climatic past, but also as a visible index of presently changing conditions (and thereby an augury of the future). Ultimately, I argue that the competing logics of glacial temporality and indexicality—its dual status as an accumulation of records and a

record of depletion—puts historical thought into an impossible bind, forcing us to contemplate the devastating internal contradictions of a historicist epistemology.

Chapter Summaries

I begin my investigation of the glacier's media history in Antarctica: a place that holds 61 percent of the world's freshwater locked—or decelerated to the point of near arrest—in a massive sheet that slowly pours, by way of glacial flow, into the worlds' oceans. In particular, my first chapter investigates shifting conceptualizations of the Antarctic in the early twentieth century, changes that have far-reaching implications for the popular understanding of natural historicity. I take as my primary objects of analysis two films: Herbert Ponting's documentary *The Great White Silence* (1924), which tells the tale of the ill-fated Scott expedition to Antarctica in 1910-12, and *With Byrd at the South Pole* (1930), a happier story of the journey that sent the first airplane flying over the South Pole. Juxtaposed with one another, the two films reveal a notable shift in the way the southernmost continent and its monstrous glacial formations figure in popular media. Antarctica is depicted in Ponting's film as an eternal void, eerie precisely for its aggressive refusal to change or give way in the face of human effort, a place remote from the dynamic temporality and interconnected space of modern life beyond the polar seas. In *With Byrd at the South Pole*, however, the ice sheet emerges as a shifting, changeable environment that is connected with the rest of the world by transportation and communications technologies. I lay particular emphasis on the way that wireless technology was deployed in this expedition, the first to maintain constant radio contact with the outside world. In creating a sense of virtual presence, wireless communication wove the temporality of the Antarctic ice into contemporary historicity, enabling comparisons and connections that effectively dispelled the notion that Antarctica existed apart

from earthly space and time. Simultaneously, the tensions of the cinema—between stillness and motion, animate and inanimate, living and dead—highlighted similar tensions in the ice itself, encouraging a notion of glacial space as more complex than it appeared. Ultimately, I argue that *With Byrd at the South Pole* and the media spectacle surrounding it contributed to a shift in the historiographical frame through which nature was understood, lending it a sense of historicity that is foundational to contemporary understandings of climate change.

In Chapter Two, I continue my study of the changing notion of glacial environments in twentieth-century modernity. Where Chapter One primarily investigates spatially oriented upheavals produced by radio's enabling of virtual presence, in this second chapter I devote the bulk of my analysis to the shifting sense of temporality in remote glacial space. Moving from the South Pole to the Alps and the Arctic, I take up two exemplars of the *Bergfilm* genre (*Avalanche* [1930] and *SOS Eisberg* [1933]), rethinking the approach to nature that has been ascribed to these films in much of the literature to date. Rather than accepting a sense of the Alpine environment as mystical, Romantic, and apart from historical time, I discuss the *Bergfilm* as emblematic of the spatiotemporal logic of modernity, part of a broader shift in the conceptualization of nature in Euro-American thought. Rather than isolated and timeless, remote environments become yet another connected field on which the dialectical temporality of modernity unfolds. Using historical contextualization and close formal analysis, I draw on archival sources and theoretical discourse to make the case that what we see in the *Bergfilm* is environment in modern time. As in Chapter One, formal analysis is complemented by attention to archival evidence of popular reception to assert that these two films are documents of a shift in the Euro-American concept of nature: from a mythical space of eternal repetition, radically separate from industrial modernity, to

a historical realm subject to the modern logics of standardization and contingency. Taken together, these first two chapters intervene into the study of cinematic modernity to insist that widely recognized shifts in spatial and temporal understanding of urban environments hold for natural settings as well, and push back the timeline for a recognition of climate historicity from the turn of the twenty-first century to the early part of the twentieth.

In the dissertation's second part, which focuses on twenty-first century cinema and digital media, I analyze the glacier itself as an archive of climate history. I begin my discussions of the archive with an analysis of Werner Herzog's *Encounters at the End of the World* (2007). This chapter lays particular emphasis on Herzog's musings about the distant past and future, and the archival challenges they present. Specifically, the capability of digital technologies to record, store, and process immense amounts of data, as well as the enormous scale of natural history itself, lead to a crisis of information overload in which the volume of material threatens to overwhelm the capacity to make meaning from it. This problem brings together the dialectic of collection and selection, most closely identified with the archival theories of Jorge Luis Borges and Jacques Derrida, with studies of digital mediation that deal with questions of automated capture and information processing. Alongside these questions of scale, *Encounters at the End of the World* also opens up an opportunity to think about tensions in the temporal address of the natural archive, in which analyses of a deep past become fodder for projecting an equally deep future, one in which the vicissitudes of the present become nearly unthinkable. Moving through a series of media technologies whose attempts to compile a completist record threaten to spin out of control, the film undermines the notion of the usefulness of total knowledge. As the record approaches the limit of the infinite, and the job of sorting through it becomes increasingly Sisyphean, the locus of

contingency shifts from what has happened to what can be remembered and explained. In the end, it presents the ice itself as the last hope of historical conservation: a material whose vulnerability could not be more obvious, and which is doomed to fail at the task of delivering meaningful messages from the past.

If *Encounters at the End of the World* can be read as a meditation on logics of accumulation, the film at the center of Chapter Four operates by way of subtraction. Like *Encounters*, *Chasing Ice* (2012) grapples with the problems of scale that haunt the discourse of the Anthropocene, preoccupying many of its most prominent scholars.¹² As an activist documentary, the film attempts to communicate the immediacy of climate change through making glacial recession dramatically visible by way of time-lapse cinematography. In this chapter, I begin by historicizing the film's use of time-lapse, connecting it to the discourses of modernity that take center-stage in part one of the dissertation. While the film lays much emphasis on its own deployment of new media technologies, the fascination it exhibits with moving image media's capacity to manipulate time is far from new. The film emerges, however, from a very different historical context from that of early encounters with time-lapse: a moment in which the global fascination with glacial regions has less to do with discovery and gain than with anxiety over loss. It is also a moment in which the media infrastructures that enable global thinking are firmly established, rather than still emergent. In its deployment of time-lapse, *Chasing Ice* seeks to shock and awe with a visceral demonstration of

¹² See, for example, Chakrabarty, "The Climate of History," as well as Joseph Masco, "The Six Extinctions: Visualizing Planetary Ecological Crisis Today," in Richard Grusin, ed., *After Extinction* (Minneapolis: University of Minnesota Press, 2018), pp. 71-105; Sean Cubitt, "Data Visualisation and Ecocriticism" in Stephen Rust, Salma Monani and Sean Cubitt, eds. *The Ecocinema Reader: Theory and Practice* (New York: Routledge/American Film Institute, 2012), pp. 277-296; Nicholas Mirzeoff, "Visualizing the Anthropocene," *Public Culture* 26, 2 (2014): 213-232, among other examples.

nature's historicity. In its approach, however, I argue that it removes the very spaces for intervention that define the historical, rendering instead a non-contingent narrative of inevitable collapse and decay. Yet at the same time, the film evidences a fascination with another mode of temporality, a present-in-duration that displays precisely that footage removed from the time-lapse. Perched uneasily between these two temporal modes, the film gestures toward the central paradox of glacial historicity, which becomes available to perception only through self-negation.

The project's final chapter shifts focus somewhat: rather than technological mediations of glaciers, I analyze how the glacier itself acts as a medium, or a mediating process, which I argue happens in two ways. I begin with the notion, common among scientists and the lay public alike, that the glacier is a sort of archive, a repository of historical data from which samples (in the form of ice cores) can be retrieved and read to understand the path to the present and what might lie ahead. In these processes, the ice core becomes a media technology much like the cinema, in which an indexical trace of historical reality is reanimated to tell a story of another time. I analyze several examples in which ice cores are put into constellation with digital media technologies, paying special attention to cases in which fixed data are rendered into moving lines on graphs, narratives of economic flux, or flowing music that attempts to produce a phenomenological experience of the passage of millennia. Alongside these archival appropriations of glacial depths, I read the glacial surface as an index of warming air and seas, its melting a sign of other, less sensorially available changes in the environment. Here, again, a paradox: the message delivered by the glacial mass becomes visible only in disappearance; material loss is informational gain. This problem becomes only more acute when placed in juxtaposition with the consciousness of the glacier as archive. The future toward which the record points is the destruction of the record itself,

and its accuracy can only be confirmed by its own erasure. Rather than providing salvation, the hoarding of information here only pushes us further into the void. In light of this unsettling collapse of familiar models of historical thought, I argue that it becomes necessary to begin to think beyond logics of accumulation, extraction, and abstraction, to imagine alternative bases of apprehension and understanding that can account for the material precarity of our rapidly receding epistemological resources.

The sinking of the *Titanic* has often been read as heralding a sea change in the technological conditions of modern life, and indeed it did. But this dissertation takes it as a jumping-off point for a different set of equally significant shifts: namely, in the way people thought about the passage of time, and the conditions of space, in the natural environment. For the great ship's demise led not only to new regulations in the use of radio: it also inaugurated a new international agency, the Ice Watch, tasked with surveying conditions in the North Atlantic. This systematic approach to surveying shifting conditions in the polar seas, identifying patterns and communicating responses, is a form of environmental mediation that lays the groundwork for a conceptualization of glacial activity quite different from the eternal void into which Robert Scott and his crew marched in 1910. With the inscription of a consistent record comes the possibility of perceiving change on a scale that exceeds the scope of a single human lifetime. In the decades that followed, ideas about nature and environment would change to afford a sense of historicity that, by a hundred years later, is foundational to the central crisis of the twenty-first century. Now, the question is not so much whether nature is historical, but how to make its history legible to the

humans who are intervening in it so drastically. My study of the epistemological challenges presented by the collision of glacial dynamics with historical thought suggests in the end the inadequacy of the archival frame to the material realities of climate change, and the necessity for rethinking our approach to natural history on a fundamental level—before we all find ourselves at the bottom of the rising sea.

Part One: Stillness in Motion

Chapter One

“All is movement and change.”

Cinema, Wireless Technology, and the Reconfiguration of Antarctic Space

Out of the Void

Against a background of nearly unbroken white, three human figures, bundled against frigid air that attacks them from every side, wrangle three ponies harnessed to sleds. Backing toward the right edge of the frame, one man tugs his animal into motion, then turns to walk with it across the snowy ground. The camera briefly pans right to keep them in frame, then stops and returns left to find the second man, who crosses the static shot, and finally the third, who again draws a slight pan to the right before the camera comes to rest and allows him to walk offscreen. Once his body disappears and only his sledge remains, a cut takes the viewer back to the first man, who continues his trudge in profile from screen left to screen right, once again walking out of view to the right. Seconds later, the men and their workhorses reappear from a different angle, facing directly away from the camera, which repeats its left to right pan to reveal more men and ponies in the distance. Four sledge teams and a fifth man with no bestial charge are arranged against the still-blank backdrop in long and extreme long shot, all framed between the top and bottom third-lines of the frame. Their jackets puff and ripple, revealing sharp winds that set the ponies' tails swinging; one man slips, nearly losing his footing on the icy terrain. As they continue their trek, the air around them lightly flickers, briefly revealing the faint contours of hills or ridges in the background of an otherwise undifferentiated expanse of white. In the final shot of this sequence three sledge teams progress in single file away from the camera at an oblique angle (*Fig. 1*).



Fig. 1 Explorers depart to their doom on the Antarctic ice sheet
Image Credit: *The Great White Silence* [1924]. London: bfi, 2011. DVD.

As they grow smaller, the camera pans right to keep them in the horizontal center of the frame. Shortly before the image fades to black, the rearmost figure raises his hand and waves back toward the camera and audience, before all three disappear into the white.¹

This scene functions as a sort of climax to Herbert Ponting's 1924 film *The Great White Silence*, which documents the British Captain Robert Falcon Scott's journey to Antarctica from 1910-1912. This expedition was infamous for its fatal end: Scott and four crewmembers died of starvation and exposure in a failed attempt to reach the South Pole, and this film preserves the last known moving images of them before they perished. I am interested in the film less for its tragic narrative, however, than for what it says about the function of Antarctica in the popular imagination of the West in the early twentieth century. This function, I will argue, would undergo

¹ Herbert Ponting, *The Great White Silence* (1924; London: bfi, 2011), DVD. This film, like many of its time, makes extensive use of tinting. Thus, these images appear more green than white—but the film's title and intertitles, as well as common sense, make clear the profilmic whiteness of the scene.

a radical change at the end of the 1920s, as the Antarctic landscape was subjected to new and different processes of mediation. As suggested by the sequence detailed above—and by its very title—*The Great White Silence* presents a vision of Antarctica as a vast expanse characterized by harsh conditions and a lack of organic life: a vacant, deadly void. The progression of several shots moving left to right to follow the men’s advance emphasizes their journey’s length; again and again, they walk off the edge of the frame, only to find more nothingness before them. As they gradually recede from view, inching toward the empty horizon, their diminished figures underscore the enormity of the space that surrounds them. The sense is strong that they have come to a remote place, severed from time, history, and the world of the cinema audiences who watch their final steps.

In fact, this sense is fostered by *The Great White Silence* already in its opening shot (Fig. 2). The film’s title appears over a freeze frame depicting the Ross Ice Barrier, where the glacial mass of the polar ice cap shears off into the sea.



Fig. 2 Title image of *The Great White Silence*
Image Credit: Herbert Ponting, *The Great White Silence* (1924; London: bfi, 2011), DVD.

This image, which serves to introduce viewers to Antarctica, deploys the classic photographic composition “rule of thirds”: the Barrier occupies the central horizontal third of the frame, with its sheer face, glaring white in the bright sunlight, slicing like a blade across the bottom third line. With its straight lines and flattened depth of field, this striking image seems locked by aesthetic conventions into a motionlessness that serves as an appropriate visual metaphor for the perception of Antarctica as a frozen, ahistorical place. The language of the film’s intertitles, much of which is drawn from Ponting’s 1921 memoir *The Great White South*, plays into this concept. “The Antarctic Continent,” the first sentence of the first intertitle declares, “is an ice clad wilderness of dazzling whiteness and appalling silence.” Slides that follow set the scene for Scott’s tragic misadventure as one of “dread and sterile desolation,” “utterly devoid of vegetation.” The South Pole is a spot where “only ten human beings have trodden since God made the World.”² Silence, void, desolation, and sense of unreachability work together to sever Antarctica conceptually from the dynamic flux that characterized life in the 1920s on the European, American, and Australian continents whence the explorers hailed.

As the film progresses, its shooting style aligns with this notion of Antarctic space as a frozen and empty waste, lively only when filled by human activity. Most takes are either static or simple pans, emphasizing the vastness of space, foregrounding men or penguins and seals who play on the ice as on a proscenium stage, for viewers’ entertainment (*Fig. 3*). The environment is a dead and motionless backdrop for “the immortal story of the Scott South Polar Expedition.”³ The venture’s

² Ponting.

³ *Ibid.*

place in eternity both begins and ends the film, as the final title slide declares that the dead explorers' "heroism shall last in the annals of our Race as long as time endures."



Fig. 3 Playing soccer on the ice, an empty stage for human action.
Image Credit: *The Great White Silence* [1924]. London: bfi, 2011. DVD.

Film theorists of the time were not insensible to these visual strategies; responding to it in 1925, Béla Balázs remarked upon the “unending expanse of white, where the Antarctic night flows immediately into the night of the universe.”⁴ What is important to Balázs about the film is not anything to do with the environment as such; but rather, how it provides a setting for “the new, objectified form of human consciousness,” as men are filmed in moments of existential crisis.⁵ Antarctica is striking because of what it does for the people who go there; it is an overwhelming emptiness that, in its very refusal to adhere to the puny scale of human imagination, elevates the consciousness of its visitors to a cosmic event. Its expanse and extremity accommodate the desire

⁴ Béla Balázs, “Reel Consciousness,” trans. Christopher M. Geissler, in Anton Kaes, Nicholas Baer, and Michal Cowan (eds.), *The Promise of Cinema: German Film Theory 1907-1933* (Oakland: University of California Press), p. 60.

⁵ Ibid.

to stage an encounter with the sublime. But this notion of Antarctic space, and the massive ice formations that composed it, was about to change dramatically.

Premiering a mere six years later, the film *With Byrd at the South Pole* takes a very different approach to Antarctica. Shot during a 1928-1930 expedition led by the celebrated American aviator Richard Byrd, which would culminate in an eighteen-hour flight over the South Pole and back, this film was part of a much broader media apparatus that was built up around Byrd's venture. Along with other forms of mediation, *With Byrd at the South Pole* participated in a sea change in the popular conceptualization of the southernmost continent. Rather than stillness, silence, emptiness and separation, it reflects an Antarctic environment characterized by dynamic change, eerie sounds, and constant mediated connection to the outside world. Byrd's journey came during an uptick in Euro-American interest in polar exploration; indeed, his was only one of three groups to test the use of airplanes in the Antarctic Circle during those years.⁶ After a decade of relative public disinterest in the Polar South, the appearance of new transportation and telecommunications technologies drew attention back to the earth's extreme ends, as they vastly expanded the potential of what could be seen, and who could see it. Equipped with wireless technologies such as telegraph and radio, and new instruments of scientific observation, Byrd's crew presented onlookers with an image of Antarctica that challenged the perceptual and conceptual frameworks previously used to understand it. With an endeavor that was part scientific research mission, part national pride project, part capitalist resource-finding venture, and all media spectacle, the Byrd Antarctic Expedition participated in a global shift in Antarctic exploration that made important strides toward a reconceptualization of natural processes. This chapter draws on

⁶ The other two were Hubert Wilkins and Douglas Mawson. I concentrate exclusively on Byrd in this chapter; importantly, however, I see him as exemplary of this moment in polar history, rather than exceptional.

personal accounts of this journey alongside contemporary newspaper reporting, radio programming, and *With Byrd at the South Pole*, which was shot by two Paramount News cinematographers who joined the crew as documentarians. Locating Byrd's expedition in much broader discourses of technological and scientific modernity, I argue that it evidences a new vision of Antarctica that is essential to contemporary understandings of climate science.

This new vision inheres in the complex interplay of technological infrastructure, scientific development, and cultural understanding of nature and environment that intersect in Byrd's venture and the media spectacle surrounding it. I am interested in three particular aspects of this interplay: first, how Byrd's representations of the Antarctic presented it as a dynamic and changing space, in a break with past representations; second, how wireless technology created a sense of global interconnectivity that fostered an understanding of the region's impact beyond the Antarctic Circle; and third, how the emergence of scientific knowledge production as the central contribution of this mission shifted the historiographical frame in a way that encouraged a popular understanding of the environment itself as historical. Evidenced by written, photographic, and cinematographic accounts of the voyage—both from explorers and observers at home—these conceptual shifts are crucial for establishing the conditions of possibility for a contemporary climate science that relies on constant monitoring and computational modeling to track and predict a natural world that is radically changing before our eyes.

Stillness in Motion: Cinema and Antarctic Dynamism

When the Byrd Expedition set out for Antarctica in the fall of 1928, as far as the general public was concerned, they were headed straight into the void. Characterized by Ponting's film and the

memory of Scott's death—as well as Ernest Shackleton's infamous failure even to reach the continent in 1914-17—Antarctica was a desolate place where brave men went to face off against the eternal elements, to struggle and, more likely than not, to die. Byrd's expedition and the media production surrounding it represent a significant break with this approach to the Antarctic environment. In his book-length account of the voyage, *Little America*, which was published a few months after his return to the United States in 1930, Byrd demonstrates a marked preoccupation with dynamism, rather than silence or emptiness. In a journal entry from early 1929, several weeks into his stay on the southernmost continent, he notes, "It has been a real experience, lying here alongside the bay ice week after week, with the opportunity of watching the changes and caprices of this frozen world. It is not the rigid and immobile world that we imagined. All is movement and change."⁷ A week later, he declares, "this is indeed a place of chastisement. And of change."⁸ During the winter, he describes how members of the crew amused themselves by going for nighttime walks: "There was always something new to be found there. Pressure ridges changed their shape constantly. New ones appeared, rising, in some cases, to heights of 30 and 40 feet, taking on eerie forms in the half-light."⁹ Among the many photographs accompanying his text is one of a crewmember, holding aloft a magnesium torch to disperse the darkness and illuminate the startling shapes of these ridges, which result from slow-motion collisions between currents of ice inching along in different directions (*Fig. 4*). Although still, this image unmistakably evokes movement, resembling nothing so much as waves frozen in the act of shifting. The confusion of swirling, curving lines, the reflection off a plethora of angular surfaces, the depth and dispersal of

⁷ Richard Byrd, *Little America* (New York and London: G. P. Putnam's Sons, 1930), p. 117.

⁸ *Ibid.*, p. 133.

⁹ *Ibid.*, p. 226.

bright points to draw the eye across these chaotic forms, stand in stark contrast to the image from the title frame of *The Great White Silence*. Where the latter presents the sharp lines of a static grid locked permanently into place, the image from Byrd's expedition reflects an idea that nature, regardless of human activity, is in perpetual flux.



Fig. 4. Photograph of the pressure ridges. Printed under the title "A Frozen Inferno" in Byrd, *Little America*, p. 193.

Here, the nature of the subject reflects that of the medium used to represent it. Like the photograph itself, the ice formation presents to the human eye an illusion of stillness that alludes to a much larger continuum of motion in duration.

This persistent interest in the invisible motion and action of the ice locates Byrd firmly in much broader discourses of modernity. The idea that the early twentieth century witnessed a major change in the conceptualization of space and time in the West is well established, perhaps most influentially by Stephen Kern's classic account *The Culture of Time and Space*. In this book, Kern demonstrates how in the years between 1880 and 1918, across a broad range of fields including

literature, art, physics, biology, sociology, mathematics, and philosophy, “the traditional view that space was an inert void in which objects existed gave way to a new view of it as active and full.”¹⁰

While Kern is primarily interested in how this shift is reflected in literature, art, philosophy, and politics, Lisa Cartwright eloquently demonstrates its importance for science—namely, biology and physiology—in *Screening the Body*, her account of late nineteenth and early twentieth century developments in technologies for visualizing the human body. In this study, Cartwright details “the emergence of a distinctly modernist mode of representation in Western scientific and public culture—a mode geared to the temporal and spatial decomposition and reconfiguration of bodies as dynamic fields of action.”¹¹ In particular, she argues for the importance of microscopic cinematography in creating “the body’s new status as a mobile, living system.”¹² The shift Cartwright identifies in physiology, at a microscopic scale, parallels the macroscopic reconceptualization of geology in which Byrd’s journey to Antarctica in the late 1920s participates.¹³

Like the shift identified by Cartwright, this new sense of the natural environment as characterized by constant imperceptible motion had much to do with the technologies of visualization used to mediate such environments. These included not only photography and cinematography, but also the airplane. While not a technology of mediation in the same sense as

¹⁰Stephen Kern, *The Culture of Time & Space* (Cambridge, MA: Harvard University Press, 1983), p. 152.

¹¹ Lisa Cartwright, *Screening the Body: Tracing Medicine’s Visual Culture* (Minneapolis: University of Minnesota Press, 1995), p. xi.

¹² *Ibid.*, 82.

¹³ The theory of continental drift, according to which all seven current continents were once part of the same landmass and have gradually drifted to their present locations, is most commonly associated with Alfred Wegener, who first put it forward in 1912 (though Wegener himself acknowledged predecessors in both the 19th century and the years immediately preceding his proposition). He advanced this theory in a 1915 book published in German that was first translated into English in 1924, a few years before Byrd’s expedition. The theory, which would later be developed into commonly accepted plate tectonics, continued to be disputed until the 1950s. But by the 1920s, the idea that even the earth itself was shifting beneath our feet was indisputably part of both lay and scientific discourse.

the camera—an airplane neither records nor stores images—it is an important technology of vision, given the radically different perspective it enables on the world below. In an article on the history of aerial perspective, Paula Amad writes extensively about the wide-ranging effects of “the aerial view’s capacity to make us see the world anew,” laying particular emphasis on its implications for ecological understanding.¹⁴ She quotes the French pilot Antoine de Saint-Exupéry (a younger contemporary of Byrd) who, in his 1939 memoir, writes, “It is not with metal that the pilot is in contact. Contrary to the vulgar illusion, it is thanks to the metal, and by virtue of it, that the pilot rediscovers nature.”¹⁵ Thus the airplane is not merely a mode of transportation, but a revelatory tool offering new vistas, and thereby new knowledge, of the world below. Byrd, too, was acutely aware of the differences afforded by his new, elevated perspective on Antarctica. In the climactic chapter of *Little America*, in which he describes flying to the South Pole, he remarks, “How much more—and yet how very much less—the surface traveller sees. And how different the point of view.”¹⁶ What the aerial point of view yields shows in the language he uses to describe the plateau surface:

Now, with the full panorama before us, in all its appalling ruggedness and gothic massiveness, we had a conception of the ice age in its flood tide. Here was the core, the center point of the Antarctic ice sheet. How deep it lay under us, whether 1000 feet or 8000 feet, we could not tell. But deep it must be, thus to dominate nearly all but the highest peaks which rimmed it, like the walls of a dam. Seeking an outlet to relieve its incalculable pressures, it presses through the passes which become glacial spillways, and makes for the sea. The parade of the mountains, the contrast of black and white, the upreaching peaks and the trisulcated troughs of the glaciers, the plateau spreading to an illusory horizon—it was something never to be forgotten.¹⁷

¹⁴ Paula Amad, “From God’s-eye to Camera-eye: Aerial Photography’s Post-humanist and Neo-humanist Visions of the World,” *History of Photography* 36.1 (February 2012), p. 83.

¹⁵ Quoted in Amad, p.77.

¹⁶ Byrd, *Little America*, p. 318.

¹⁷ Byrd, *Little America*, p. 337.

With the world spread beneath him, Byrd sees the ice anew: not as an inert mass, but a “flood tide,” whose movement is stopped only by mountain ranges which function as “the walls of a dam.” He sees evidence of “incalculable pressures,” understands passes as “spillways” for glaciers as the ice “makes for the sea.” This language is rich with movement, and speaks to the revelations made available to Byrd by his view from above. He paints with words a motion picture, in which the reader never forgets that even if it appears perfectly still, the ice is always on the move.

Those following Byrd’s trip were not restricted just to his words; this expedition was a media spectacle of massive proportions, using multiple platforms to publicize the discoveries and adventures of the crew. Two cameramen provided by Paramount News, Joseph T. Rucker and Willard Van Der Veer, reportedly shot 154,000 feet (or over 29 miles) of footage during the sixteen months they spent on the continent.¹⁸ Audiences received this footage in two forms: as part of a feature-length documentary entitled *With Byrd at the South Pole*, released the same week Byrd returned to New York, and at appearances by Byrd on an extensive post-expedition lecture tour around the US and Europe, undertaken to help pay off debts accrued on his voyage.¹⁹ Appearing in person alongside footage from Paramount’s cutting room floor, the adventurer regaled sellout crowds in hundreds of cities with stories of daring and discovery. Both the feature film and the lecture reels support the impression, created by Byrd’s written account, of the Antarctic ice as active and dynamic. Introducing viewers to the peculiarities of the southernmost continent, *With*

¹⁸ Byrd names this figure in an article by Al Sherman, “Movies Factor in Byrd Trip,” *New York Herald*, 17 July 1930, Box 326, Admiral Richard E. Byrd Papers, Byrd Polar and Climate Research Center, The Ohio State University, Columbus, Ohio.

¹⁹ Indeed, it speaks to the urgency of producing a media narrative that the filmmakers and their footage were rushed back to the United States upon departure from Antarctica, arriving more than two months before the rest of the crew so that the studio could cut and release the film to coincide with Byrd’s return in mid-June. The film, which is composed entirely of footage shot on location in Antarctica or onboard the ship, won top honors for cinematography at the 3rd Academy Awards ceremony in 1931.

Byrd at the South Pole highlights crevasses, “those deep gorges in the Barrier which crack open without warning.” The dramatic rescue of an expedition member who falls into the water after the ice suddenly gives way beneath his feet underscores this idea of ice as mobile ground. Like *Little America*, the film also spends some time on wintertime walks to explore pressure ridges (Figs. 5.1-5.6).



Figs. 5.1-5.6. Exploring the pressure ridges in the Antarctic night. Stills from *With Byrd at the South Pole* [1930]. USA: Image Entertainment, 1992. DVD.

After a series of scenes documenting indoor activities of cooking, repairs, building and packing supplies for adventures to come, an intertitle asks, “Meanwhile, what changes are taking place in the Barrier ice? Every few days, a party must go out to investigate.” Some of the most memorable footage in the film includes explorers scabbling up and sliding down these strange formations, magnesium flares held aloft to light the way as the film explains that “everywhere, tremendous forces are continually at work.” Audiences picked up on this startling idea that rather than a static void, Antarctica is a place that “changes daily,” as a newspaper in Stamford, Connecticut reported

after Byrd's lecture there.²⁰ Mediated by technologies more commonly associated with urban space, Antarctica suddenly appeared to share in the dynamism that characterized life between the polar circles. More than just introducing a sense of connection, this affected the continent's very historicity by encouraging observation and record-keeping. With daily change comes the interest in recording shifting conditions, and with that record comes a consciousness of history.

This introduction of a historical logic into an unpeopled, seemingly inorganic land was due in large part to novel perspectives offered by new technologies. For audiences of the lecture tours and *With Byrd at the South Pole* alike, the expedition footage brought together two unknowns: Antarctica, and aerial vision. Like *Little America*, the feature film climaxes with the flight to the South Pole, and presents many shots out the airplane window, both at eye level and looking down. These views present the aerial perspective that for Byrd, created the impression of the Barrier ice as fluid, forceful, and inexorably moving. Seen out the window or through the trap door of the airplane, the vast expanse of the ice sheet reveals folds and ripples of motion, like a pond into which something has been dropped (Fig. 6.1).

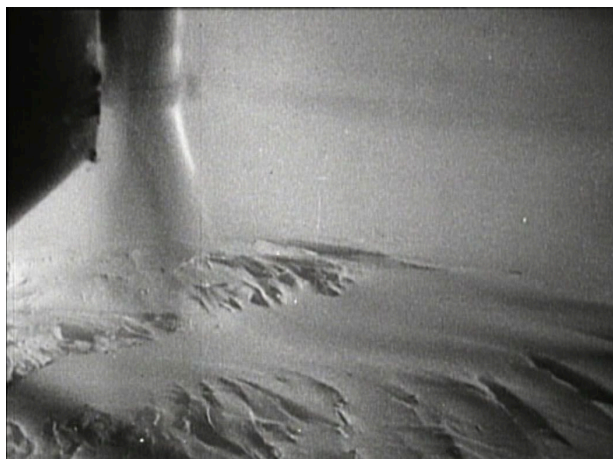


Fig. 6.1 An aerial view shown in *With Byrd at the South Pole*

²⁰ "Byrd Flies Here From Waterbury to Keep Speaking Date," paper unknown, Stamford, CT, 13 October 1930, Box 336, Admiral Richard E. Byrd Papers.

The sculpted folds of ice-clad mountains come to resemble the pressure ridges whose movement provided for so much entertainment in the Antarctic night (Fig. 6.2).



Fig. 6.2 An aerial view shown in *With Byrd at the South Pole*

A glacial pass becomes a waterfall, spilling toward the Antarctic Ocean, even if it does so slowly enough for its movement to remain imperceptible (Fig. 6.3).



Fig. 6.3 An aerial view shown in *With Byrd at the South Pole*

Seen from above, the ice sheet is not a featureless void but a slow-motion torrent, exerting not only physical pressure on the geological formations that hold it back, but also conceptual pressure on its traditional designation as a still, barren place of changelessness and death.²¹

Coupled with the distanced perspective enabled by the aerial view, the moving image medium contributes to the notion that Antarctica, though frozen, is far from static. As Laura Mulvey points out in her incisive work *Death 24x a Second*, the cinema brings with it a particular relationship to temporality: unlike the photograph, it “cannot escape from duration, or from beginnings and ends, or from the patterns that lie between them.”²² While *The Great White Silence* offers moving images, it frames motion and change as exclusive to the animals and people that flit across frozen, fixed environments. In the rare shots showing an icescape unpopulated by organic life, it is barely distinguishable from a photograph; indeed, many such shots in the film are freeze frames. Audiences of *With Byrd at the South Pole*, on the other hand, encountered a new perspective on the ice sheet, one which invited them to see it as in flux, headed somewhere different than it had been before. Delivered by a medium that insists on continual processes, these sequences pointed to the inescapable conclusion that Antarctic stillness was nothing more than an optical trick played by time.

Indeed, glacial ice shares several qualities that Mulvey identifies as essential to the cinema: tension between stillness and motion, a blurring of the inanimate and the animate, a dialectical capacity to preserve and to displace organic matter. All are wrapped up in the cluster of conceptual destabilizations that characterize late nineteenth and early twentieth century modernity: ideas like

²¹ Contemporary activist slogans like “water is life”—familiar from the NoDAPL movement and Flint, MI, put interesting pressure on the sense of Antarctica’s deathliness. If ice represents death, and water life, the liquification of Antarctica should be greeted with celebration—but, of course, it is a source of panic for most observers.

²² Laura Mulvey, *Death 24x a Second: Stillness and the Moving Image* (London: Reaktion Books, 2006), p. 15.

the permanence of location, the universality of time, and the visibility of truth. Yet in a period that was marked by a new sense of speed, an “annihilation of space by time” mediated by transportation forms like the train and airplane, which effectively shortened distances by dint of swiftness, the glacier posed an inverse temporal problem.²³ It pushed the limits of human perception because its movements were so slow, and the space they occupied so large. It extended an invitation to consider time on a different scale, one that required a radical expansion of the human frame of reference. Film, with its ability to travel through time, to render motion as stillness and stillness as motion, and to present for human consumption inhuman points of view, accepted this invitation and brought millions of spectators along to see.

A Small World After All: Media Connectivity and Virtual Presence at the South Pole



Fig. 7. The radio towers of Little America. Photograph printed in Byrd, *Little America*, p. 177.

²³ The “annihilation of space by time” comes from Marx’s chapter on capital in the *Grundrisse*.

Alongside a newfound sense of Antarctic dynamism, the Byrd expedition introduced to the Polar South the possibility of media connectivity. Unlike his forebears', Byrd's adventures were reported and received not only upon his return, but as they happened. During the capstone flight to the Pole, the aviator's takeoff, and his return eighteen hours later, were front-page news in hundreds of papers around the United States and internationally. This near real-time reporting was enabled by the expedition's pioneering use of wireless technology. Establishing Little America included erecting three radio towers, powered by five generators provided by Kolster Electric (Fig. 7).²⁴ A combination of telegraphy and broadcast radio, then in its infancy, kept the men in daily contact with the world beyond the Antarctic Circle.²⁵ The crew even included a staff writer from *The New York Times*, Russell Owen, who delivered stories to the paper by wire on a near daily basis. It is difficult to overstate what a radical departure this represented for Antarctic exploration, which had previously meant total isolation for months and years at a time. Perhaps the most eloquent demonstration of the latter phenomenon is Ernest Shackleton's commentary upon his first contact with civilization in 1917, after two and a half years adrift in the Southern Ocean. His crew had left the same week as the First World War began, and regaining contact meant grappling with a new world order wrought by death and destruction:

We were like men arisen from the dead to a world gone mad. Our minds accustomed themselves gradually to the tales of nations in arms, of deathless courage and unimagined slaughter, of a world conflict that had grown beyond all conceptions, of vast red battlefields in grimmest contrast with the frigid whiteness we had left behind us...No other civilized men could have been as blankly ignorant of world-shaking happenings as we were when we reached Stromness Whaling Station.²⁶

²⁴ "Kolster Reports Order from Byrd Expedition," *New York Sun*, 1 August 1930, Box 323, Admiral Richard E. Byrd Papers.

²⁵ A note on terminology: when I use the term "radio" in this chapter, I refer simply to the process of communicating via radio waves, which can manifest either as telegraphic communication or radio broadcast. I try to be clear to which manifestation I am referring when it is important for the argument; when the term "radio" appears on its own, I see the significance in the technology of connection itself.

²⁶ Ernest Shackleton, *South: The ENDURANCE Expedition* [1921] (New York: Signet Books, 1999), p. 232.

This striking description is fraught with the consciousness of Antarctica as a barren void, isolated from the trials and tribulations of the living world, a place of “frigid whiteness” and “blank ignorance,” enforced by the lack of the very technologies that were enabling the massacre of the young men of Europe and America.

The reigning conception of the North and South Poles in the years following World War One, as places outside of time and civilization, were essential to their popular appeal. It is important to note that *The Great White Silence*, which appeared in 1924, was composed of footage from 1910-12. It thus represented a return in two senses: to a time before the war, and a space beyond it, where the mechanized horrors of the battlefields could not reach. It was a fantasy of disconnection in an increasingly interconnected world, when the stakes of technological innovation could be deadly.²⁷ Nor was it the only film of its era to yearn for such a retreat: two years earlier, Robert Flaherty’s *Nanook of the North* had taken viewers away from industrialized modernity to the Arctic, in an ethnographic tale from beyond time. Fatimah Tobing Rony defines an essential element of the ethnographic mode as the “presuppos[ition] that the people studied are timeless.”²⁸ She describes *Nanook*, and other films in the ethnographic mode, as “a cinema of archetypal moments endlessly repeated. In *Nanook*, the archetypal moment is that of a society ignorant of guns or gramophones: a society of man the hunter, man against nature, man the eater of raw flesh.”²⁹ If *Nanook* presents a fantasy version of Inuit life as ahistorical, pre-technological, and radically disconnected from Western civilization, *The Great White Silence* suggests that this

²⁷ The threat of calamitous violence was not limited to obvious technologies of war like the bomber plane, submarine, or machine gun: Stephen Kern has argued convincingly that the telegraph itself played a decisive role in the escalation to World War One, contributing to conflicting temporalities of messaging that led to mistimed ultimatums and hasty replies due to uneven integration of modern communications technologies by leaders in the nations involved. See Kern, “The Temporality of the July Crisis,” in *The Culture of Time and Space*.

²⁸ Fatimah Tobing Rony, *The Third Eye: Race, Cinema, and Ethnographic Spectacle* (Durham: Duke UP, 1996), p. 102.

²⁹ *Ibid.*

ahistoricity and lack of technology are inherent to polar space itself, available to all who choose to venture there. What differentiated the Antarctic from the Arctic, beyond 133 degrees of latitude, was its absence of human life. Its emptiness beckoned those who longed for a simpler, if in many ways crueler, mode of existence. In a Britain still reeling from the ills of civilization (both technological and, like influenza, viral in nature), Herbert Ponting's vision of Antarctica offered white men the opportunity to step onto the stage of eternity, to walk out of a modern "world gone mad," and into an infinite struggle with nature's elements.³⁰

The approach and impact of *With Byrd at the South Pole* and other media proliferating from that expedition stand in stark contrast to films like *The Great White Silence* and *Nanook of the North*, the latter of which, Rony reminds us, emerged from a much broader discourse on the Arctic and its peoples.³¹ This shift may simply reflect the passage of time. While *Nanook* premiered in 1922 and *The Great White Silence* in 1924, Byrd departed in October 1928, nearly ten years after armistice, when industrial technologies like the airplane, submarine, and radio had lost some of their uneasy association with catastrophe and been (re-)incorporated into everyday life and entertainment. This was especially true in the United States, where most civilians had never seen a bomber in action but might expect to receive packages by Air Mail. Stunt pilots like Charles Lindbergh, Amelia Earhart, and Byrd himself became household names, not for military exploits, but for spectacular feats of peacetime adventure. Radio, meanwhile, was no longer just a safeguard against maritime disaster or a tool to coordinate military offensives. Over the course of the 1920s,

³⁰ Of course, the irony of any film that seeks an idealized pastoral escape from the pathologies of industrialized culture is that by the very presence of the camera, and printing and distribution of the film, it incorporates that natural environment into the machinery of modern society. Scott MacDonald deals at some length with this dialectic in his book *The Garden in the Machine* (University of California Press, 2001), in particular in Chapter One ("The Garden in the Machine") and Chapter Ten ("Satan's National Park").

³¹ Rony, p. 99.

the percentage of US households with a radio receiver went from near zero to around 50, with the major commercial broadcasters NBC and CBS starting up in 1926 and 1927.³² By 1929, even the submarine was getting a narrative reset, as the explorer Hubert Wilkins planned his *Nautilus* expedition, an underwater journey beneath the North Polar ice cap. Thus, although removed from earlier expeditions only by a few years, technologically speaking, Byrd's Antarctic venture was taking place in a whole new world. Rather than viewing the southernmost continent as an isolated retreat from that world, the team went to great lengths to remain connected, and to bring Antarctica into a communications network that was playing an increasingly important role in fashioning "imagined communities" in Europe and the United States.³³

The priority given to remaining in constant contact was reflected in the order of operations at Little America, where radio connectivity enabled the crew to communicate not only with the airplanes, but also with the *New York Times*, their satellite team in New Zealand, and commercial broadcasters. These communications most often took the form of telegraphy, but sometimes included radio broadcasts, which might go either from or to Antarctica. While earlier expeditions had exploited emergent media forms to publicize their voyages, this was the first to unfold before audiences at home in real time. Beyond its entertainment value, this use of wireless technology only underscores the shift toward an understanding of this environment as active and full. Radio's somewhat mystical ability to reveal hidden truths, or even to create something out of nothing, was one of its great curiosities in its early days. Jeffrey Sconce notes that "the arrival of Marconi's astounding wireless system at the dawn of the new century promised to unlock the mystical

³² "The Geography of Transport Systems," <https://people.hofstra.edu/geotrans/eng/ch1en/conc1en/telecomdiffusionUS.html>; Douglas B. Craig, *Fireside Politics: Radio and Political Culture in the United States, 1920-1940* (Baltimore: Johns Hopkins University Press, 2005), p. 15.

³³ See Benedict Anderson, *Imagined Communities* (New York: Verso Books, 1983).

enigmas of the ether, that mysterious substance once believed to be the invisible medium through which all light, electricity and magnetism moved.”³⁴ With its ability to tap into invisible information floating in the air all around its listeners, wireless radio, perhaps more than any other technical medium, seemed to confirm the idea that no space was truly as empty as it appeared. Unlike the “silence” represented by previous expeditions, radio technology drew focus to auditory signals that might reveal invisible information. This offered a different perspective on glacial sounds, which are frequently the sole indicator of constant churning taking place beneath an apparently still surface. In an environment where even motion that remains invisible is often audible—one writer describes pressure ridges as making “the sounds of titans in a death struggle—moans, subterranean rumblings, explosions”—radio helped to underscore the importance of activity beyond what the eye could see.³⁵

The significance of radio to this expedition’s spectacular achievements was lost on no one, from the leadership, to the crew, to audiences following the journey at home. Like many transitional media productions, the films depicting this expedition focus almost as much attention on the technologies themselves as on the journey they are reporting.³⁶ Thus *With Byrd at the South Pole* explicitly foregrounds radio throughout—displaying towers, radio operator, and telegrams from beyond the Antarctic Circle—but nowhere as dramatically as in its climactic sequence documenting the flight over the South Pole. As the plane advances southward over the plateau, three dozen expedition members remaining at the base at Little America stand in for the audience at home,

³⁴ Jeffrey Sconce, *Haunted Media: Electric Presence from Telegraphy to Television* (Durham: Duke UP, 2000), p. 61.

³⁵ Wallace West, *Paramount Newsreel Men with Admiral Byrd in Little America*, Racine, WI: Whitman Publishing Company, 1934, p. 24, Box 97, Folder 3968, Admiral Richard E. Byrd Papers.

³⁶ Tom Gunning identified this phenomenon in developing his influential concept of the “cinema of attractions.” See Gunning, “The Cinema of Attractions: Early Film, its Spectator and the Avant-Garde,” *Wide Angle*, vol. 8, nos. 3 & 4 (1986). Lisa Parks picks up on this trend in satellite television of the 1960s in her book *Cultures in Orbit* (Durham: Duke University Press, 2005).

listening to wireless communications from Byrd and his two fellow pilots as they progress to the South Pole and back. The film dramatizes this reception with parallel editing, cutting back and forth between the plane and the listeners, who crowd around the receiver to hear the dots and dashes of Morse-coded reports. Shoring up the sense of simultaneity created by the editing pattern is the introduction of both diegetic and non-diegetic sound into this sequence of the film, which up to the flight segment has largely lacked it.³⁷ As the plane takes off, engines whirring, a narrator explains what is happening inside the aircraft; with his excited declarations and the somewhat breathless pace of his delivery, he sounds like a sports announcer detailing the events of an unseen game. His descriptions follow the editing: when the film moves from the plane to the crew at Little America, he describes the tense atmosphere at the camp. Layered behind his voice are background noises that underscore the distinction between the two spaces in which the story is simultaneously unfolding: the whirring of engines, for the plane, and the electronic beeps of Morse code for Little America, sounds that belie the “nerve-taut silence” with which the narrator describes the scene around the receiver. In this way, film and sound technology work together to create a sense of a shared informational space that includes the vast ice cap surrounding the South Pole.

With this introduction of a virtual presence at the point that had epitomized remoteness and unreachability, radio enabled a conceptual completion of the globe. At the same time, it expanded notions of exploration and discovery to include not just physical arrival at a material location, but also a more abstract gathering of information from afar. In this new media constellation, to be “with” Byrd, and “at” the South Pole, meant being connected by a series of machines—radio,

³⁷ An exception is the opening, in which Admiral Byrd stands on a ship deck and gives a brief, if painfully awkward, talk to the viewers emphasizing how glad he is that everyone has returned safely. This opener functions as a prologue to the film, which unfolds as a conventional silent film up until the climactic flight to the South Pole.

airplane, aerial cartographic camera—while maintaining a material distance of thousands of feet (pilots), hundreds of miles (the crew at base camp), or half a world away (cinema audiences) from the geographic pole.³⁸ Nevertheless, state-of-the-art cameras—another media technology that received much attention in newspaper coverage—were busily collecting data that would be used to fill in existing maps of the area. Powered by novel modes of travel, surveillance, and recording, it was a new approach to space that would be enormously influential for exploration and discovery as the twentieth century continued to unfold.

As the clearest entry point to these newly accessible locations, radio was one of the primary preoccupations of audiences following the expedition. Even before the crew left, newspapers published notices on the contract Byrd made for radio service with Kolster Electric.³⁹ Once the journey got underway, interest in this area of innovation only intensified. An article from the *New York Times* with the headline “Byrd Offers Radio New Opportunity”—very likely typed by their correspondent Russell Owen in Antarctica and delivered to the paper by wireless—opens thus:

Radio records are being shattered by the Byrd Antarctic Expedition and new records are being made that were probably never dreamed of in the days when Amundsen, Scott and Shackleton trudged on toward the South Polar goal. As they camped on the ice did they ever expect that some day in that isolated section of the world explorers would tune in on the voice of a Metropolitan Opera singer or hear the voice of the Mayor of the city of New York and the greetings from friends flashed to them across 10,000 miles of space from a “checkerboard antenna”?⁴⁰

This kind of report was entirely typical: extensive scrapbooks kept by the Byrd estate, now held in the archives of The Ohio State University, reveal multiple notices per week in the *Times* and other newspapers like the *Brooklyn Citizen*, *New York Sun*, the *New York Herald Tribune*, the *Boston Herald*,

³⁸ The only concession to physical arrival at the South Pole is the dropping of a weighted American flag over what is estimated to be the correct point. Although there is something slightly absurd about this (plainly futile) attempt to mark territory, it also serves as a chilling reminder of the trajectory taken a decade before (and a decade later) by so many bombs over Europe.

³⁹ “Kolster Reports Order From Byrd Expedition” (op. cit.).

⁴⁰ Box 324, Admiral Richard E. Byrd Papers.

the *Brooklyn Eagle*, the *St. Louis Post Dispatch*, and the *Los Angeles Times* treating the expedition's use of radio. These frequently served merely to give an update on the expedition's progress ("Byrd Expedition Nears Ice Pack, He Radios Wilbur"), but sometimes dealt with other questions, such as programs to be broadcast to Byrd and the crew ("Radio Cheer Sent to Byrd Expedition; 'Fine,' They Reply"); explanations of how the radio technology worked ("London Radios Byrd By New York Relay"); or dealings with everyday life back at home ("Byrd Aide Rents Home in Westchester By Radio"; "Radio Links Byrd Explorer to Wife"; "Byrd Engineer getting Divorce by Radio"). By forging a connection between the extremities of Antarctica and the banalities of daily life, radio brought the South Polar Region into the popular imagination as part of the shared global space of human experience.

At the same time as radio technology was helping to refashion ideas of the Antarctic, Byrd's journey provided many opportunities to test and expand this rapidly developing medium. If radio was helping to remove blank spots from the map of popular understanding of Antarctic space, Byrd's expedition returned the favor by participating in experiments aimed at "the ultimate elimination of radio 'dead spots' and 'fading,'" as the *New York Times* reported in August of 1929.⁴¹ Wireless communication with Antarctica helped scientists develop theories about how radio functioned and why: did a mysterious "heavyside layer" covering the earth interfere with signals?⁴² Was there something in the rarefied polar air that explained both the Northern Lights and the strong connection? Here, the physical endeavor and the media project closely mirror each other in their rhetorical goals: complete coverage of the globe. Commercially, too, this question of coverage

⁴¹ "Byrd's Aide Reports Radio Test Success," *New York Times*, 19 August 1929, Box 324, Admiral Richard E. Byrd Papers.

⁴² Russell Owen, "

was relevant: Kolster, the sponsor of the crew's wireless technology, used the expedition to advertise for its products, trying to bolster rapidly increasing radio diffusion with the promise of exciting tales from the edge of the world.⁴³ The symbolism was clear: in American living rooms as in Little America, the radio receiver became a space where the entire world could virtually gather together in "the vast extended present of simultaneity."⁴⁴

This rapprochement between spaces of exploration and domesticity was part of a broader spatial reconfiguration proposed by mediated connectivity. It contributed to the multi-platform "annihilation of space by time" that, for Marx and his intellectual descendants, characterizes the industrial world.⁴⁵ Some interpretations of this new world order tended to the apocalyptic, others to the utopian; but everyone seemed to agree that radio was changing the spatial organization of life on earth.⁴⁶ The most obvious way in which this manifested with regard to Byrd's expedition is the public fascination with the sheer distance traveled by wireless signals, which allowed for a reconceptualization of the reach of both technology and the senses. Among the hundreds of newspaper reports highlighting this project's pioneering use of communications technology, many—like the one quoted above—explicitly emphasize distance. "Byrd, Far Away, Hears Broadway Joy Tonight," reads a headline from the *New York American*; "Montreal Man to Challenge Byrd Aide to Play Chess With Moves Sent 11,000 Miles by Radio," declares another in the *New York Times*.⁴⁷ The implication of both is clear: wireless connection renders physical distance irrelevant to

⁴³ Advertisement, *The New Yorker*, 27 October 1928, Box 323, Admiral Richard E. Byrd Papers.

⁴⁴ Kern, p. 318.

⁴⁵ See, for instance, Wolfgang Schivelbusch's classic *The Railway Journey* (Berkeley: University of California Press, 1986) for a discussion of how railroads collapsed distance.

⁴⁶ For a detailed examination of responses to radio's reconfiguration of space, particularly its more uncanny elements, see Sconce, *Haunted Media*.

⁴⁷ These articles ran on 2 June 1929 and 11 May 1929, respectively; both are in Box 24, Admiral Richard E. Byrd Papers.

the ability to instantaneously communicate information, or share a virtual space of entertainment. It also enables an awareness of weather and climate conditions that stretches across the globe, as becomes clear in *With Byrd at the South Pole*. Inside one of the buildings at Little America, a clipboard displays temperature readings from Little America alongside those from New York City. In a close-up on the papers, the camera reveals a dramatic disparity: 96° above in New York, 72° below in Little America, a 168-degree difference. The report is written on a radiogram for the Byrd Antarctic expedition, laying bare the essential role played by wireless in creating a sense of a globally shared climate. The sheer difference of these numbers exists in tension with their spatial juxtaposition, which suggests they might be disparate effects of a connected system. In fostering a virtual link that bridged physical distance, radio created conceptual space for the idea, crucial to early twenty-first century climate science, that climatological conditions in Antarctica, rather than isolated or exceptional, were one part of a series of networked effects that determined the weather on pressure ridge and city street alike. Radio's ability to bring people together to talk about the weather was also observed by newspaper reporters in their coverage of the expedition. In May of 1929, the *New York Journal* ran a cartoon in which Byrd speaks to a man called Stefansson (presumably the famed Arctic explorer Vilhjalmur Stefansson) about the weather at the North Pole (Fig. 8). In this sketch, two parka-clad figures perch on either end of the globe, one right side up, one upside down. Each speaks into a microphone; these devices are connected by a zigzag line that runs along the right side of the globe. While Stefansson reports rain, Byrd announces that the sun is shining. Sharing weather information from New York to Antarctica, or the North Pole to the South, frames these disparate locations as single points of a global climatic system that is brought together, and emerges as thinkable, with the aid of radio.

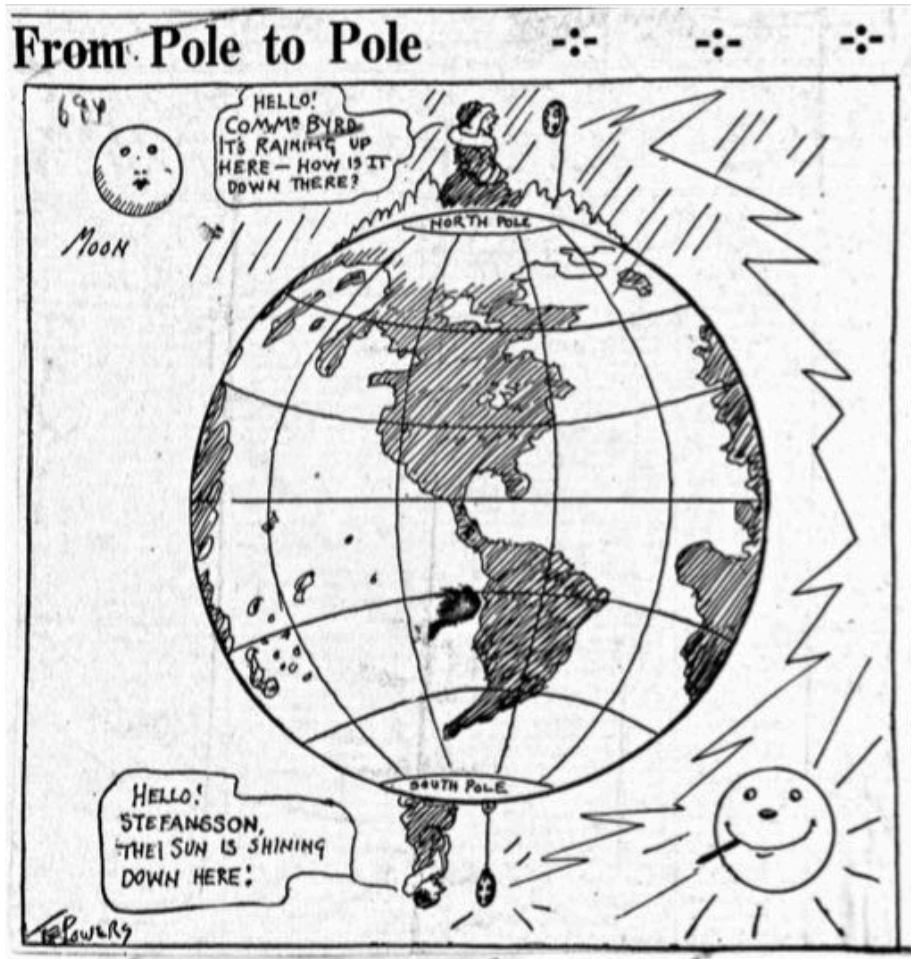


Fig. 8. From the *New York Journal*, May 10, 1929. Box 324, Admiral Richard E. Byrd Papers.

In fact, this cartoon was itself ripped from the headlines, referring to a recent incident in which radio operators in Little America had exchanged messages with meteorologists in a station in Greenland, comparing notes on light, weather, and the aurora. As Russell Owen writes in an article that ran in the *Los Angeles Times* just two days earlier,

One end of the world talked with the other last night when our radio station communicated again with the University of Michigan meteorological station at Mt. Evans, Greenland. The sun has disappeared here and it is just becoming warm there and the conversation between the two operators made possible the remarkable contrast offered by the shifting seasons...Hanson and Petersen [Byrd's radio operators] have found it easier to work with Greenland at times than with stations in the United States because it is one of the peculiarities of radio that a point near halfway around the

world from us the signals concentrate or come together as they travel on many paths around the globe and as they meet become stronger. It is about 12,000 miles to Greenland.⁴⁸

The exchange with Greenland demonstrates not only the emergent consciousness of a globally interconnected world (and climate), but also another way in which radio was pushing at the understanding of space as defined by distance, direction, and geophysical boundaries. Wireless information does not travel along routes that might be intuitive to a geographical consciousness attuned to the movement of bodies, and its oddities were objects of frequent curiosity. In the same article, Owen explains, “Larry Gould [the expedition’s scientific lead], who is a professor of geology at the University of Michigan, then sent some messages to Ann Arbor, Mich., through the Greenland station, as it was easier to talk to Greenland than to Michigan.” Antarctica—Greenland—Michigan is not the only counter-intuitive travel itinerary to emerge from wireless technology; later that same week, Byrd and his crew received an Australian program that arrived by way of Pittsburgh.⁴⁹ Removed by a distance of 3,000 miles as measured by the crow, this program traveled 21,000 miles to reach Byrd’s ears.

These strange routes are reflected in a proliferation of maps that break form with the familiar Mercator projection of the globe’s continents. Located at the convergence of the meridians, and home (for the last several hundred years, at least) to the south magnetic pole, Antarctica stubbornly eludes the spatial conventions and interpretive tools that have driven exploration and territorial expansion for centuries. It is fitting, then that radio—as both broadcast and telegraphy—posed its own threat to the popular conceptualization of global spatial arrangement. Illustrators tried a variety of strategies to address this, manipulating cartographic

⁴⁸ Russell Owen, “Radio Links World’s Ends,” *Los Angeles Times*, 8 May 1929, Box 324, Admiral Richard E. Byrd Papers.

⁴⁹ “Rebroadcast to Byrd Goes 21,000 Miles,” *New York Times*, 14 May 1929, Box 324, Admiral Richard E. Byrd Papers.

A General Electric pamphlet shows a circular map tracing radio connections from Antarctica to New Zealand to Australia to New York and back again (Fig. 9.2). It displays, perforce, a different angle on the world than those generally favored in Europe and America: the vast landless expanse of the Pacific Ocean occupies the map's center, with the Americas running off the right-hand edge and Australia cut in half on the left. It is a literal re-centering of imperial cartography.

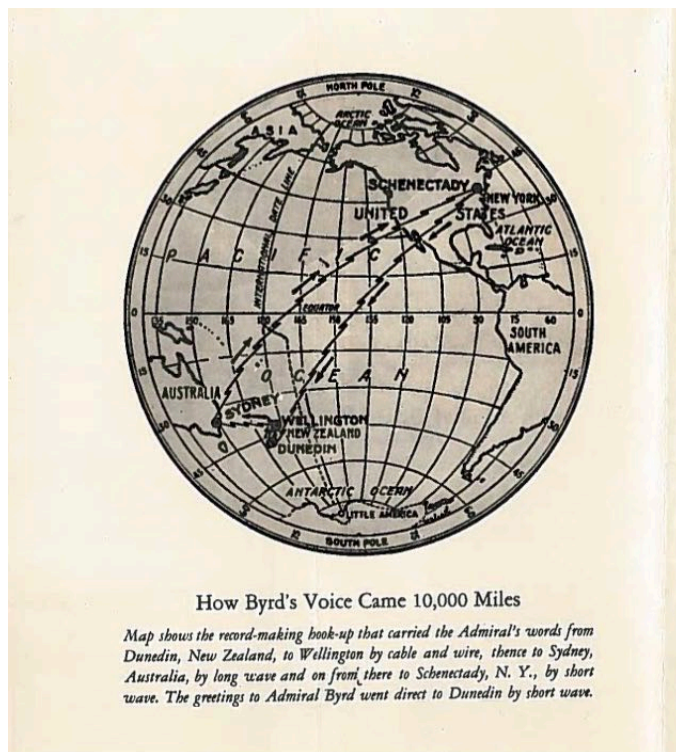


Fig. 9.2. General Electric, "Our 10,000-Mile Radio Broadcast with Admiral Byrd," Box 98, Folder 3977, Admiral Richard E. Byrd Papers.

But most indicative of how radio warps an inherited sense of global space is a "world distance chart" first printed in *Radio News* in 1933, during the run-up to Byrd's second Antarctic expedition, which took place from 1933-35 (Fig. 9.3). In this projection, the shape of the continents departs notably from the Mercator or the standard globe. Australia takes up more space than Africa or Asia, and dwarfs the Americas. Overlaid on these strange landmasses, curving lines of latitude and longitude loop around and back into each other. A caption instructs the user how

to calculate the air line distance between two points, explicating these different conventions for understanding space.

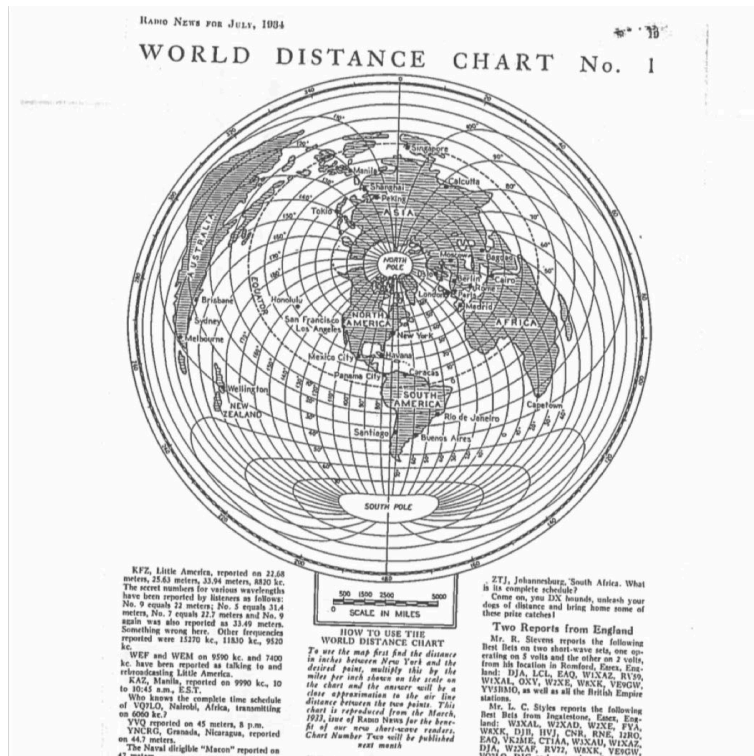


Fig. 9.3. "World Distance Chart No. 1," *Radio News*, July 1934, Box 98, Folder 3977, Admiral Richard E. Byrd Papers.

Through dimensionality, a shifted center, or alternate processes of distortion, each of these maps presents a vivid demonstration of how radio pushes at the customary spatial configurations that undergird conceptualizations of the globe.

A challenge to the very concept of national territory—and to the spatial understanding upon which it rests—is inherent in Antarctic exploration, as noted by Elena Glasberg in her recent book *Antarctica as Cultural Critique*. "Given its lack of indigenous population, its relative remoteness in time and space, and the fragility of its environment," she writes, "Antarctica throughout the twentieth century has thwarted the ideologies, law regimes, and operating practices of

nationalism.”⁵⁰ But it is more than simple remoteness that troubles the ideological grounds of nationalism. As noted earlier, Antarctica sits at the convergence of the meridian lines used to orient other continents in global space and time. The tools people use, from maps to compasses to the position of the sun, are rendered useless by a geographical position that stubbornly refuses to play by the rules. This phenomenon has struck many observers of the Antarctic, including Richard Byrd. In *Little America*, he describes the spatiotemporal disorientation he experienced flying over the South Pole:

It is a confusing place, this imaginary point, the South Pole. All time meridians converge there. A person unfortunate enough to be living in the vicinity would have difficulty in telling just what time to keep. Time is reckoned by the interval between two successive crossings of the sun over the meridian at the place at which the time is reckoned. As all meridians intersect at the South Pole, there is no particular meridian. The sun circles the sky at the same height above the snow horizon, and this height changes only an imperceptible amount every twenty-four hours. Directions, as we reckon them, would likewise mean nothing to this unfortunate creature. For unless he were travelling either north or south, it would be impossible for him to walk in a straight line and still retain the same direction. His direction would change noticeably every few minutes; and to keep his original direction he would be forced to follow a spiral course.⁵¹

Conventions of space and time are foundational to ideologies of empire and nation. Territorial claims rest on the assumption that a given surface will retain stable coordinates; the Antarctic, with its dissolution of cardinal directions and constantly moving glacial terrain, thus attacks the determinacy of location on two fronts. In a classical model of land claimed by right of discovery, the date and time of first arrival are reckoned and recorded using clock and calendar rules. These same rules help to shore up the sense of simultaneity that Benedict Anderson identifies as fundamental to national consciousness.⁵² When light and darkness are measured in months, not days, and the date line is always on the horizon, the coordination of simultaneous experience

⁵⁰ Elena Glasberg, *Antarctica as Cultural Critique: The Gendered Politics of Scientific Exploration and Climate Change* (New York: Palgrave MacMillan, 2012), p. 6.

⁵¹ Byrd, *Little America*, p. 341.

⁵² See Anderson, *Imagined Communities*, especially “Apprehensions of Time,” pp. 22-36.

becomes a comedy of errors. Even in 1929, aided by the very technologies that had helped establish standardized time and solidify national difference, while also bringing the world within reach, Byrd found himself unable to fit Antarctica into a familiar spatiotemporal order.

Indeed, Byrd's entire venture in the South Polar Region vacillated between national interest and international cooperation, empire building and global unity. Himself an officer of the US Navy, he commanded a crew made up largely of Americans, but including Swedes and Norwegians (like Bernt Balchen, the man who actually piloted the plane over the South Pole); he dropped an American flag at the South Pole while paying tribute to British and Norwegian accomplishments; he relied on a Norwegian whaler—perhaps the ultimate symbol of global trade—to get his ships through the pack ice in both directions. Due to geography, the last point of departure and first point of arrival were in New Zealand, which was also where half the crew spent the winter months. It was perhaps this reliance on international relationships that confused many reporters when it came to Byrd's intention to make territorial claims on the continent. Upon the crew's "return to civilization," initial reports accorded with the globalist rhetoric of stories on radio-supported interconnectivity.⁵³ A headline in the *New York Graphic* from March 10, 1930, the date of the expedition's arrival in New Zealand, declares "Antarctic Land He Found Belongs To World, Byrd Says."⁵⁴ It goes on to quote the newly crowned "world hero," who stated, "Personally, I am not the least concerned with claiming the land for America...I have named it Marie Byrd Land [for his wife], but it is not American. It belongs to the world." The *Boston Globe* follows up on March 13 that "Byrd Denies Intent To Claim New Land," instead highlighting that "his ideal, he said, was to

⁵³ United Press, "Byrd In New Zealand Gets Great Welcome; Tells Of Polar Trip," *Brooklyn Times*, 10 March 1930, Box 325, Admiral Richard E. Byrd Papers, Byrd Polar and Climate Research Center, The Ohio State University, Columbus, Ohio.

⁵⁴ United Press, "Antarctic Land He Found Belongs to World, Byrd Says," *New York Graphic* 10 March 1930.

secure complete understanding between the United States and the British Empire.”⁵⁵ Less than two weeks later, however, the same paper reported that Byrd had been “again misquoted,” and that, indeed, “Byrd Will Lay Claim To Lands He Found.”⁵⁶ In fact, Byrd spent the rest of his career lobbying the U.S. government to make a land claim in Antarctica, but to no avail. While his first Antarctic expedition inaugurated American scientific activity in Antarctica that has continued to the present, to this day the U.S. government has never made a territorial claim on the continent.⁵⁷

Governmental resistance to declaring sovereignty in Antarctica was in line with the popular reception of Byrd’s return from the far South. Unlike the wonders of radio technology, which had inspired widespread excitement and utopian visions of global community, the idea of claiming territory met with indifference, bemusement, or even derision. In the *St. Paul Dispatch*, a writer reacting to Byrd’s South Polar flight explains, “Claims to territory based on discovery are a little out-moded, perhaps because there has been so little desirable territory left to claim.”⁵⁸ Another writer, ridiculing England’s desire to rule Antarctica, remarks, “what the empire upon which the sun never sets wants with a continent on which the sun turns its back completely for more than half the year is a mystery.”⁵⁹ The author goes on to note that both “just what constitutes a valid claim to territory” and “what constitutes discovery” are hard to pin down, rendering any Antarctic land dispute between the United States and Great Britain extremely difficult to adjudicate.

Perhaps the most scathing indictment comes from the widely syndicated humor column “Telling

⁵⁵ Box 325, Admiral Richard E. Byrd Papers.

⁵⁶ “Byrd Will Lay Claim To Lands He Found,” *Boston Globe* 25 March 1930.

⁵⁷ Elena Glasberg demonstrates compellingly in *Antarctica as Cultural Critique* the ways in which a depoliticized “search for knowledge” has provided ideological cover for military interests, rendering a strict separation of the two misguided at best.

⁵⁸ “South Pole Real Estate,” *St. Paul Dispatch*, 30 November 1929, Box 324, Admiral Richard E. Byrd Papers.

⁵⁹ “The Antarctic Crisis,” *New York Herald Tribune*, 30 November 1929, Box 324, Admiral Richard E. Byrd Papers.

the World,” which ran periodic articles parodying Russell Owen’s coverage of the Byrd Expedition, under the guise of a fictional crewmember named J. Herman Seidlitz. In a message delivered “by reindeer and mock turtle to New Zealand”—gently lampooning the popular fascination with the expedition’s communications technology—this fabricated correspondent writes,

We have just got word from the State Department in Washington that Great Britain is claiming all the territory in the Antarctic. I suppose King George also claims our skating rinks in Madison Square Garden, Boston and Chicago.

Personally I am in favor of letting England have all of the Antarctic. There is ice enough for us all. But Byrd is worried over these claims and when he discovers the South Pole he intends to leave a man there guarding the Pole against British aggression. He has sent for a flagpole sitter for this job.⁶⁰

This skeptical approach to the value of Antarctic ground was, in some cases, bound up with the increased sense of global connection that marked so much of the reporting on the journey. In an article printed in the *Camden, NJ Courier* upon Byrd’s return to New Zealand, an author muses, “What we’d do with Antarctica if we had it, nobody seems to know.”⁶¹ Like O’Hara, this writer criticizes the State Department and Great Britain for insisting on the notion of sovereignty, calling their “fuss about a region which is so inaccessible...sort of a dog in the manger attitude.”

Conceding that perhaps, in a distant future, some technological revolution might render the territory “a great international prize,” the author wistfully asks,

On the other hand, isn’t it also possible by the time that happens, that the nations of the world will have become so enlightened and so civilized that they will be as one great federation of States, like our own, living in harmony—and that the wealth of an Antarctic continent would be used for the benefit of all, instead of just a few?⁶²

This question suggests a similar perspective to that fostered by radio, from which “the round world [is] only a neighborhood.”⁶³ Observers ran wild with ecstatic visions of these new technologies’

⁶⁰ Neal O’Hara, “Telling the World,” *New York Evening World*, 18 April 1929, Box 324, Admiral Richard E. Byrd Papers.

⁶¹ “What Use Antarctica?” *Camden Courier*, 20 March 1930, Box 325, Admiral Richard E. Byrd Papers.

⁶² *Ibid.*

⁶³ Anon, untitled notice, *Albany News*, 30 November 1929, Box 324, Admiral Richard E. Byrd Papers.

potential, even claiming that “it is through the perfecting of the means of communication and the crumpling of what alone keeps men and nations apart in a space time universe that the peace of the world and the unity of mankind are assured.”⁶⁴ As wireless technologies generated enthusiastic visions of a different kind of world order, the notion of rigid borders did not sit easily on the shifting, drifting Antarctic ice. Indeed, thirty years later, though the world was hardly “one great federation of states” (rather, it was caught in an arms race between two), Antarctica became the site of the first arms control agreement established during the Cold War. The Antarctic Treaty System (ATS) forbids military activity and territorial claims, favoring instead international cooperation in the pursuit of scientific investigation. In a space that persistently eludes traditional logics of material dominion and territorial control, the ATS resituates the goal of exploration in the more abstract realm of knowledge and information.

Seeing with Science

Decades before either the ATS or the geopolitical tensions underlying it emerged, there was already a noticeable shift in the public discourse around polar exploration. The decline in significance accorded to territorial sovereignty in Antarctic exploration was accompanied by the rise of a different set of preoccupations: namely, with scientific endeavor and the expansion of human knowledge. While the most famous expeditions of the early twentieth century had paid some lip service to the importance of science, the quest for knowledge was rarely given pride of

⁶⁴ “Crumpling of Space,” *New York Times*, 30 December 1928, Box 323, Admiral Richard E. Byrd Papers.

place in quite the way it was in Byrd's venture.⁶⁵ This emphasis can be read simply from the expedition's extensive scientific staff, which included a physicist and his assistant, two meteorologists, an oceanographer, an aerial cartographer, a surgeon-biologist, and a geologist.⁶⁶ Two of them, the geologist Laurence M. Gould and the aerial mapper Ashley C. McKinley, held positions of leadership on the expedition as second- and third-in-command, evidencing the importance of their role.⁶⁷ Byrd also goes to some lengths in *Little America* to underscore the centrality of science to his goals. Writing in justification of the great costs incurred by the journey—something he often felt compelled to do—he explains in the book's foreword,

This last expedition to the Antarctic was, for reasons explained on subsequent pages, a costly one. Preparations for it were extensive, its equipment and scientific gear was new, modern and, in many cases, especially designed for the problem; its scientific staff was more than competent and the expedition itself was away from the United States for nearly two years. This was according to the original plan, the realization of which was possible only through the support of friends, who out of their keen interest in scientific research provided the sinews of exploration.⁶⁸

In keeping with this beginning, the memoir devotes many words to the cutting-edge nature of its equipment, the skill of its scientists, and the hours devoted to the labor of observation.⁶⁹ Indeed, Byrd writes that “the extensive scientific inquiry planned for the Antarctic...alone could justify our going,” even going so far as to claim that “science had taken the place of empire-building in exploration.”⁷⁰ Whether he (and his backers) were truly so territorially disinterested as he implies

⁶⁵ An important exception to this trend was Douglas Mawson of Australia, trained as a geologist, who was a pioneer of meteorological and other scientific research in Antarctica. While quite well known among scientific communities, however, Mawson never achieved the same popular recognition as his contemporaries Shackleton, Scott, and Byrd.

⁶⁶ At this time, the field now known as “glaciology” was still emergent, and the study of ice as a geophysical science often fell under the purview of geologists like Dr. Laurence M. Gould, who later in his career would go on to teach glaciology at the university level.

⁶⁷ A complete list of the expedition crew is available in Byrd, *Little America*, pp. 413-416.

⁶⁸ Byrd, *Little America*, vii.

⁶⁹ The results of these findings were published in a separate edition of four volumes aimed at specialists who wished to dive into the technical findings of the expedition. Since I am focused here on popular reception, I will not deal at any length with these reports, but they are available in the Admiral Richard E. Byrd Papers.

⁷⁰ Byrd, *Little America*, 10, 44.

remains up for debate, but to the extent that they existed, these ambitions were determinedly cloaked in the drive of a politically agnostic scientific curiosity.⁷¹

The filmic material produced during the expedition reflects this turn to information as the preeminent resource to be obtained by South Polar exploration. In a brief prologue to the Paramount feature *With Byrd at the South Pole*, the Admiral himself stands on the deck of a ship, saying a few words about the expedition with the help of new sync-sound technology.⁷² An amateur film performer, he pauses frequently, eyes darting nervously, and bounces on his toes. He manages, however, to deliver the message that “we invaded the bottom of the world for the advancement of science,” and the film that follows does much to foreground this noble endeavor. This includes the extensive focus on radio examined in the previous section, but also a sequence of Laurence Gould studying rock formations, shots of weather charts, the testing of instruments, and, in the climactic flight sequence, a pronounced interest in the optical devices used to see and orient from the airplane: binoculars, sextant, sun compass, and of course the camera itself. The lecture reel footage that featured in Byrd’s extensive post-expedition tour of Europe and the US reveals yet more interest in the processes of scientific study: shots show rocks being dug up, and ice crystals laid out on a cloth for examination, measurement and comparison. These sequences suggest that the interest of this voyage—while certainly still encompassing animal antics and human heroism—also extended to the inner workings of the environment, now being made newly available to the senses by instruments of observation, recording, and projection.

⁷¹ See Glasberg, *Antarctica as Cultural Critique*, for a very skeptical analysis of Byrd’s public declamations on the priority given to pure science.

⁷² As mentioned earlier in the chapter, this hybrid film contains both sync sound and silent segments. Scenes deploying sync sound include this opening with Byrd, and the flight sequence that serves as the film’s climax. The hour or so that unfolds between them takes the form of a traditional silent film, with a score but no diegetic sound.

The popular reception of the films and the journey itself suggests that the public embraced this science-forward approach to Antarctica. About two months before the expedition set sail, a report in the *Brooklyn Eagle* with the headline “Scientists To Hold Center of Picture on Byrd’s Quest” delivers details about the various projects to be undertaken—“To Map Peaks,” “Hunt for Fossils,” and “To Visit Magnetic Pole,” among others—explaining that “Commander Byrd’s chief purpose is to extend man’s knowledge of the ice-ridden land that reaches around the bottom of the world.”⁷³ This interest in the scientific progress of the mission persists throughout the extensive newspaper coverage of the journey: in November of 1928, as Byrd was sailing south, the *New York Herald Tribune* reported on meteorological data sent to the Commander from the leader of a project in Greenland.⁷⁴ Striking a more whimsical tone, a glass industry magazine reported in January of 1929 on the expedition’s intent to throw overboard messages and scientific data in glass bottles as “silent messengers of science,” a modern iteration of an ancient communications medium deployed for centuries by shipwrecked sailors.⁷⁵ This article both demonstrates attempts by a wide variety of industries to capitalize on the advertising potential of the expedition, and alludes to Byrd’s own romantic vision of scientific endeavor. In a radio address broadcast shortly before his departure, he asserted that “in the pursuit of science, there is romance galore - more romance of adventure than exists anywhere else in the world today.”⁷⁶ This attempt to frame science in the terms of adventure narrative is a sort of update to the spirit of Scott and Shackleton: an embrace of the popular appeal of discovery, but one that lends it to the collection of

⁷³ “Scientists to Hold Center of Picture on Byrd’s Quest,” *Brooklyn Eagle*, 9 August 1928, Box 323, Admiral Richard E. Byrd Papers.

⁷⁴ “Meteorological Data Sent To Byrd Expedition,” *New York Herald Tribune*, 11 November 1928, Box 323, Admiral Richard E. Byrd Papers.

⁷⁵ “Silent Messengers of Science,” *Glass Container*, 1 January 1929, Box 323, Admiral Richard E. Byrd Papers.

⁷⁶ Richard Byrd, untitled radio address, 8 August 1928, Box 78, Folder 3493, Admiral Richard E. Byrd Papers.

information rather than territorial conquest. Again, it marks an important shift in Western ideas about global power in the twentieth century: a move in which the most important symbol of wealth and domination would be not land, but information.

Reflecting the importance of communications technologies in this shift, the near-daily reporting on the radio activity of the expedition often focused on the progress being made for radio science, or detailed technological innovations that enabled wireless connection.⁷⁷ *New York Times* correspondent Russell Owen offered several reports on the activity of the aurora and other celestial phenomena of the Antarctic, and in June of 1929 Laurence Gould, geologist and second-in-command, published a full-page article on the “scientific and geographical problems that the staff of the Byrd expedition will try to solve.”⁷⁸ Later that year, just a few days before the famous polar flight, the physicist Davies penned an article of similar scope focusing on his study of magnetism, asserting that “their observations in Antarctica will help to solve problems of radio and aerial navigation.”⁷⁹ The celebrated flight, while certainly heralded in many papers as a heroic deed, was also seen as a contribution to scientific advance. “Science Awaits Invaluable Data of Byrd’s Flight,” declared the *New York Herald Tribune*; “Byrd’s Polar Dash Widens Horizons of Scientific World,” asserted the *New York World*; the *Brooklyn Eagle* proclaimed that “Byrd May Help Solve Mysteries of the Pole.”⁸⁰ In fact, the *Seattle Star* even suggested the world “Give The Credit

⁷⁷ For instance, in April of 1929, the *New York Times* declared a “triumph in ether” upon the successful relay of messages from London by way of New York; the *Herald Tribune* noted signals reflected to South Africa; a third report details which type of radio is best for receiving the expedition’s messages (“two-tube”). One particularly interesting notice from the *Bronx Home News* references a study by naval scientists that suggests the radio connection is due to the same “tiny air atoms” that are responsible for the Northern Lights. Box 324, Admiral Richard E. Byrd Papers.

⁷⁸ Laurence Gould, “Unanswered Questions of the Antarctic,” *The New York Times* 16 June 1929, Box 324, Admiral Richard E. Byrd Papers.

⁷⁹ Frank Davies, “Byrd Scientists Study Earth’s Magnetism,” *New York Times* 24 November 1929, Box 324, Admiral Richard E. Byrd Papers.

⁸⁰ These headlines top articles that can be found in Box 324, Admiral Richard E. Byrd Papers.

To Science,” rather than to the man of the hour.⁸¹ There were, of course, exceptions to the national fervor over the event: the *New York Journal* reports on an evangelical minister from Chicago who insisted that “the earth is flat and rain drips through holes somebody punched into heaven” and that “he [Commander Byrd] simply flew to a point which he believes to have been 90 degrees south and then back to his starting place.”⁸² Thus in the general rush to respond to this much-touted achievement, even science denial had its day. Just four years after the watershed Scopes trial publicly aired the scientific debate around evolution, Byrd’s expedition and its coverage brought into popular consciousness yet another new way of thinking about natural history that had begun to emerge among scientists in the mid-nineteenth century. In both cases, media narratives would become central to an ideological schism that continues to confound the West today.

This turn to earth science as a conceptual framework for understanding Antarctic exploration had important effects on the meaning of the place, effects of far-reaching significance for the Western understanding of nature. Perhaps the most significant change was the newfound historicization of the Antarctic environment that emerged from the popular reception of Byrd’s expedition. Drawing on contemporary developments in the understanding of climate history, he located Antarctica firmly in a geological timeline of climactic change, as he explained in a radio address given in August of 1928, two months before his departure. Antarctica, he said,

is in the sinister clutches of an ice age which has killed the life and the luxuriant vegetation that once existed there, and which has made of it by far the coldest and most forbidding region on the face of the earth.

What would the scientist and the adventurer give if he could turn back the pages of time thirty or so thousand years and look upon the northern part of our fair country buried beneath mountains of ice, as it was in the throes of the ice period which then existed. It is by unfolding the past we can learn of the future. It is little known that one-eighth of the world today is in the throes of an ice age.

⁸¹ “Give the Credit to Science,” *Seattle Star*, 2 December 1929, Box 324, Admiral Richard E. Byrd Papers.

⁸² “Voliva Won’t Believe Byrd Flew to South Pole,” *New York Journal*, n.d., Box 324, Admiral Richard E. Byrd Papers.

In the Antarctic we will be able to study first hand the descent of the ice on the once beautiful land which killed life just as ruthlessly as would a deluge of fire. On a land which many think was once a passageway and the habitation of life, if we can uncover fossil remains we will be able to tell the nature of this life.⁸³

In a talk that makes multiple interventions into some of the most commonly held ideas about Antarctica, this passage lays the groundwork for understanding the historiographical implications of the complex interrelationship between media and nature. It starts with a shift in temporal framing: examined in the flow of geologic, rather than human, time, Antarctica appears dynamic, changing, and, importantly, historical. But the notion of the storage medium is also central here: only by “turning back the *pages of time*” to “look upon” the climate of a past era does the impact and process of the ice age open up to historical understanding. The metaphorical medium here is a book, not a film, but the scopic nature of discovery clearly points toward image-based mediation.

Indeed, the use of film in the Antarctic was seen by more than one reviewer of *With Byrd at the South Pole* to hold the key to understanding the passage of large periods of time. Writing in the *Christian Science Monitor*, a critic ponders “the gloriously enlarged thing that the study of history is to become in the future, when all the high points in man’s story of achievement are recorded in this fashion. What would it mean to us today had there been a motion picture photographer in the crew of the *Santa Maria!*”⁸⁴ Similarly, in a review entitled “Making History Visible,” a writer in Knoxville, Tennessee declares that

No discussion of the Byrd film here today is complete that does not take into account its significance as a historical record of a sort made possible by the moving picture camera and inevitably destined for such illumination of his story as the world had never dreamed until our day.

...

History, after this film, as the perfection so far of such records, will live for us in visible form...All great formal occasions of historic pageantry, as well as the casual and unexpected acts of the world of

⁸³ Richard Byrd, untitled radio address, 8 August 1928, Box 78, Folder 3493, Admiral Richard E. Byrd Papers.

⁸⁴ “With Byrd at the South Pole,” *Christian Science Monitor*, 3 July 1930, Box 326, Admiral Richard E. Byrd Papers.

men and of nature, will be caught by the cameramen as news from all lands is gathered now and dispensed by newspaper reporters.⁸⁵

Both of these responses to *With Byrd at the South Pole* highlight the significance of the still relatively new medium of film for ideas about historical record-keeping, and film's utopian potential as a transparent window onto very different pasts. This mindset, in the context of Byrd's journey, suggests an openness to understanding not only that climate changes—often drastically—over time, but that these epochal changes can be observed and understood by the environment's human inhabitants, perhaps even serving to ease or improve the experience of the future.

Indeed, the future is a common preoccupation of all these texts—the film critics' and Byrd's—and also informed much reporting about the expedition that touched on the theme of environmental science. In a brief notice from the *New York World* that appeared in May 1929, an unnamed author writes about the past and future of climate change with an anxiety that reads like a flash forward to the twenty-first century:

The ancient tradition common among all primitive peoples of a world-wide flood is now thought by scientists to have been sound. The cause of the ocean's rise may have been the melting of the ice-cap at the North Pole at the end of the last ice age, which occurred about 20,000 years ago. One of the purposes of the Byrd Expedition is to determine whether the Antarctic ice-cap is melting. According to Sir Edgeworth David, famous Australian geologist, the level of the entire ocean would be raised about fifty feet if the whole Antarctic ice barrier melted. Practically every seaport town would then be under water.⁸⁶

A far cry from endless wastes frozen into eternity, for this writer, the Antarctic ice cap is subject to change that poses a clear and present danger to every coastal settlement in the world. Its dynamism is ominous, and must be contained by careful observation. But not every vision of the climatic

⁸⁵ "Making History Visible," *Knoxville Journal*, 2 July 1930, Box 326, Admiral Richard E. Byrd Papers. These readings are very much in line with contemporaneous discussions in Germany of film's relationship to historical understanding, a topic that generated much excitement among European thinkers at this time. See Kaes, Baer, and Cowan (eds.), *The Promise of Cinema: German Film Theory 1907-1933* (Oakland: University of California Press, 2016).

⁸⁶ "World Flood," *New York World*, 26 May 1929, Box 24, Admiral Richard E. Byrd Papers.

future that takes into account Antarctica's capacity for change is so bleak: bringing together both these strands of thought—the climate historical and the film historiographical, another author in Waterbury Connecticut ponders an ice-free future for the polar regions:

There may come the time, then, when the Arctic and Antarctic regions will be free from ice, covered with rank vegetation, and habitable for a much more varied animal life than they are now. They were so once; indeed, it is probable that they have been so during most of the history of the earth. It is curious to think that, if that time comes and the human race is still extant, Greenland and Antarctica may be more desirable parts of the world in which to live, and the polar seas may bear the greater part of the [sic] mankind's commercial and pleasure vessels, if waterborne ships are still in use. And if, in that far time, history shall have preserved a record of our polar explorations, how odd it will seem to people living in those pleasant lands that it should once have been so terrible a hardship and danger even to penetrate them!⁸⁷

It is an oft-recognized peculiarity of historical thought that attempts to understand the past are often clearly oriented toward the future.⁸⁸ In enabling a visual juxtaposition of past conditions with a radically different present, film encourages a heightened awareness of historical change. This awareness, in the case of the southernmost continent, was itself profoundly distinct from inherited notions that understood that frozen place exclusively as empty and static, lacking the capacity for meaningful mutation. With the aid of moving images, radio connectivity, and changing scientific frameworks, a new conceptualization of Antarctica and its ice reflected the utopian visions and dystopian anxieties of the early twentieth century. It was an idea that no matter how apparently constant or stable, the earth and its elements were in constant motion, liable to heave and pitch, crumble or collapse, at any moment—and with the novel sense of interconnectivity fostered by technologies like the radio and the airplane, physical distance no longer equated to removal from the consequences of faraway activity. Governed by enormously

⁸⁷ "Will Polar Regions Get Warmer?" *Waterbury Republican*, 21 September 1930, Box 327, Admiral Richard E. Byrd Papers.

⁸⁸ Paula Amad, for example, writes that "the archive bets on its indispensability not only to the present (soon-to-be-past), but, more importantly, to the future, in the hope that its salvaged documents will be remembered, consulted, and studied." See Amad, *Counter-Archive* (New York: Columbia University Press, 2010), p. 1.

complex yet heretofore invisible structures and processes that were just beginning to emerge into perceptibility, the Antarctic ice suggested a far-reaching shift in the consciousness of natural space, and the inadequacy of extant frameworks to locate, freeze, and contain the planet in all its vagaries.

Conclusion

This new vision of Antarctica—characterized by environmental dynamism, global interconnection, and a historically changeable climate—emerges in constant dialogue with methods of seeing and understanding the processes that have come to characterize nature in a Western understanding. As a continent whose surface is covered in glacial ice, and a place that is primarily accessed through technologies of mediation, Antarctica is a particularly productive site for investigating cultural conceptualizations of the cryosphere as they are shaped by media processes. The shift that took place in the late 1920s and early 1930s was powered by a confluence of airplane, camera, and radio. As a technology of vision, the airplane enabled a dramatic change in spatial perspective that helped to encourage a corresponding expansion of temporal perspectives. From above, patterns and connections became visible that lent a sense of constant motion underlying the apparent stillness of the ice. Cinema—founded on its own inverse dialectics of stillness and motion, in which a series of static images underlay the appearance of movement—was the visual medium best situated to suggest to audiences that there might be more to this picture than met the eye.

But cinema alone was not enough, as demonstrated by the archaic appeal of *The Great White Silence*. Rather, as I have argued through the case of *With Byrd at the South Pole*, it was only in conjunction with other media of transport and communication that the cinema changed popular

ideas about Antarctica and its ice. As moving images in aerial perspective introduced the idea of movement to the ice fields, developments in wireless telegraphy and broadcast radio helped foster the sense that not only was this motion occurring, but it was connected to movements and changes taking place on the other side of the world. And as these emergent forms of mediation produced a sense of dynamic connection, their various capacities to record, store, and retransmit newly gathered information began to write a history where previously none had been imagined. Decades would pass before people in the West began to accept the idea that human activity and environmental changes were linked, but to the extent that it made these changes, and their scope, perceptually and conceptually available to the general public, the media culture of Antarctica in the late 1920s laid the groundwork for the way we have come to understand the global climate today.

Chapter Two
Moving Mountains:
Glacial Contingency and Modernity in the Bergfilm

The nineteen-twenties and nineteen-thirties saw a sharp rise in the popularity of alpine sports and tourism in Europe and North America, enabled by advances in transportation technology and furthered by the dissemination of photographs, films, and travel literature set in mountainous regions.¹ In Germany, enthusiasm for these activities was such that scholars have referred to a “cult of mountains” in this period.² Emerging from this context, a minor genre of German film called the *Bergfilm*, or “mountain film,” tapped into audiences’ seemingly insatiable demand for Alpine material.³ Pioneered by the German geologist-turned-filmmaker Dr. Arnold Fanck, whose passion for dramatic landscapes and extreme winter sports defines his *oeuvre*, mountain films showcase remarkable cinematography in spectacular natural settings. Fanck directed eight films in this genre between 1921 and 1934, and remains the most important name

¹ This was generally true in Europe and America, but especially in the Germanophone world. For an insightful account of the *Bergfilm*’s relationship with German tourist practices of the nineteen-thirties, see Nancy Nenno, “‘Postcards from the Edge’: Education and Tourism in the German Mountain Film,” in *Light Motives: German Popular Film in Perspective*, ed. Randall Halle and Margaret McCarthy (Detroit: Wayne State UP, 2003), 61-84.

² See, e.g., Christopher Morris, *Modernism and the Cult of Mountains: Music, Opera Cinema* (Oxon and New York: Routledge, 2016). Morris borrows the term from Steven E. Aschheim’s *The Nietzsche Legacy in Germany 1890-1900* (Berkeley and Los Angeles: University of California Press, 1992).

³ I refer to the genre as “minor” due to the relatively small number of films that belong to it, and its specificity to German and Austrian cinema. However, in their time, these films were among the most popular in German cinema, regularly setting box office records in the 1920s and 1930s. In his book *Höhenrausch*, film historian Christian Rapp asserts that “the popularity of the mountains and mountain climbing in the twenties formed a sort of epiphenomenon, without which the *Bergfilm* would likely never have emerged, certainly not with the kind of success it enjoyed in the cinema. Mountains and mountain adventures were present in almost every media format. They filled illustrated magazines, educational periodicals, exhibitions, works of popular fiction and non-fiction.” Rapp, *Höhenrausch: Der deutsche Bergfilm* (Vienna: Sonderzahl Verlagsgesellschaft, 2007), 17. All translations from this volume are my own.

associated with Alpine filmmaking in Germany (though other directors, most notably Leni Riefenstahl and Luis Trenker, also worked in this idiom after getting their start on Fanck's sets).

This chapter will address two works from the midpoint of Fanck's career, *Stürme über dem Montblanc* (1930, released under the English title *Avalanche*) and *SOS Iceberg* (1933, a US co-production, released under the English title *SOS Iceberg*).⁴ Though nearly all of Fanck's films take place in icy environments, these two are of particular interest because they explicitly depict climate monitoring in glacial regions. In the earlier film, a weather station attendant takes daily readings atop the highest peak on the European continent, using Morse code to telegraph his measurements to scientists on the ground. He connects remotely with an astronomer's daughter, forming a bond strengthened by her visits to the mountaintop, which she reaches by airplane. She, meanwhile, assists her father in his observatory, taking telescopic measurements of the night sky. The drama hinges on a sudden storm that catches the weatherman by surprise, necessitating his rescue via airplane. Similarly, the plot of *S.O.S. Eisberg* is set in motion when an unpredictable natural event disrupts the work of modern science: a glaciologist on a research expedition gets trapped on a glacier in the Greenland ice sheet when a calving event destroys his boat. Although the situation is dire, in the end contact is made via shortwave radio and, again, a dramatic rescue by airplane concludes the film.

In spite of narrative devices and set dressings that draw on clear markers of modernity—such as telecommunications, transportation, and scientific monitoring—film critics and theorists for many years characterized the *Bergfilm* as a manifestation of reactionary anti-modernism, to be understood in tandem with the back-to-the-land philosophy and health cults that characterized

⁴ In fact, this film was shot bilingually, and a shorter, English-language version was released in the United States. In this chapter, I refer exclusively to the German version of the film that premiered on August 31, 1933.

interwar Germany in the run-up to Hitler's takeover.⁵ More recent scholarship has taken up the genre's relationship to modernity, especially its significance for tourism, imperialism, and resource extraction.⁶ In this chapter, I aim to contribute to these valuable reevaluations of the *Bergfilm*; however, rather than examine the social or political role of remote natural spaces in modernity, as the bulk of this work has done, I focus on how these films participate in a broader reconceptualization of the historicity of nature.

Fanck's engagement with the mountains emerged from a long tradition in German visual culture that understood the Alps, especially, as "untouched by temporal movement," and the upper icy limits as "the absolute 'unhistorical' landscape."⁷ Drawing on a canon that begins with the nationally treasured Romantic paintings of Caspar David Friedrich, this view of the Alps as removed from the flow of time and history is a familiar conclusion of art historical analyses of Germany's aesthetic tradition; but it is a tradition with which Fanck's moving pictures break in important ways. Rather than eternal or timeless, I argue that these two films understand their glacial environments according to a spatiotemporal logic that is more familiar from analyses of modernity that have focused on cities, largely to the exclusion of non-urban environments. In doing so, I make a two-fold intervention: on the one hand, into studies of the *Bergfilm* genre and

⁵ Indeed, there are clear connections between the genre and Nazi filmmaking, perhaps best embodied by Leni Riefenstahl, who got her start starring in Fanck's films and went on to become Hitler's chief propagandist. (Fanck, too, continued to make films in Nazi Germany, though his career peaked with the two films under discussion here.) I do not intend to dislodge the *Bergfilm* from its place in the history of Nazi aesthetics, as much as to argue that it simultaneously participates in other historical trajectories.

⁶ For more on tourism, see Nenno; or Johannes von Moltke, "Evergreens: The *Heimat* Genre in *The German Cinema Book*, ed. Carter, Bergfelder, and Göktürk (London: BFI, 2002). For the presence of scientific imperialism in *SOS Eisberg*, see Lili-Anne Koerber, "'See the Crashing Masses of White Death': Greenland, Germany, and the Sublime in the 'Bergfilm' *SOS Eisberg*," in *Films on Ice: Cinemas of the Arctic*, ed. Anna Westerdahl Stenport and Scott MacKenzie (Edinburgh: Edinburgh UP, 2016).

⁷ Georg Simmel, "Die Alpen," in *Philosophische Kultur: Gesammelte Essays von Georg Simmel* (Leipzig: Alfred Körner Verlag, 1919), 138. Translations my own. Simmel, who is best known for his writing on the cultural shifts of modernity, especially in the urban sphere, saw the Alps as distanced from the dynamism of life, frozen in eternal stillness.

its relationship with modernity, and on the other, into the theorization of Euro-American modernity more broadly, with particular attention to the role of mediation in bringing nature into modern historical thought.

This approach to time-based media—as a set of tools that make natural phenomena both visually and conceptually available to historical analysis—is much needed at this moment in intellectual history. In his landmark 2009 article “The Climate of History,” Dipesh Chakrabarty claims that the early twenty-first century’s declaration of the Anthropocene Epoch—a recognition that human activity can change the global climate—necessitates an understanding of climate and environment as historical, breaking with a tradition that conceives of it as eternally unchanging, or at most, cyclical.⁸ But while he makes a convincing case for this conceptual shift, he neglects the material (and thus historical) conditions of its emergence, namely the mediation of environment through visual and communications technologies over the course of the twentieth century. Processes of mediation create the very record from which historical narratives are fashioned. To keep such a record is, even if unconsciously, to imply an expectation of change. Both *Avalanche* and *SOS Eisberg*, which predate the discussions of the Anthropocene by nearly half a century, reflect and participate in an understanding of nature as a dynamic, shifting force. Through their persistent preoccupation with inscription and measurement, contingency and shock, and attention to change over time, these two films are documents of a shift in the Euro-American concept of nature: from a mythical space of eternal repetition, radically separate from industrial modernity, to a historical realm subject to the modern logics of standardization and contingency. Each in its own way, *Avalanche* and *SOS Eisberg* depict how the management of nature’s unpredictable whims

⁸ Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry* 35.2 (2009), 197-222.

through processes of mediation and communication results in the creation of a chronological record—the very lens that ultimately allows the onlooker to see nature historicized.

Record-Setting: Inscription and Measurement in Avalanche

What first strikes most viewers of Arnold Fanck’s mountain films—certainly what first struck contemporary critics like Siegfried Kracauer and Béla Balázs—is the unique way in which they capture the grandiosity and power of nature, specifically the mountains.⁹ Fanck was known at the time, and is remembered in film history, for his insistence on location shooting in extreme environments (such as the top of continental Europe’s highest peak, and the ice fjords of northwestern Greenland).¹⁰ His 1930 film *Avalanche* is no exception, astounding audiences with its spectacular scenery. Indeed, Balázs was such a fan of Fanck’s work that he wrote a special introduction to the production book that was published to accompany this film. In that text, the critic breathlessly dubs the director “the greatest cinematographer of nature.”¹¹ He adds that Fanck “was the first to allow for the enormous pathos of full-scale cosmic images to emerge on film.”¹² It doesn’t take much time for *Avalanche* to demonstrate Balázs’ point: the film’s opening sequence includes magnificent vistas of a sunlit horizon above a sea of clouds stretching unbroken, save for one or two craggy peaks, as far as the eye can see.

⁹ See Kracauer, “Mountains, Clouds, People,” trans. Nicholas Baer, in *The Promise of Cinema: German Film Theory 1907-1933*, ed. Anton Kaes, Michael Cowan, and Nicholas Baer (Oakland: UC Press, 2016), 97-98; and Balázs, “The Case of Dr. Fanck,” trans. Alex H. Bush, in *The Promise of Cinema*, 68-70. (Hereafter, *The Promise of Cinema* will be abbreviated to TPOC in all citations.)

¹⁰ Fanck has even described himself as a “fanatic for reality,” though he insists repeatedly that this is because he cannot achieve desired effects in the studio, and that if he could, he would much rather use “tricks” than put his actors’ and crewmembers’ lives at risk on dangerous location shoots (Fanck, *Der Kampf mit dem Berge*, 4).

¹¹ Balázs, “The Case of Dr. Fanck,” 68.

¹² *Ibid.*



Fig. 1 The landscape above the clouds in *Avalanche*

In a tiny hut perched on the edge of its eponymous mountain, this sequence introduces the film's protagonist, Hannes, a meteorologist who lives atop Mont Blanc, the highest peak in the Swiss Alps. The story chronicles his romance with Hella Armstrong, an astronomer's daughter who lives in the valley below.¹³ Fanck has written that he designed these characters precisely because they would allow his story to unfold amidst “the world above the clouds,” a narrative driven by pictorial obsession.¹⁴ It is, then, unsurprising that the film opens with such stunning imagery, starkly foregrounding the drama of the mountain landscape.

But the first few minutes of *Avalanche* also reveal a second preoccupation—less ostentatious, perhaps, but no less intriguing—that runs throughout this film and indicates its particularly modern approach to nature: namely, a persistent interest in technologies of measurement,

¹³ In fact, this hut has an interesting place in the history of meteorology: though disused by the time Fanck appropriated it as a film set, it was originally built as an observatory by the French doctor and mountain enthusiast Joseph Vallot, and within a year was supplemented by a state-run observatory built under the supervision of astronomer Jules Janssen. While the latter building fell into disrepair, the Vallot hut continues to stand today, though it has since been converted into a luxury tourist site.

¹⁴ In *Der Kampf mit dem Berge*, Fanck writes, “The primary concern in each of my mountain films is always the optical vision. I.e., the impetus and theme for a film never comes to me from a literary narrative, but from a few particularly spectacular pictorial themes.” Fanck, *Der Kampf mit dem Berge*, 50.

inscription, and communication (or, to be more succinct, of mediation). The first hint of this fascination comes in the film's sixth shot: in the meteorologist's hut, amidst the trappings of rustic chalet life—wood-fired stove, checkered tablecloth, a pot of snow to melt into fresh water, a meal of cured meat and hard cheese—stands a telegraph machine, its knobs and dials both a symbolic and a functional connection to the modern world below the clouds. After puttering about for a few moments, Hannes emerges from this quaint shelter. Just outside his cabin, sharp peaks erupt through clouds that rush by in what Siegfried Kracauer describes as “a kaleidoscopic spectacle, always the same and ever new.”¹⁵ Hannes traipses through the snow to another object that, like the telegraph, sticks out for its industrial, machine-like appearance: a large weathervane, whose coating of ice and snow does not stop it from spinning rapidly in the same wind that sends the clouds flowing around the mountaintops. Approaching its base, Hannes opens a small door to reveal a dial that resembles a clock face. He pencils the wind speed into his small notebook, framed in close-up to display a list of dates, each with an entry next to it. Upon returning to his hut, he sits at the telegraph apparatus, checks the time, and converts this analog recording into an electric signal, transmitting the information to a series of international telegraph operators shown in montage as they receive the message, their respective locations indicated by large map outlines painted on the walls behind them.¹⁶ What emerges from this sequence, then, is not only a picture of nature as cosmic spectacle, but also as an object of monitoring, inscription, and transmission.

¹⁵ Kracauer wrote this in his review of Fanck's first mountain film, *Der Berg des Schicksals*, but it suits these scenes equally well. Although he later would condemn Fanck's body of work as proto-Fascist cinema in his classic *From Caligari to Hitler*, Kracauer was at first quite taken with the genre's spectacular imagery and innovative use of cinema technology to achieve it. Kracauer, “Mountains, Clouds, People,” 97.

¹⁶ These map outlines are, of course, themselves a form of mediation, an inscription of geospatial information that communicates the transnational import of Hannes's message. I will deal with this dramatization of virtually networked space at greater length later in this chapter.

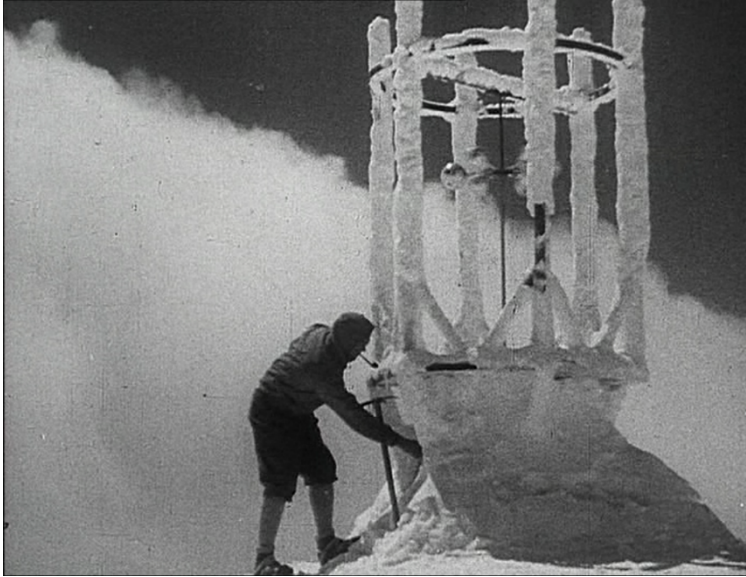


Fig. 2 Hannes at the weathervane atop Mont Blanc

As the film continues, the narrative and its framing repeatedly direct the viewer's attention to such practices of mediation. Hannes has a friendship, largely mediated by telegraphic observations about the heavenly bodies, with Professor Armstrong, an astronomer in the valley. The professor shares these messages with his daughter, who assists him at the giant telescope through which the two of them look up towards and past Mont Blanc's peak, adjusting dials and measures to get an ideal view of the starry sky; this is how Hannes and Hella first encounter one another.¹⁷ Later, when flying by the meteorologist's hut with her pilot friend (famed military and trick pilot Ernst Udet), Hella drops a Christmas tree and a visiting card for Hannes. Accompanying her printed name, she has simply inscribed it "regards, although we haven't met."¹⁸ The card serves as a two-part inscription of Hella's presence and message. Her printed name bears the stamp of modern

¹⁷ The telescope's view, indicated by the use of a circular mat on the camera lens, can serve as a reminder that this film itself is a mediation of environment as well, the product of an optical device designed to make remote spaces available. The importance of optical devices to understanding visual modernity is clearly and convincingly argued in Jonathan Crary's *Techniques of the Observer* (Cambridge: MIT Press, 1992).

¹⁸ In German, the text is "Hella Armstrong grüßt unbekannterweise." The name is printed, the rest written by hand. "Unbekannterweise grüßen" (literally, "to greet unacquaintedly") is a commonly used formulation in German.

technology, while the handwritten note carries a stronger indexical trace of her presence. The card serves as a remote flirtation, building a record of romance on the foundation of meteorological and astronomical information exchange.

Even when Hella and Hannes meet in person at the hut, which she visits with her father shortly after dropping her holiday greetings, technologies of communication and observation remain central to their connection. Upon entering Hannes's chalet, Hella flits girlishly from the telegraph machine—into which she mimes delivering a message—to the radio, and finally to a small instrument that resembles a microscope. Clearly recognizing the tool, Hella animatedly exclaims, “Oh, you do geological work, too?!” and seats herself before the device, eagerly looking through it and turning its knobs.¹⁹ Her obliging father somewhat ruefully explains that she's not much of a housewife, no good at cleaning and only interested in science and skiing. In this scene, Hella Armstrong is the *Bergfilm*'s version of the modern girl: athletic, comfortable with technology, more dedicated to pursuing a profession than domestic duties. Her bobbed hair and sensible clothing—pants and a fur jacket, sturdy outdoor wear to protect her from the elements—reinforce these references to shifting ideas about gender roles, an important part of modernity, especially in Germany, where casualties among the male population in World War One outnumbered those of any other nation.²⁰ The next day, Hella accompanies Hannes to take readings at the weathervane, further cementing their bond through processes of scientific observation. Once she returns to the valley, Hannes watches the calendar, counting down the days until his vacation at Easter.

¹⁹ It is fitting that geological observation would receive special attention in a film that causes us to re-think glacial temporality through technologies of vision.

²⁰ In an excellent article about the *Bergfilm* genre, one of the earliest pieces to examine these films in conjunction with, rather than opposition or contrast to, Weimar modernity, Eric Rentschler writes at some length about gender relations in *Avalanche*. Rentschler, “The Mountains and Modernity,” *New German Critique* 51 (1990): 137-161, doi: 10.2307/488175

Meanwhile, their romance continues on its mediated course: a long-distance relationship pursued via telegrams and letters.²¹ A rhythm develops between spectacular exterior shots of the Alpine landscape and tightly framed close-ups on the inscription and transmission of information; modern love is woven into the space of nature as surely as telegraph cables and environmental monitoring devices permeate the landscape.

Avalanche's preoccupations with technologies of monitoring and communication function as reminders of the much broader reconceptualization of time and space in which it participates. In particular, this film's temporal logic, supported by strategies of inscription and exchange, reflects two unmistakably modern qualities: simultaneity and standardization. Stephen Kern has defined the former as a hallmark of modern temporality; indeed, he names telephone lines as the key development in the cultural shift that took place in Europe and America between 1880 and 1918, working as they did to "create the vast extended present of simultaneity."²² In montages that juxtapose the playing of organ music in Berlin with its live radio broadcast in the meteorologist's hut on Mont Blanc; the sending of a telegram from the mountaintop with its receipt in the observatory below; and the manual recording of weather conditions with the delivery of the report across continental Europe, *Stürme über dem Monblanc* represents—and, through cinematic technology, helps to create—a sense of simultaneity that rests on a foundation of instantaneous transmission through electronic media.²³

²¹ To be sure, to a certain extent this technique reflects the industrial conditions of the film's historical moment: at the height of the European film industry's transition to sound, in 1930. Like many other early sound films—*The Jazz Singer*, *The Blue Angel*, *Blackmail*—*Avalanche* relies heavily on visual storytelling strategies that integrate written exposition into the narration, thus obviating the need both for newly old-fashioned intertitles and for a still-bulky and inconvenient sync sound technology.

²² Stephen Kern, *The Culture of Time and Space, 1880-1918*, rev. ed. (Cambridge: Harvard UP, 1999), 318.

²³ The fact that this idea of instantaneous transmission has always been a fantasy, as suggested by John Durham Peters, does not prevent it from being conceptually foundational to the temporal sense of modernity. See John Durham Peters, "Recording Beyond the Grave: Joseph Smith's Celestial Bookkeeping," *Critical Inquiry* 42 (2016), 862.

Of course, simultaneity is tightly linked to temporal standardization. As Wolfgang Schivelbusch explains in his classic account of railroads and modernity, trains created a need for standardized time. Their speed required transregional consistency:

[a] patchwork of varying local times was no problem as long as traffic between the places was so slow that the slight temporal differences really did not matter; but the temporal foreshortening of the distances that was effected by the trains forced the differing local times to confront each other.²⁴

Kern acknowledges the important role of the railroad system in introducing the call for standardized time, but asserts that it remained impossible to enforce globally until the telegraph enabled an international electric broadcast of a unified time signal. In a pre-electric era, France could maintain a legal time nine minutes behind their Greenwich-based time zone, but “the independence of local times began to collapse once the framework of a global electronic network was established.”²⁵ For Mary Ann Doane, this process of standardization is merely one part of a much broader drive to rationalize time that “involves an unrelenting search for its representation in visual terms—visual terms that exceed the capacity of the naked eye.”²⁶ Only through a visible, standardized measure can simultaneity be expressed and understood as such. Regardless of the technology that is centered, these accounts of modernity agree that new conceptions of time were linked to unprecedentedly pervasive systems of technological measurement and control.

This marriage between simultaneity and standardization is visible in *Avalanche* through the constant pairing of communications technologies with time tracking devices. Every time he sits down at the telegraph, Hannes checks the clock that stands next to it; the message recipient

²⁴ Wolfgang Schivelbusch, *The Railway Journey: The Industrialization of Time and Space in the 19th Century*, 2nd ed. (Berkeley: UC Press, 1986), 43.

²⁵ Kern, *The Culture of Time & Space*, 14.

²⁶ Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive* (Cambridge: Harvard UP, 2002), 6.

records time of receipt, checked against the wristwatches whose proliferation is one of the classic hallmarks of modernity.²⁷ As he exchanges letters and telegrams with Hella, Hannes watches the days pass on his calendar in a brief montage that counts down the days to Easter, when he has a break and can return to the valley. Calendar time also regulates his observations from the weathervane; recall the close-up of his notebook in the opening sequence, which shows a list of figures alongside dates, denoting his daily readings of conditions. Out of the public management of simultaneity emerges a methodical chronology of emotional and sensory experience.

Just as these public standards of time's passage provided a framework for the personal experience of time—breaking the extended longing for a lover into day-long steps on the road to a publicly declared and dated holiday—nature, too, is incorporated through observation and inscription into a rationalized temporal logic. Yet always haunting this project of measurement and standardization, in the mountains as in the city, is—to quote Doane again—“the threat of an overwhelming contingency”: the idea that anything can happen at any time, that a seemingly solid ice bridge might crumble underfoot into an abyss, that the towering snowpack could give way to avalanche, that nothing is eternal and everything is in an invisible motion that can only be revealed by constant careful measurement.²⁸ Precisely the sense of internal motion and dynamism that the philosopher Georg Simmel missed in the Alps—which he saw as “timeless, withdrawn from the flow of things”—hangs like Damocles' sword over *Avalanche*'s protagonists and spectators, as the film's very title forces an anticipation of movement and change on a grand, even

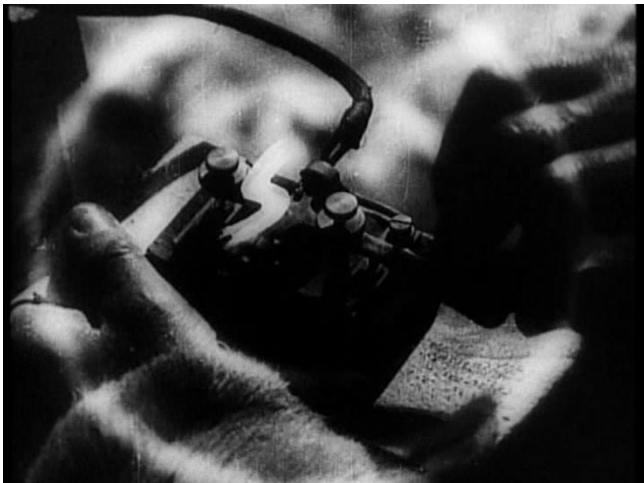
²⁷ Already in 1903, the sociologist Georg Simmel wrote about the new popularity of wristwatches and the shift in temporal culture they heralded; his observations are taken up by both Kern and Doane, as well as his student and intellectual heir Siegfried Kracauer. See Georg Simmel, “Metropolis and Mental Life,” (1903) in *The Blackwell City Reader*, ed. Gary Bridge and Sophie Watson (Oxford and Malden, MA: Wiley-Blackwell, 2002), 13.

²⁸ Doane, *The Emergence of Cinematic Time*, 17.

catastrophic scale.²⁹ The eponymous avalanche does, in the end, catch the hero by surprise, sweeping his gloves away and threatening him with the loss, first of his hands, and then of his life. In the film's climactic finale, the drama of simultaneity unfolds in the form of a rescue mission, on its agonizingly slow way up the slopes as Hannes huddles amidst the snowdrifts that blow in to his hut as his frozen, useless hands lose their capacity to close doors and windows. Only the airplane—the latest in accelerated travel and near-instantaneous connection, as had been so recently dramatized by Byrd's adventures—can save him from the swirling chaos of ice and wind, a bonechilling testament to the force of entropy.

Shockwaves: Contingency as Modernity in SOS Eisberg

Picking up where *Avalanche* leaves off—thematically, if not narratively—Fanck's 1933 film *SOS Eisberg* opens with a close-up shot of hands on a telegraph device, tapping out the most familiar of Morse signals: dot-dot-dot dash-dash-dash dot-dot-dot, or S-O-S. Just in case the viewer fails to recognize this rhythm, animated letters, surrounded by rippling rings that emanate from center screen, float up from the frantic fingers, repeating three times the first word of the film's title.



²⁹ Georg Simmel, "Die Alpen," 138.

Fig. 4 Opening shot of *SOS Iceberg*: animated letters and concentric circles emanate from the telegraph machine

With the third occurrence, the background shot of telegraph machine and hands disappears, replaced by a long pan across the infinitely variable shapes quickly identified by completion of the title: *Eisberg*. The opening credits continue across this backdrop, as a gentle up-and-down tilt, accompanying the long pan, gives the viewer the sense of being aboard a ship drifting through the icy sea.



Fig. 4 The background shifts to icebergs



Fig. 5 *SOS Eisberg* title shot

Credits over, the lights come up on a wintry landscape, where a frigid wind kicks up the loose top layer of the frozen ground. Over taut stringed instrumentation, the next cut reveals the interior of an ice cave, whose crystalline walls glimmer in candlelight. The shadow of an approaching man grows against the wall, but he barely enters the frame; instead, only his left arm is visible, the second shot of disembodied hands offered by this film. The next shot, a close-up, mirrors even more closely the opening frame, but the telegraph has been replaced by an older and more solipsistic form of communication: the diary of Professor Lorenz, as the cover announces to the camera. The hands flip to the first page, dated 1 October 1919, with the location noted: “At the edge of the world.” As if anticipating the audience’s next question—where is the edge of the world,

and what does it look like?—the next shot shows a vast, craggy glacial terminus, a tangled accumulation of frozen water whose forceful calving thunders over the shrill vibrations of the score. The filmic conversation between setting and diary proceeds with a cut back to the book, which gives more specific information as to the location of this world’s edge, and the date of encounter: “5 April 1920, 187th day at Karajak Glacier, the highest glacial wall in the world.” This alternation between iceberg and diary continues through another cycle before the camera stays with the ice. In a long handheld shot with a slightly closer frame, an immense mass of ice breaks from the terminus, slowly but powerfully rotating in the freezing waters of the glacial bay. Over the roar caused by hundreds of tons of shattering ice, the next shot shows a spot further from shore, where waves caused by the newly calved iceberg roll in from the right, their perfect curve echoing the animated ripples that emanate from the telegraph shown in the opening sequence.



Fig. 6 Large ripples emanate from calving event, in a visual rhyme with the animated ripple of the telegraph

The scene continues to intersperse documentary shots of glacial events with entries into the diary. Even as these grow more desperate in tone (“Hunger! Hunger!...I want to see people again!”), their author remains mostly hidden from view. The parade of spectacular footage brings forth a montage of the Arctic sun, glaring powerfully on sloping icebergs and the glassy sea from which

they rise. The still-obscured author muses on day 205 that perhaps spring will open up the front. Another tremendous calving event follows this consideration, suggesting that this natural environment does indeed adhere to predictable patterns. But just as this scribe of the cryosphere celebrates the “freedom” brought on by “60 foot calving waves,” the film shows a lone kayak, dislodged from its resting spot on the ice and carried away by those same waves, propelled by the force of the crumbling glacier that could almost be mistaken for a great castle shaken by an earthquake until its walls seem to liquefy and only piles of dust remain. Dejected, the shadow returns, a dark shape on the wall of a man with head in hands. “The road is too hard,” says the diary, which is finally flipped closed. For the first time, the writer’s head enters the frame, as he lays his book down on the surface before him.

Though coy with narrative information, this opening sequence introduces many thematic elements that make *SOS Eisberg* ripe for analysis in light of the conjunction between environment, history, and mediation. On one level, Fanck’s last film for UFA is a simple adventure narrative about peril and rescue among the frigid waters, unforgiving icescapes, and ferocious wildlife of Greenland, the most remote frontier yet visited by a director who loved nothing more than vacant, extreme locations. At the same time, however, it is a document of how, through emerging media forms, Euro-American discourses of modernity were inflecting and reshaping ideas about nature, in particular the part played by remote environments in making up an interconnected, constantly moving, perpetually trackable world. From its very first frame—even before the opening credits begin to appear—this film insists on the idea of a world whose remotest corners are accessible by radio waves and electric wires.³⁰ It also displays a relentless fascination with both graphic and

³⁰ At the risk of presenting too pat an analysis, it seems worth noting that in these early frames, the technological apparatus is represented by way of animation—a human construct framed as such—while the natural setting appears as

cinematographic inscription of little understood natural processes. In its ability to capture movement—and itself be moved—the camera provides visual access to an event underscored by the diary pages as “never before seen by man” (a dramatic exaggeration, to be sure, not to mention a telling elision of indigenous people’s experiences of this environment). Sound film, then still a very new technology, helps to underscore the force exerted by a calving glacier, and the journal entries supply time markers to help communicate the temporal scale of onscreen events. As he watches the days pass, waiting for spring and hoping for freedom, Professor Lorenz attempts to use a temporal logic informed by past experience (the recording, storing and transmission of details that emerge over time as seasonal patterns) to predict the behavior of his environment. But finally—and most importantly—this environment, like the rest of the modern world to which it is connected, is subject to contingency. At the very moment when nature seems to follow a rationally identifiable pattern, softening with the spring thaw, chance erupts: here, in the form of a bursting iceberg that carries away Lorenz’s kayak, an unpredicted ripple effect of the very glacial melt that had just promised his salvation.

Contingency is, of course, one of the keywords of modernity, particularly as it has come to be understood within film studies. Working from Doane’s theory of contingency in modernity, the glacier—an object whose spatial and temporal scale demand a statistical approach if they are to be rationally understood, but whose complexity exceeds the limits of that discipline—is a quintessentially modern object, and *SOS Eisberg*’s treatment of it is a markedly modern approach.

For this is a film which, as announced in its opening sequence, pits the vagaries of chance—a kayak

documentary on-location shooting. Formally, the film superimposes a human technology of communicating meaning through symbols onto “real” space. Of course, to read the filmed background as transparent and unconstructed would be tremendously naive; but that is how Fanck seems to have understood it, according to his voluminous writings about his film work. To take it at the level of presentation, then, this earliest sequence of the telegraph signal emanating over the fjord performs in its very construction the (super)imposition of human technology onto the natural world.

on the ice—against techno-scientific attempts to master natural space, dramatized here by the filming and journaling of the ice’s movement. As the film’s narrative framework emerges, it only reinforces this sense that the true drama at work is that of the struggle between contingency and rationality, or (as Fanck would understand them) nature and science. Professor Lorenz, it turns out, is a glaciologist, lost on a scientific expedition to gather data in Greenland, now stranded and presumed dead. The film tells the story of his colleagues who, upon learning he is still alive and adrift in the ice fields, set out to rescue him. When they, too, become marooned amidst the floes, it is up to Lorenz’s wife, who just happens to be a star pilot, to rescue them. Her skills, too, prove no match for the merciless Arctic sea, and ultimately all are rescued by her flight instructor and a team of kayaking Inuit (who have done a better job than Lorenz of holding on to their boats). Throughout the film, scientists and pilots bring their best skills and tools to the task at hand, but are hindered over and over again by environmental factors they can neither control nor predict: wind, waves, wildlife, and most importantly, the drifting, cracking, and calving of the capricious ice, whose shifts are governed by a network of invisible forces, from currents to crystalline structures hidden deep beneath the surface of sea and berg alike.

This film’s entrenchment in broader discourses of modernity becomes clear when one begins to sift through the large volume of literature that surrounded its production. Fanck was a prodigious documenter of his film work, and he produced multiple accounts of the conception and shooting of *SOS Eisberg*, which are supplemented by reports from cameraman Sepp Allgeier, star Leni Riefenstahl, and the glaciologist Ernst Sorge, who accompanied the filming expedition as an advisor and who obtained some of the most spectacular calving footage that appears in the movie. These accounts, published in book form in the years following this film, whose shooting

had received close attention from daily and weekly presses, demonstrate that the stubborn uncontrollability of the natural environment, and particularly the inconstancy of the ice, were of perpetual concern in this location shoot; it is thus unsurprising that they form such a noticeable undercurrent in the film itself.

This troubling inconstancy was multiple: it inhered not only in the unstable location of the bergs, which were on their way from the calving face out to the open water, but also in movements brought on by (often invisible) structural shifts: the calving and rolling provoked by changes in density, weight, and temperature. In his book *SOS Eisberg*, which documents the film shoot, Fanck describes the frustration of shooting in this landscape on the move:

Hardly had a particularly beautiful, shimmering ice form emerged from the fjord in front of Nuugaatsiaq, such that we would already be discussing in the evening the best way to get at it the next day – when on the next day it would have disappeared without a trace and be swaying so far out in the open sea that we would have to give up any hope of reaching it.³¹

This is merely one of many descriptions of how the film crew was frequently foiled in its efforts at creating perfect compositions by the location's refusal to hold still.

On top of this mobility, the icebergs' precarious form compounded the sense of radical contingency that underlay film production. In her mountain film memoir *Der Kampf im Schnee und Eis*, Riefenstahl is particularly preoccupied with the unreliability of *SOS Eisberg's* shooting terrain: "The icebergs are not a secure ground under your feet," she writes, elaborating a few pages later: "Thus the question is: When will these calvings begin? As yet the period remains unknown. There is still no calculation to be able to precisely predict the moment of the breakup."³² She discusses

³¹ Arnold Fanck, *SOS Eisberg: Mit Dr. Fanck und Ernst Udet in Grönland* (Munich: Verlag F. Bruckmann AG, 1933), 23. All translations from this document are my own.

³² Leni Riefenstahl, *Kampf in Schnee und Eis* (Leipzig: Hesse & Becker Verlag, 1933), 86, 89. All translations from this book are my own.

the challenges this poses to a film shoot in no uncertain terms. “Every recording for which a camera has to stand on an ice floe or an iceberg is a big risk for all of us. In these moments, our entire film depends on whether the ice will hold for as long as the camera is standing on it.”³³ The contingent temporality of modernity, characterized by the uncertain duration of any stability, dramatizes the shoot for Riefenstahl as much as the film’s own narrative. In perhaps her most eloquent gripe over the icebergs’ capricious nature, the star details an event in which the crew was endangered by their constant testing of such radically contingent objects:

A calm and silent mass? False. For it cracks and thunders over the mirror-like sea, like a volley of cannonfire, and amidst the crashing I can hear, very close to me, screams and cries for help. And a quiet quake goes through the entire enormous block. I fall forward—back in the direction I came from—and the ice trembles beneath me for the second time, before my eyes a wide piece of ice comes loose, four people who stood on this piece sink into the sea, and mighty columns of water shoot up into the sky—then there is a moment of quiet.³⁴

Thus it is not just the iceberg’s instability that makes it dangerous: it is the impossibility of identifying precisely when it will spring into action. Surrounded on all sides by water barely above freezing, the stakes are quite high. Among the many ways in which the production of *SOS Eisberg* imitated its own narrative storyline, this uncertainty about when danger might strike is perhaps the most poignant.³⁵

Fanck, too, wrote extensively about the uncanniness of glacial movement and calving; for him, it arises from the apparent stillness and eternity of the ice mass, which disguises its constant internal and underwater movement. Examining just why the rolling of icebergs in the water is so uncanny, he muses, “I think it is because we have a feeling for the immense mass that is losing its

³³ Ibid., 93.

³⁴ Ibid., 98-99.

³⁵ On the film shoot, Sorge went out to make observations of the little-known Rink Glacier and did not return at the expected time. It turned out that like the fictional Professor Lorenz, he had lost his kayak to a calving event and—also like Lorenz—had to be rescued by airman Ernst Udet.

balance and tossing and turning like a rubber ball in the water, when moments before it was standing before us with the instinctively familiar and therefore assumed permanence of a “mountain” [“Berg”].”³⁶ It is thus in part the action’s seeming incongruity with its appearance that makes it so uncanny. It is unexpected—perhaps unexpectable—and therefore all the more troubling. This tension is familiar from the paradigmatically modern theory of shell shock developed by Freud to explain psychological devastation experienced by physically unharmed soldiers in World War One. According to this theory, people suffered from shell shock, or more broadly, from “traumatic neurosis” if they were not prepared for an attack, or if it came when conditions did not lead them to expect it—it was its unpredictability, its contingency, that made it so dangerous.³⁷ Hence the much-discussed need for a “stimulus shield” to protect the modern individual from the onslaughts of urban modernity.³⁸ What *SOS Eisberg* shows us, however, is that it is not only urban industrialized modernity that can be understood through a framework of contingency and shock: even the sublime landscape of the Arctic is subject to the whims of chance. This connection is underscored by the fact that Fanck often turns to the battlefields of World War One to describe the monstrous sounds of glacial calving. Finding an analogy to the Western Front on the northwestern coast of Greenland seems surprising indeed, but perhaps it should not. Writing on the preoccupation with shock in the modern urban experience, in particular for Siegfried Kracauer and Walter Benjamin, Mary Ann Doane proposes that more than merely an effect of war on the

³⁶ Fanck, *SOS Eisberg*, 25. There is light wordplay here, as the German word *Eisberg*—from which the English iceberg is derived—is a compound of *Eis* (ice), and *Berg* (mountain). Thus in German, *Eisberg* literally means ice-mountain, and the word implies the stability of the geological form.

³⁷ See Sigmund Freud, *Beyond the Pleasure Principle*, trans. James Strachey (New York: W. W. Norton & Co., 1961), 12.

³⁸ *Ibid.*, 18-27. In the fourth section of *Beyond the Pleasure Principle*, Freud elaborates upon the danger of excessive stimuli to the psychic organism and the need for a “protective shield” to defend against harm. This idea was famously influential for the work of Walter Benjamin, and already echoes Simmel’s 1903 meditation on urban life, cited earlier in this article.

collective psyche, “shock is...perhaps most importantly, a way of conceptualizing contingency in modernity.”³⁹ If contingency is a natural characteristic of the glacial environment as understood in modernity, so too, it follows, is shock.

Yet it is more than just contingency and its attendant shocks that qualify the glacier in *SOS Eisberg* as a fundamentally modern phenomenon: as in *Avalanche*, the far-flung consequences of its contingent events signal a new conception of time and space. From shocks come shockwaves, both material and metaphorical. Already in the opening sequence with which I started this chapter, this film attends to the waves of water that emanate from a calving site, carrying debris and the force of breakage with them. Calving is merely the first in an expanding field of possible events, concentric circles of entropy conveyed through fjord and ocean. Near the film’s mid-point, the structural similarity of glacial calving and electric communication (implied in the opening sequence’s visual rhyme between the circles representing telegraph signals and those of rippling waves—see Fig. 4-6) culminates when the stranded group of scientists succeeds in making a connection via telegraph to a station in Denmark. In a rapid montage, the first signal—a chance connection of waves in a vast air field—is transmitted to operators in Japan, France, America, and Germany. It next appears splashed across the headlines of a German newspaper, whence Hella Lorenz, the trick pilot wife of the stranded Professor, learns of it and takes off in her plane to attempt a daring rescue. Information travels through a series of connections, aided by chance—the picking up of the signal, Hella’s receiving the newspaper—each step setting in motion another set of potentialities whose outcome is never fully predictable. In 1932, at a moment when Germany was reeling from an economic catastrophe whose wide-ranging effects were rooted in the failure of a financial system

³⁹ Doane, *The Emergence of Cinematic Time*, 13.

powered by technologies of electric communication, the stakes of information exchange were perhaps clearer than they had ever been.

Environment in Modern Time

The sense of nature that permeates both *Avalanche* and *SOS Iceberg*, as a connected space in constant and dynamic interaction with the forces of modernization, reflects more than just Fanck's interest in scientific progress and technological development. Rather, as in *With Byrd at the South Pole*, it demonstrates how encounters with new media technologies, particularly the motion picture, were reshaping the way people thought about remote natural settings and the passage of time. In the nineteenth century, Romantic poetry and painting dominated the popular imagination of nature, especially the Alps. Perhaps the most celebrated of German Romantic painters, Caspar David Friedrich, is known for mountain landscapes that emphasize sublimity and transcendence, and "mediate religious experience."⁴⁰ Certainly, Fanck's compositional indebtedness to Friedrich is undeniable; but his films depart in important ways from the Romantic vision of nature as a mystical space removed from modern life, that transcends time and, with it, history. As discussed above, Fanck wrote frequently in a variety of venues about his film projects; one topic of consistent concern is a new kind of vision that he sees emerging with the moving image camera. In *Der Kampf mit dem Berge*, a memoir about his film career up to and including *Avalanche* (but before *SOS Iceberg*), he describes the moment in 1912 when his interest in photography was eclipsed by a new obsession with cinematography:

I had quite simply fallen in love with a picture I had taken of a cumulus cloud rising from behind a forest. I tried countless experiments with this image, because something about it was unsatisfying. And remained

⁴⁰ Joseph Koerner, *Caspar David Friedrich and the Subject of Landscape* [1990], 2nd. Ed. (London: Reaktion Books, 2009), 22.

unsatisfying despite these many experiments, even though photographically speaking, it was certainly quite a beautiful picture. Finally, I realized the reason for my dissatisfaction. I was unable to reproduce the mighty movement that lay in this ascending cloud, in the impression that it made on me in reality. For me, still photography was not true enough to life.⁴¹

The word that Fanck uses in the original German for “true to life” is telling: *naturgetreu*, or “faithful to nature.” His complaint with still photography is that it is inadequate to represent an environment that is in constant motion. Still images betray the dynamic temporality of nature, freezing constant change into eternal motionlessness.

Fortunately for Fanck, new technologies were offering new possibilities, and the amateur photographer quickly became an amateur filmmaker. In a 1930 article for the popular film periodical *Film-Kurier*, Fanck writes of the differences between “photographic seeing” and “filmic seeing”:

Thus upon this first presentation I clearly understood the basic elements that distinguish photographic seeing from filmic seeing: simplification of the image to a monumental effect...—composition of the image not just in lines, but simultaneously in light-lines, (with preference for extreme backlighting or drop shadow effects). And most essentially, thinking in movement, which must be compositionally integrated with the image into a unified whole.⁴²

Fanck’s musings reflect common preoccupations in the contemporary German *Kinodebatte*, or “cinema debate,” a lively public discussion of the nature of cinema that unfolded in film periodicals like the *Film-Kurier* in the early part of the twentieth century.⁴³ The ability to reproduce movement was foremost among the properties of the medium that most fascinated *Kinodebatte* participants (including future luminaries like Siegfried Kracauer, Béla Balázs, Walter Benjamin, and Lotte Eisner). Indeed, in 1914—just the time when Fanck was making his first move from still

⁴¹ Fanck, *Der Kampf mit dem Berge*, 14.

⁴² Fanck, “Arnold Fanck, Biografie eines Kreises,” *Der Film-Kurier*, January 1, 1930.

⁴³ For more on the *Kinodebatte*, see Kaes (1984), and Kaes, Cowan and Baer (2016). Both volumes include rich collections of texts from this extremely productive moment in early film theory; the latter sourcebook is entirely translated into English.

to moving photography—theorist Hermann Häfker declared in the introduction to one of his three books on cinema, “nothing enchants everyone and also seems to be the intrinsic task of motion picture art like the reproduction of landscapes and everything that moves within them.”⁴⁴ It was precisely this desire to capture everything that moves in the landscape that would prompt Fanck to order his cameraman Hans Schneeberger, during the filming of *Avalanche*, to aim his camera at a large snow mass that looked likely to collapse and wait, hour after hour and day after day, for the spectacular avalanche to present itself for filmic recording. To miss such an event would mean failing to achieve what Fanck saw as the essential mission of the *Bergfilm*, namely “to render such natural beauty truly visible.” Under the cinematographic camera, nature is visualized in its true form—the form of continuous movement.

In service of this new technologically mediated vision, Fanck became a pioneer in a technique that also piqued the interest of Walter Benjamin, among other film theorists: namely, slow-motion cinematography. In characteristically self-aggrandizing fashion, Fanck claims that his was the first company (“long before almighty UFA dared take such a step”) to purchase a slow motion camera.⁴⁵ Benjamin famously wrote in “The Work of Art in the Age of its Technological Reproducibility” that “slow motion not only reveals familiar aspects of movements, but discloses quite unknown aspects within them...Clearly, it is another nature which speaks to the camera as compared to the eye.”⁴⁶ Writing a few years earlier, in 1933, Fanck similarly regards the slow-motion camera as almost sentient, possessed of a different kind of vision with a distinct set of values, revealing new aspects of the movements set in front of it: “more reliably than any referee, more responsibly than

⁴⁴ Häfker (1914), “*Cinema and Geography: Introduction*”, trans. Nicholas Baer, in *TPOC*, 51.

⁴⁵ Fanck, *Der Kampf mit dem Berge*, 19.

⁴⁶ Benjamin, “The Work of Art in the Age of its Technological Reproducibility: Second Version,” in *The Work of Art in the Age of its Technological Reproducibility and Other Writings on Media*, trans. Edmund Jephcott et. al., Cambridge: Belknap Press of Harvard UP, 2008, p. 37.

any film director, and more critically than any critic, the slow-motion camera passes judgment on what a human body can or cannot do.”⁴⁷ This idea that the camera possesses privileged access to a mysterious nature, one whose properties remain obscure to human perception, is intimately intertwined with the cinema’s ability to manipulate time, to “fix and make repeatable the ephemeral,” and to present for a new kind of examination a natural environment made strange.⁴⁸

The *Bergfilm*’s new vision did not fall on blind eyes; with the release of each film, theorists and critics rushed to elaborate on the secrets of nature become spectacle under Fanck’s camera. Kracauer—who would later go on to identify the *Bergfilm* as representative of a proto-fascist mentality—describes how “the distortion of time produces an enchanting optical intoxication” in Fanck’s *Der Berg des Schicksals*.⁴⁹ Here, he is writing of time-lapse rather than slow motion, but the sense that this film’s temporal manipulation enables a novel visual access to the natural environment remains the same. In a special foreword to the book accompanying the release of *Avalanche*, Béla Balázs writes that Fanck “opened up a gargantuan world of titans for us and, with his camera, threw our human vision into the middle of it all...What we see there is truly unadulterated nature. That we see it is completely unnatural, for it is not intended for the human eye.”⁵⁰ Writing about *SOS Eisberg*, an anonymous reviewer for *Der Film-Kurier* calls Fanck “the man who has granted film a whole new world, a whole new way of seeing.”⁵¹ These articles and others like them suggest that in the encounter between glacial environment and film camera, both Fanck and his audiences found a new understanding of nature, not as eternally still but as ever-changing, unpredictable, and inescapably contingent.

⁴⁷ Fanck, *Der Kampf mit dem Berge*, 34.

⁴⁸ Doane, *The Emergence of Cinematic Time*, 22.

⁴⁹ Kracauer, “Mountains, Clouds, People,” 97.

⁵⁰ Balázs, “The Case of Dr. Fanck,” 68-69.

⁵¹ Anon., “Filmkritik: SOS Eisberg,” *Der Film-Kurier*, August 31, 1933.

Perhaps the most compelling reason to consider the *Bergfilm* as part of a shift in the Euro-American understanding of nature is the genre's imbrication with emergent fields of natural science, particularly meteorology and glaciology. I have already discussed the ways in which meteorological practices frame the narrative of *Avalanche*; *SOS Eisberg* has an even more involved relationship with glaciological research. This is due in part to a peculiarity of colonial history: in 1932, when Fanck and his crew went to Greenland to shoot the film, the Danish government (which still controls Greenland today) only granted access permits to scientific missions.⁵² In order to legitimize his film expedition, Fanck hired two glaciologists, Dr. Ernst Sorge and Dr. Fritz Loewe, who used the journey as an opportunity to conduct research on Greenland's ice. Both had been members of an ill-fated expedition to Greenland in 1930, which resulted in the death of the trip's leader, Alfred Wegener (who originated the theory of continental drift, according to which the apparently still ground is in constant motion). On that journey, Sorge extracted the first known ice core sample from the Greenland ice sheet, using it to research climate patterns of past years. This practice, now central to climate science, is perhaps the clearest distillation of a scientific approach to nature that assumes its historicity; it is thus striking that two of the crewmembers from Wegener's expedition next returned to Greenland to consult on the making of a Fanck film.

Sorge went on to write a memoir about the film expedition; it reveals telling intersections between film technology and the scientific understanding of glacial dynamics.⁵³ He spent much of

⁵² This policy was rooted in a paternalistic (and hypocritical) protectionism: having noticed the negative impacts of their own colonial settlements on Greenland Inuit, the Danish government restricted access to Greenland in the name of preventing harm to its native people caused by contact with the West. For more on the colonial policy of Denmark in Greenland, see Mark Nuttall, *Arctic Homeland: Kinship, Community and Development in Northwest Greenland* (Toronto: University of Toronto Press, 1992).

⁵³ In some ways, his experience was a case of life imitating art. During this trip to shoot a film about a lost glaciologist whose passion for a single glacier nearly leads to his death in isolation, Sorge went out on his own to record observations on the Rink Glacier. Packing provisions for four days, he ended up being away from the main camp for nine, stranded by a massive calving event that swept his boat away. Like the fictional glaciologist Professor Lorenz, he

his time in Greenland visiting and studying the Rink Glacier, a massive formation that had not yet been studied (at least not by European scientists). On one of several trips to the Rink, which was some distance removed from the crew's main camp, Sorge acquired film equipment from Fanck. Most interestingly, he painstakingly attempted to create a time-lapse film of the glacier's movement, a process he describes at some length in his account:

I set myself a big task during the next couple of days. I proposed to take a series of pictures of the movements of the glacier, so that the whole, on the film, should appear as one vast moving stream.

...

The making of these individual films requires a certain amount of patience; accordingly one does well to set about it under as comfortable conditions as possible, and to provide for some change in carrying on so mechanical a job. I hung my watch on the camera-stand, and whenever the second-hand pointed to 60 or to 30 I gave the handle a single turn. In between I walked about, of course only a few steps and back again, like a sentry before his box. I kept an eye, too, on the glacier, made notes, observed the rocks round about, then took a look at the second-hand to see if time was up for the next turn.

The weather was fine; the glacier and the mountains behind it stood out clearly. At midday on the 30th I began to use a small light-screen in my photography. In proportion to the oncoming of dusk in the evenings, I gradually opened up the screen. But the night was now so dark that the gleaming glacier could no more be distinguished in the obscurity of the cliffs. Between two and four o'clock in the morning all the ground and everything on it was thick with dew, so great was the nightly radiation. The camera lens was covered with moisture and had to be carefully wiped before the taking of each picture. Then the dew froze, forming a smooth crust of ice, so that the whole affair was encased in it.

It was very weird all night to hear the constant booming and cracking in the glacier yet to see nothing of it. In the morning, at seventeen minutes past six, the first signs appeared that a big breakaway was about to take place. Accordingly, I geared the camera in readiness for taking a continuous film.

...

I had begun to film in the nick of time and caught the entire sequence. The camera was very luckily situated as the projection was only 600 meters away and formed part of the highest section of the front...

My night's vigil was thoroughly rewarded. I put my apparatus back into its former gear, taking photographs at intervals, and resumed my sentry-go up till eight o'clock.⁵⁴

Like the filmmaker, the scientist sees the potential for cinematographic recording to provide new visual access to glacial temporality that eludes unmediated vision due to its slow pace (though, as Sorge notes, its movement is "at least forty times more rapid than the fastest of the Alpine

was rescued only by aerial intervention at the hands of Ernst Udet, who flew out on multiple scouting missions to find the lost scientist. Upon Sorge's arrival back at the main camp, he remained undaunted. Instead, he went straight to Fanck and demanded they return to the glacier together, according to Fanck's own memoir of the *SOS Iceberg* expedition: "Fanck – Fanck – you have to see it – you must go there – simply unthinkable, what could be filmed there with image and sound, if we could get the right machines up to the Rink Glacier." Though resistant at first, Fanck ultimately agreed, and sent Sorge back with a small crew and filming equipment to procure footage of the immense calving events taking place at this glacier's terminus. (Fanck, *SOS Eisberg*, 55.)

⁵⁴ Sorge, *With Plane, Boat, and Camera in Greenland*, 179-181.

glaciers”).⁵⁵ His dedication to this idea can perhaps be measured by his willingness to stay up all night, remaining tethered to the device by the demands of the project, which required he never be more than 30 seconds’ walk away. This objective to create a visual effect through the elision of time—capturing only tiny fractions of each minute—ultimately gives way to a continuous operation, recording a calving event in its totality. In this tension between the techniques of deliberate omission and totalizing accumulation, Sorge’s anecdote neatly encapsulates the contradiction at the heart, not only of cinema’s relationship with time, but of modern temporality more generally.

Nature Historicized

While I have sought to highlight here the ways in which the *Bergfilm* participates in the new discursive formations of twentieth-century modernity, it was first understood as demonstrating reactionary anti-modernism, a reading which is founded in part on an assertion of nature as disconnected and isolated from the industrialized world.⁵⁶ Beginning with Siegfried Kracauer’s account in his classic *From Caligari to Hitler*, film historians and theorists have often focused (at times to the exclusion of other avenues of inquiry) on the *Bergfilm*’s aesthetic and industrial connections to Nazi filmmaking.⁵⁷ While Kracauer praises Fanck’s documentary achievements in spite of their pairing with banal narratives (thereby establishing another longstanding tradition in reception of the *Bergfilm*), he ultimately diagnoses Fanck’s approach as “rooted in a mentality

⁵⁵ Ibid., 179.

⁵⁶ There are exceptions, some of which I will discuss later in this section.

⁵⁷ Certainly, continuities of personnel—perhaps best embodied by (but not limited to) Leni Riefenstahl, who got her cinematic start with Fanck and went on to infamy as Hitler’s chief propagandist—cannot and should not be disregarded. However, a central tenet of my historical practice is that histories are multiple and overlapping, and that no object participates in only one trajectory. Thus, the *Bergfilm* can play an important role in both the development of Nazi cinema and the unfolding of environmental history.

kindred to the Nazi spirit.”⁵⁸ Three decades later, in another seminal work that grapples with the ideologies nestled in interwar German film production, Susan Sontag would cite Kracauer to build her case against Leni Riefenstahl in “Fascinating Fascism,” referring to Fanck’s mountain films as “an anthology of proto-Nazi sentiments.”⁵⁹ Kracauer’s and Sontag’s influential analyses pick up on undeniable resonances between the ethos of the *Bergfilm* and the Third Reich—indeed, one production account of *SOS Eisberg* observes that Riefenstahl spent her free time on the shoot reading *Mein Kampf* under a photographic portrait of Adolf Hitler that she hung up in her bunk space—but each also rests on an overly simplified interpretation of the film’s relationship with nature that privileges the mystical and dismisses the historical.⁶⁰

According to Kracauer, “the idolatry of glaciers and rocks was symptomatic of an antirationalism on which the Nazis could capitalize.”⁶¹ His insistence on the mountains’ timelessness and removal perhaps betrays his own intellectual lineage: he was a student of Simmel, for whom “the firm landscape allows no sense of the play of dynamic factors...the firm region is, so to speak, the absolute ‘unhistorical’ landscape.”⁶² In Simmel’s estimation, the Alps were ahistorical, asocial, a transcendental space apart from time and life—a common understanding of a visual vocabulary defined by Caspar David Friedrich and painters like him. Though Kracauer does not directly cite Simmel, he shares his former teacher’s understanding of the Alpine environment as one of radical separation and negation of the forces of modernity and history. Kracauer

⁵⁸ Siegfried Kracauer, *From Caligari to Hitler* (Princeton: Princeton UP, 1947), 112.

⁵⁹ Susan Sontag, “Fascinating Fascism,” *The New York Review of Books*, February 6, 1975.

⁶⁰ According to the glaciologist Ernst Sorge’s film memoir, “she had a small collection of books, and among them some travels in the South Seas, as she was already planning a new film. In addition, Adolf Hitler’s *Mein Kampf* was never out of her hands. She studied it with the utmost interest, and openly declared herself fully to agree with its conclusions. She found a visible means of expressing her great admiration for Hitler by hanging up his picture, framed in sealskin, both in her tent and now in this new habitation.” Sorge, *With ‘Plane, Boat, and Camera in Greenland*, 203.

⁶¹ Kracauer, *From Caligari to Hitler*, 112.

⁶² Simmel, “Die Alpen,” 138.

connects the “mountain cult” of the 1930s to the “Hitler cult,” noting the aesthetic similarity between the clouds foregrounded in *Avalanche* and those that so famously open Riefenstahl’s most infamous film, *Triumph des Willens* (*Triumph of the Will*, 1934).⁶³ The relationship with nature diagnosed by Kracauer, and later taken up by Sontag, is characterized by quasi-religious worship and mysticism, with the mountains “represented as supremely beautiful and dangerous, that majestic force which invites the ultimate affirmation of and escape from the self.”⁶⁴ In the primary book-length critical study of the *Bergfilm* genre, Christian Rapp continues the tradition established by Kracauer and Sontag, describing the mountain as “a territory detached from time and civilization...a semi-sacred space that can only be accessed on the condition of decoupling from society.”⁶⁵ In this analysis, nature is to be understood not only ahistorical, but even atemporal, untouched and untouchable by the actions and concerns of humankind.

Yet the conceptual relationship between nature and history was, as Nicholas Baer notes in a recent article on Fanck’s earlier film *Der heilige Berg*, at the center of heated debate in interwar Germany, the context from which both *Avalanche* and *SOS Eisberg* emerged.⁶⁶ Kracauer in particular, wary of the Nazis’ rise to power on a wave of nationalist sentiment steeped in nostalgia for Romanticism, viewed nature with deep skepticism, seeing it as antithetical to reason and historicist thought. His frequent interlocutor Theodor Adorno, on the other hand, rather characteristically took a more dialectical view, insisting on the conceptual inextricability of nature and history. In a lecture delivered in 1932—a year after the smashing success of *Avalanche* and during the production of *SOS Eisberg*—he insists on understanding “nature as an historical being where it

⁶³ Ibid., 257-8.

⁶⁴ Sontag.

⁶⁵ Christian Rapp, *Höhenrausch*, 9.

⁶⁶ Baer, “Natural History: Rethinking the *Bergfilm*,” in “*Der Wunderliche Realist*” – *Studien zu Siegfried Kracauer*, ed. Jörn Ahrens et al. (Berlin: Springer Verlag, 2016), 280.

seems to rest most deeply in itself as nature.”⁶⁷ In doing so, as Baer notes, he intervened in a long tradition that insists on the separation of nature—characterized by inflexible laws, necessary consequences, and predictable patterns—from history, with its implications of specific networks of contingent effects dependent upon, and manipulable by, human agents.⁶⁸ Adorno’s formulation demonstrates that long before the notion of climate change entered mainstream Euro-American thought, some of the most influential theorists of the twentieth century were beginning to challenge the notion of nature as outside history.⁶⁹

This intellectual context sheds new light on the complex interactions of natural environment and media processes that pervade both *Avalanche* and *SOS Iceberg*. In fact, even Kracauer notes the presence of modern media technology in the mountain space, observing that “fragments of Bach and Beethoven from an abandoned radio on Mont Blanc intermittently penetrate the roaring storm.”⁷⁰ As quickly as he recognizes this layering of natural and media landscapes, however, he brushes it aside, arguing that the musical interludes “[make] the dark altitudes seem more aloof and inhuman.”⁷¹ What Kracauer sees as a mere reinforcement of the isolation of the remote mountaintops from societal concerns, I argue, is part of a much broader field of technologies that populate this film and weave a web that connects the peaks with the valley below. Indeed, the radio goes far beyond the valley: before the climactic storm to which Kracauer refers, in the same

⁶⁷ Quoted in Baer, 293.

⁶⁸ Ibid.

⁶⁹ There are quite early proposals of some form of climate change, dating back at least as far as 1824, when French physicist Joseph Fourier observed that the composition of the atmosphere is likely to affect the climate. But they remained on the margins of the popular imaginary until at least the late 1970s, when the first World Climate Conference was held, which would ultimately lead to the formation of the Intergovernmental Panel on Climate Change in 1988. Also in 1988, the US Congress was informed for the first time that scientific consensus overwhelmingly showed a distinct global warming trend caused by the “greenhouse effect.” See Philip Shabecoff, “Global Warming Has Begun, Expert Tells Senate,” *New York Times*, June 24, 1988, A14.

⁷⁰ Kracauer, *From Caligari to Hitler*, 258.

⁷¹ Ibid.

opening sequence that I referenced earlier in this article, the radio is introduced as a link between Hannes and his good friend, a musician in Berlin. From the pilot Udet, who flies up to the hut to deliver the message, Hannes receives instructions to tune in every Sunday night to the broadcast of the musician's show. Underscoring the virtual rapprochement of the two spaces, the film juxtaposes them in montage, connecting the church in the city with the chalet 543 miles away (and 14311 feet above) by way of a diegetically shared score.⁷²

The radio is but one star in a constellation of technologies that serve to draw the mountain world into the sphere of human concerns and actions. I have already discussed the vital importance of the telegraph to the narrative and spatiotemporal logic of *Avalanche*; it is the vehicle for romance, but also creates the conditions of possibility for understanding the passage of glaciologic time. This is perhaps most clearly dramatized the first time Hannes uses his telegraph machine, to transmit the measurements he takes from the weathervane at the film's opening. Checking the clock and donning headphones, he begins to wire a message about wind conditions; his message is received in a series of international stations shown in montage. Behind telegraph operators, national outlines on the wall demonstrate their state allegiance: Great Britain, France, Italy, Sweden, Germany. Over these shots, the beeps and clicks of Morse code—the first sound effect to depart from an orchestral score—dramatize the cross-border connections supported by telegraph technology. Although it makes no direct reference to the political turmoil in Germany at this moment—indeed, it was praised by the prominent film critic Hans Feld for transcending politics—*Avalanche* locates itself in this spatially reconfigured world by virtue of its reliance on the

⁷² This deployment of montage is one of many modernist film techniques that characterize Fanck's oeuvre and challenge a simplistic reading of it as traditionalist or purely Romantic; Baer analyzes similar aesthetic patterns in *Der heilige Berg* that trouble a reading of the *Bergfilm* aesthetic as eschewing the forms of modernist filmmaking.

telegraph and the maps used to signal receivers' locations.⁷³ (And given the political particularity of Germany by which one can date a historical moment almost to the decade simply from the nation's outline on a map, it is nearly as temporally as geographically specific.)

Strongly recalling this sequence, the climactic midpoint of *SOS Eisberg* also dramatizes telegraphic contact, though its differences reflect important historical shifts in the geographic imaginary of this film. Responding to an earlier call for "all radio operators north of the 60th parallel to take part in the search," a collection of operators around the world participate in an effort to make contact with the lost expedition. Here, the technicians are not simply a collection of continental Europeans, but are defined by a latitudinal relation that stretches across the globe. Teams from the United States and Japan join those in Germany, Denmark, and France in the drama of explorers in distress, as does a child of unspecified nationality working with what is clearly an amateur home radio setup. When the message is first received, a series of scenes in different (unsubtitled) languages shows the operators tuning in. As excitement over this first contact grows, the frame tightens and the editing gains speed, culminating in a rapid montage of low-angle close-ups on operators' faces, which flash across the screen as the familiar signal buzzes in the backdrop.⁷⁴ With its clear references to the technological moment as well as geopolitical relations—the nod to Japan is unmistakable from Fanck, who a few years later would accept a contract from the Japanese ministry of culture—this sequence is firmly embedded in world history.

⁷³ Hans Feld, "Filmkritik: Der Fanck-Film der Aafa. Stürme über dem Monblanc," *Der Film-Kurier*, February 3, 1931.

⁷⁴ Rentschler notes the *Bergfilm*'s aesthetic consonance with techniques and tendencies embraced in the cinematic avant-garde of the 1920s, including chiaroscuro lighting and geometric compositions lending themselves to abstraction. This rapid montage of faces has a similar effect, bringing together such icons of experimental filmmaking practice as Sergei Eisenstein, Lev Kuleshov, and Dziga Vertov (all contemporaries of Fanck). See Rentschler, "The Mountains and Modernity," 146-148.

More than just a technological reorganization of time and space, the mediation of nature seen in both *SOS Eisberg* and *Avalanche* also signals an emergent understanding, supported by the science of statistics, of weather as climate—local effects of an interconnected system, whose movements are tracked, and whose conceptualization is shaped, by networked communications and the records they produce. The translation of weather patterns into lists of numbers, the dating and measurement of meteorological events according to clock and calendar time, and the international cooperation on scientific missions to the polar north reflect an interest in nature beyond its role as an unchanging stage for human activity, an attempt to understand it as a shifting, active force with widely dispersed effects. This shift is akin to that described by Dipesh Chakrabarty as “the collapse of the age-old humanist distinction between natural history and human history.”⁷⁵ This collapse, he contends, emerges from the early twenty-first century’s declaration of the Anthropocene Epoch, which is a formalized recognition that human activity can change the global climate. It is, in his account, a twenty-first century phenomenon, whose central idea dates back no further than the late twentieth century.

While this account is a useful intellectual history of how nature has been conceptualized in relation to human activity, it neglects any analysis of the material process necessary to the central shift involved. Historicization requires a historical record; and the historicization of an entity as large as environment requires tools of scalar manipulation, to make the object conceptually and perceptually available. Indeed, Chakrabarty addresses scale: one of his central contentions is that humans have become geological agents, a designation that forces us “to scale up our imagination of the human.”⁷⁶ But as with the historical record, he leaves aside any analysis of the tools that

⁷⁵ Chakrabarty, “The Climate of History,” 201.

⁷⁶ *Ibid.*, 206.

make this work possible: namely, visual media, and moving image media in particular. *Avalanche* and *SOS Eisberg* both track the mediation of environment through visual technologies, suggesting that the concept of nature as historically mutable does not suddenly arrive with the declaration of a new geological epoch, but creeps in decades earlier through essentially modern practices of observation and inscription. Why make a record from year to year if each simply repeats the actions of the last? With their mutual preoccupations with early climate science and the technological infrastructures that supported it, *SOS Eisberg* and *Avalanche* show that nearly a century before the Anthropocene got its name, the idea of climate history was emerging in constellation with modernity.

Part Two: A Future without History

Chapter Three
The Antarctic An-Archive:
Encountering History at the End of the World

Wearing a puffy red parka with a fur-lined hood, glaciologist Douglas MacAyeal describes a recurring dream.

I am again walking across the top of B-15. I might as well be on a piece of the South Pole, but yet, I'm actually adrift in the ocean, a vagabond floating in the ocean. And below my feet, I can feel the rumble of the iceberg; I can feel the change, the cry of the iceberg, as it's screeching and as it's bouncing off the seabed—as it's steering in the ocean currents, as it's beginning to move north. I can feel that sound coming up through the bottoms of my feet, and telling me that this iceberg is coming north: that's my dream.

B-15 is the technical term for a massive iceberg that has broken off the South Polar ice cap. It is late 2006 or early 2007, and MacAyeal is talking to Werner Herzog for the latter's documentary about Antarctica, *Encounters at the End of the World*. Already from the language he uses to describe his dream, it is clear that this scientist of the ice has a distinctly contemporary understanding of his object: as dynamic, unstable, constantly changing and on the move. It is a conceptualization of glacial environments whose emergence in the early twentieth century I tracked in the first part of this dissertation, and which I will trace in the early twenty-first century in the next three chapters. In both eras, I argue, common notions of the glacier are imbricated with epistemological frames encouraged by media forms: cinema and radio in the early twentieth century, and digital computing in the twenty-first. As becomes evident during MacAyeal's interview, he sees his own idea of the ice as historically contingent, reliant on new theories and evidence that have emerged in the past hundred years. The film, meanwhile, deploys *mise-en-scène* and editing to suggest that

these theories and evidence are inextricable from the processes of mediation through which they are discovered and communicated.

This intimate interrelationship between historical conceptualizations of the ice and its mediation only becomes clearer as the interview goes on. After introducing MacAyeal, a cut to a low-angle aerial pan shows icebergs surrounded by sea ice that presumably resemble the one from his dream. The film then returns to the glaciologist, who references the early twentieth century expeditions of Robert Falcon Scott and Ernest Shackleton in order to explain just how much things have changed:

Unlike Scott and Shackleton, who viewed the ice as this sort of static monster that had to be crossed to get to the South Pole, we scientists now are able to see the ice as a dynamic, living entity that is sort of producing change, like the icebergs that I study.

As MacAyeal describes this shift—drawing on visual terms like “view” and “see”—his setting gives clues as to what has made him and his colleagues “able to see” in this new way. Whereas he describes his dream in a close-up shot, only his face and the wall behind him in frame, in this second appearance a wider angle provides the viewer with more information. Next to a window that looks out at McMurdo, the largest settlement in Antarctica and home to many National Science Foundation (NSF)-funded research projects, MacAyeal sits in front of a desk bearing a white Apple desktop computer.¹ Its screen displays a still image of a massive ice formation, looming up from the ocean, its vast surface stretching back toward the vanishing point.² Moments after describing the modern understanding of glacial dynamism, MacAyeal turns to the computer screen, tapping the image with a pen and identifying the ice as B-15, the immense iceberg he

¹ The NSF also paid for Herzog’s visit to Antarctica to shoot this film, from November 1, 2006-April 30, 2007.

² The framing of this image closely resembles that of the title frame of *The Great White Silence*, discussed in Chapter One.

researches (“larger than the country that built the Titanic,” he notes).³ As the expert describes his object, running through a series of metaphors to explain just how much water is locked in place by subzero temperatures, the camera zooms in on the computer screen, simulating a tracking shot in a remediation of this digital image that, like the scientist himself, attempts to encompass in bits and bytes the enormity of the glacial phenomenon at hand.

The next cut brings a new and different kind of footage: a grainy pan to the left across a ship on open water, followed by another look at the iceberg, this time at eye-level. The low thrum of helicopter blades stitches together several different panning shots that move across the iceberg’s sheer face, as MacAyeal explains that this is video footage shot by his research team. On the low-resolution video, the helicopter lands on the ice field constituted by the top of B-15. Several figures in standard-issue red parkas, like the one MacAyeal wears in his interview, set up instruments intended to increase understanding of the iceberg through processes of observation and data analysis. Its power and mystery inhere partly in its size, as the glaciologist explains: “They’re so big, there’s an element of fear: we don’t know really what’s going to come ahead when they eventually begin to melt in the ocean beyond Antarctica.” As these instruments automatically record data, the scientists’ task will be to process it and translate it into terms that are legible not only to other scientists, but ultimately to the lay public.⁴ And in this task of translation, as becomes clear in the next segment of the interview, scalar manipulation is paramount.

³ Here, MacAyeal participates in a long tradition of using familiar locations as reference points to communicate the size of icebergs: in *The Great White Silence*, an iceberg is compared to London; Fanck used Berlin to explain the volume of ice in the Rink Glacier; in *Chasing Ice*, as will appear in Chapter Four, the city of choice is Manhattan to lend scale to the Ilulissat Glacier of Greenland.

⁴ MacAyeal does not explicitly discuss the process by which his research will be integrated into other projects or publicly disseminated, but this task of communicating research results is inherent in any scientific endeavor.

Transitioning from personal documentary footage of his team landing on B-15, MacAyeal introduces a third mediation of this enigmatic object, one which addresses the problem of scale head-on. As the camera cuts back to the scientist at his desk, he explains a new moving image that appears on his computer, a strangely pulsating mass of gray, black, and white. (The window displaying this video overlaps with a second one, in which the viewer can discern the video footage that was just presented on the full screen.)



Fig. 1 Glaciologist Douglas MacAyeal in his lab in Antarctica, shown in *Encounters at the End of the World*

The black-and-white video, with its fan-shaped frame, jerky movements, and unmistakable liquidity, somewhat resembles an inverted sonogram. MacAyeal reveals it to be a “time-lapse animation of satellite imagery of the sea ice and of the continent of Antarctica.” Among three shades of gray that shift and swirl with the halting rhythm common to time-lapse and stop motion animation, MacAyeal directs the viewer’s attention to “little bits and pieces” that, he clarifies, are actually “titanic icebergs”—one, about half the size of his pinky fingernail, “might be the size of the island of Sicily in the Mediterranean. It’s like a little tiny bumblebee, zipping around in a circle, happy to be in the warm waters as it’s drifting north.” The camera, zooming in on the screen and

tilting to follow this white speck, tracks it as it moves out of frame, into an oblivion that, MacAyeal has already begun to imply, ultimately threatens us all.

The final moments of this interview continue to highlight the connections between media processes, environmental concepts, and notions of history that I will argue are central to *Encounters at the End of the World*. Framed in a two-shot with his computer screen showing the satellite time-lapse, MacAyeal again underscores the difference between historical and contemporary understandings of the southernmost continent:

I'd be happy to see Antarctica as a static, monolithic environment, a cold monolith of ice, sort of the way the people back in the past used to see it. But now, our comfortable thought about Antarctica is over. Now we're seeing it as a living being that's dynamic, that's producing change—change that it's broadcasting to the rest of the world, possibly in response to what the world is broadcasting down to Antarctica. Certainly on a gut level, it's going to be frightening to see what happens when these babies get north.⁵

Although the scientist does not explicitly name mediation itself as essential to this reconceptualization, the film uses editing techniques to do so for him. As MacAyeal wryly reflects on the loss of “our comfortable thought about Antarctica,” the film displays a full-screen image of the time-lapse video, removing him from the frame. His contemplation of Antarctica as a “living being,” its dynamism and catalytic nature, become a voice-over accompanying this sonogram-like imagery that collapses vast stretches of both time and space, making different patterns of movement and change available to human perception. These techniques of minimization are what make today's scientists “able to see” the ice in a new way, just as techniques of enlargement revolutionized biology by making visible the miniscule movements of bacterial growth or blood

⁵ The use of the word “babies” here only emphasizes the time-lapse's similarity to a sonogram, though the birth in question here seems to imply more an act of destruction than one of creation; the fact that the iceberg “babies” will shrink and disappear over time, rather than growing larger and more robust, only continues the inversion.

cells.⁶ Like the film, MacAyeal's vocabulary shows the fundamental role played by mediation in his approach to nature. He explains the relationship between Antarctica and the rest of the world as a form of "broadcasting," reflecting the extent to which media forms have become embedded in the conceptual frames used to grapple with ecosystemic processes.⁷

I begin this chapter with this scene because it distills a set of concepts that are crucial to understanding not only *Encounters at the End of the World*, but also contemporary Western narratives of environmental collapse and climate change writ large. First, the interview highlights the film's preoccupation with media forms: the still image of B-15 on MacAyeal's computer screen, his team's aerial videos of the iceberg, the satellite time-lapse, and, of course, *Encounters at the End of the World* itself.⁸ This media-rich sequence is typical of this film: for as much as it is a documentary about Antarctica, *Encounters at the End of the World* is a study of media technologies and their relationships with nature and with history. As I have argued in this dissertation, cultural ideas about environment, space, and temporality are contingent on the media forms through which people perceive them. In this case, these media forms are products of digital technological processes that fundamentally change the scale of inquiry and analysis. As a digital film—and a film that pays deliberate attention to multiple digital forms beyond cinema—*Encounters* highlights a fundamental condition of computing in the early twenty-first century: namely, the information

⁶ In her insightful study of microscopy, *Screening the Body*, Lisa Cartwright argues convincingly for the role of innovations in moving image media in re-shaping an idea of the microscopic world as dynamic and changing rather than static and stable. See Lisa Cartwright, *Screening the Body* (Minneapolis: University of Minnesota Press, 1995), especially Chapter One, "Science and the Cinema."

⁷ I have already argued extensively in Chapters One and Two for the importance of radio and other technologies of connection to changing concepts of climate in the late 1920s and early 1930s—MacAyeal's comments demonstrate the widespread adoption of these notions seventy years later.

⁸ Given the longstanding relationship between dreams and the cinema—a subject with which Herzog has been notably preoccupied throughout his prolific career—it is perhaps appropriate that this sequence of media forms begins with a description of reverie.

overload that characterizes media infrastructures that run on automated capture and processing, and overwhelmingly vast storage capacities.

The problem of excessive data is not limited to computing technologies; it has preoccupied many film theorists as well. Among the myriad changes wrought by the mechanization of observation and recording is the removal of human rationality from the creation of the record. Cinema, “available as the potential record of anything and everything that happens,” changes the primary mode of recording from one of selection—choosing to write down what seems important—to one of collection, accumulating whatever is available.⁹ Suddenly the archivist is faced with the prospect of what seems to be total, unfiltered access to the past.¹⁰ Film theorist and historian Paula Amad names this tendency of historical data collection to spin out of control “counter-archival,” and she too locates its origin in the development of film, with its “ability to record and store the raw data of routine experience, transient details, uneventful moments, ordinary gestures, and casual occurrences.”¹¹ As a film, *Encounters at the End of the World* exemplifies this random access, while also highlighting the ways in which the increased scale of digital storage and recording have intensified this quality of recorded media. In its compilation of media forms, its seemingly random assortment of personal anecdotes, and its aesthetically varied approach to the southernmost continent, this film points to the problems posed for history by a topic as large as the global environment, and a media infrastructure with the seeming capacity to capture—if not properly to analyze—everything.

⁹ Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive* (Cambridge: Harvard UP, 2002), 16.

¹⁰ Of course, this illusion of total unmediated access through film is just that: an illusion.

¹¹ Paula Amad, *Counter-Archive* (New York: Columbia University Press, 2010), 5.

For *Encounters at the End of the World* does take on the history of nature—even of life itself—as its explicit subject, one it can never hope to contain. The film returns repeatedly to mediation processes that invoke deep time: computer-based DNA sequencing and human evolution, video surveillance of a volcano whose last major eruption occurred 70,000 years ago, microscopic cinematography of microbial organisms who may represent an “early form of intelligence.”¹² This persistent interest in the long history of the Antarctic environment draws on the preservational capacities not only of media, but of the ice itself, presenting a multiplicity of histories which converge, intersect, and diverge much like the icebergs floating through MacAyeal’s time-lapse. Like that time-lapse, which rushes toward an uncertain future—a future that is “certainly going to be frightening”—*Encounters at the End of the World* looks simultaneously backward and forward. As with any project informed by historical consciousness, Herzog’s documentary is as invested in the future as it is in the past.¹³ Here, this future-orientation is fraught with anxiety over the imminence of climate change and ecosystemic collapse. The scale of this problem is accentuated by the film’s movement between mediations of the deep geological past and contemplation of a symmetrically distant future, one in which media and ice alike may provide the only record of humanity’s existence. This invocation of the future anterior—another common trope in Herzog’s films—rounds out the picture this film paints of the interrelationship between nature, media, and history-making.¹⁴ It is a composite image of astonishing scope, in which the ability to gather information

¹² The phrase comes from Herzog, who uses it in an interview that will be discussed later in the chapter.

¹³ As Amad notes, “The archive bets on its indispensability not only to the present, (so-to-be-past), but, more importantly, to the future, in the hope that its salvaged documents will be remembered, consulted, and studied. The researcher in the present, who is always removed from the archive’s own original temporal vortex, should thus be careful not to overlook the fantasies of the future nestled amidst the documents in which she pursues the facts of the past.” Amad, *Counter-Archive*, 1.

¹⁴ *Cave of Forgotten Dreams*, *Lessons of Darkness*, *Wild Blue Yonder*, and *Grizzly Man* all invoke this temporal experience of a present that will one day be long past.

threatens to overwhelm the capacity to understand it, and the forward push of history menaces the backward look. In the end, the film will suggest, the answer may lie in a return to the material elements of nature itself, themselves troubled by a dialectic of preservation and precarity that points to a fatal flaw in the historical project *tout court*.

Encountering Deep Time

From the first few moments of *Encounters at the End of the World*, it might seem that Herzog approaches Antarctica as precisely the kind of timeless, even mythical place that early explorers like Scott and Shackleton believed it to be, according to MacAyeal. The film opens with striking underwater cinematography, which the director reveals in voiceover to have been shot by a friend, a professional diver. On screen, before a background in varying shades of blue—from near-black to the color of the sky at noon on a sunny day—a silhouetted figure clad in SCUBA gear swims around a strange stalactite-like ice formation that reaches about halfway down from the top of the frame. The diver holds a light that causes the formation to glow a pale turquoise, with some of its crystalline surfaces appearing almost gilded.



Fig. 2 A diver explores the water beneath the ice cap in the opening shots of *Encounters at the End of the World*

On the soundtrack, Russian liturgical music performed by an all-male a cappella choir lends a sacral air to the scenery, which soon changes in a cut to a different submarine location. Here, the camera pushes through what appears to be a shallow depth between the sea floor and bulbous crystal clouds above, which take on a greenish yellow hue in the backlighting of the sunlight. These meandering images of the watery world beneath the ice, Herzog explains, were what made him want to come to Antarctica in the first place. To get there, he boarded a New Zealand military plane with his crew and dozens of other travelers, all flying “into the unknown, a seemingly endless void.” In this sequence the film’s visual and verbal vocabularies echo the sense of the Antarctic as a space apart from earthly concerns, a sublime and unknowable environment that attains to the metaphysical plane.¹⁵

To be sure, as noted by many scholars of Herzog’s *oeuvre*, the director has—like his predecessor Arnold Fanck—an unmistakable “connection to the German aesthetic tradition and to the legacy of romanticism in particular.”¹⁶ The modes through which Eric Ames argues Herzog approaches landscape—trance, testimony, parody and allegory—can all be found in *Encounters at the End of the World*, but I argue that this film offers yet another lens through which to understand its extreme environment: namely, the historical. More precisely, the film is preoccupied with various forms of mediation that help to produce a sense of Antarctic historicity: from archival film, to microscopic cinematography, to digital DNA sequencing. Each of these media forms leads in its own way back to the project of grappling with the enormity of environmental history, and the crisis of futurity provoked by new modes of technologically supported vision. Endowed with the

¹⁵ In her study *Antarctica as Cultural Critique*, Elena Glasberg offers a sharp critique of Herzog on these grounds—or more precisely, based on what she reads as his lament over the disappearance of true heroism—but as will become clear in this chapter, my interest in the film is different.

¹⁶ Eric Ames, *Ferocious Reality: Documentary According to Werner Herzog* (Minneapolis: University of Minnesota Press, 2012), 51.

capacity for scalar manipulation, these processes of mediation convert the seemingly static expanse of deep time into a more human frame, one which lends it a sense of the historical dynamism it once seemed to lack.¹⁷

In fact, despite the somewhat mystical tone set by the film's earliest images, this process of historicization through mediation begins as soon as the film crew lands on the continent. From the moment the enormous military aircraft touches down and begins to taxi on the layer of ice that blankets the Ross Sea, with the Transantarctic Mountain Range looming blue and white in the background, the film begins to break down the common cliché of Antarctica as a barren wasteland severed from the developments of the modern world. Heavy machinery and motorized vehicles rumble across the screen, the screech of metal on metal and low roar of combustion engines gradually giving way to an orchestral score. These twenty-first century images of the Ross Sea are immediately followed by black-and-white archival footage of the same place. The scenes come from Ernest Shackleton's ill-fated *Endurance* expedition to Antarctica, which took place from 1914-1917.¹⁸ Shackleton's ship, caught in the ice whose constant motion and pressure would eventually destroy it, lists alarmingly in the background as the crew unload its contents onto the frozen surface over the same bay where Herzog's plane has just arrived. Herzog's interest in Shackleton, to whom he returns repeatedly in *Encounters*, seems primarily to be in his failure: Glasberg identifies Herzog's relationship to earlier explorers as "post-Heroic," a simultaneous lamentation and parody of the futile efforts a hundred years prior.¹⁹ Certainly, Herzog's self-staging is an unavoidable

¹⁷ As Andrea Westermann has noted in conversation, scalar shifts enable changes that are qualitative as well as quantitative; the emergence of historical conceptualization is, I argue, one such qualitative transformation.

¹⁸ As discussed in Chapter One, the historical coincidence of Shackleton's expedition with World War One (both began the same week) lent itself to the sense that Antarctic space—where the catastrophe that engulfed Europe was not only invisible, but wholly incommunicable—was radically different, another world outside time.

¹⁹ Glasberg, *Antarctica as Cultural Critique*, xxii.

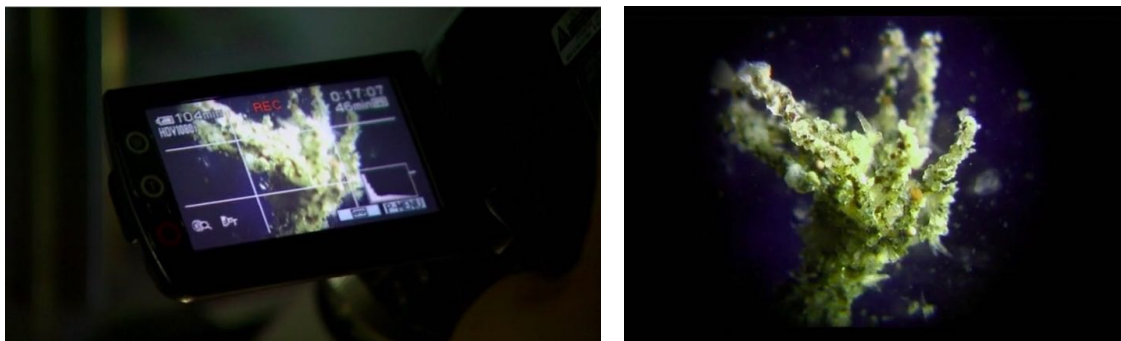
element of all his documentary work, especially as it has taken on an increasingly ironic tone in the last fifteen years.²⁰ But if we look beyond Herzog to the broader discursive context of the film itself, these scenes also set the stage for a different and more profound theme that runs throughout *Encounters at the End of the World*: through mediated representation, the southernmost continent, like its six inhabited brethren, enters the historical.

Once the viewer begins to look for them, signs of Antarctica's historicity are all over *Encounters at the End of the World*: the first McMurdo inhabitant to appear in the film, a driver of the immense buses that serve as transport in and around the base, points out "Captain Scott's hut, built in 1902." Like the archival film footage, it presents a sharp contrast with contemporary McMurdo, a landscape of yellow plastic tubs, storage containers, and readymade shelters dotting muddy fields torn up by Caterpillars and other heavy machinery. Appearing unchanged for over a hundred years, the structure is a reminder that the icy environment itself, like the recording media that take it in, has a preservational effect, one that will be discussed at length later in this chapter.²¹ These contrasts between the Antarctica of the early twentieth century and that of the early twenty-first, their conservation enabled by film and by ice alike, open Antarctica up to historical analysis by laying bare the changes it has undergone over the course of a hundred years. These mutations indicate a place that is not separate from the ravages of time, but rather intimately bound up in the research and development of new modes of transportation, extraction, and observation that characterize Western modernity.

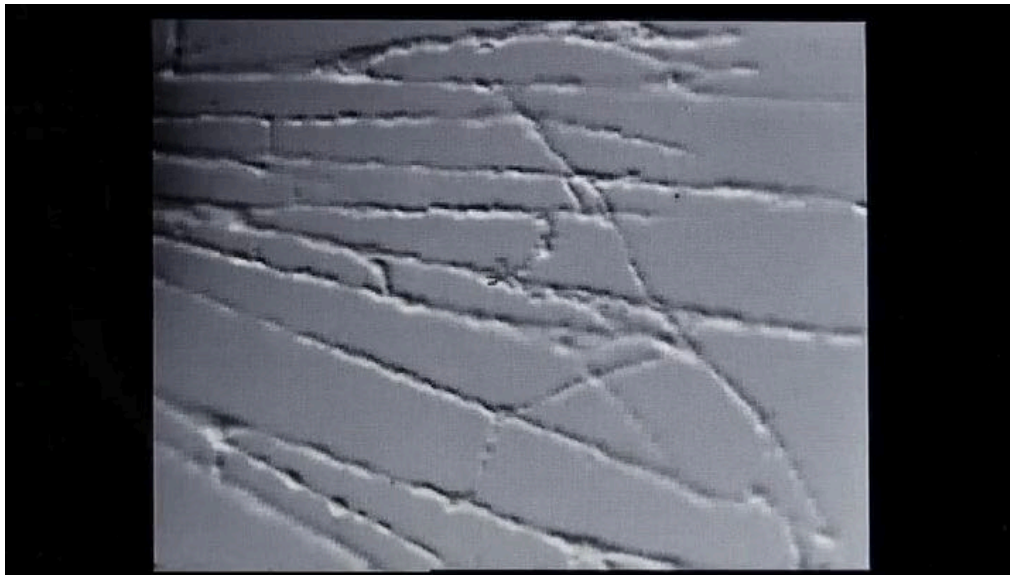
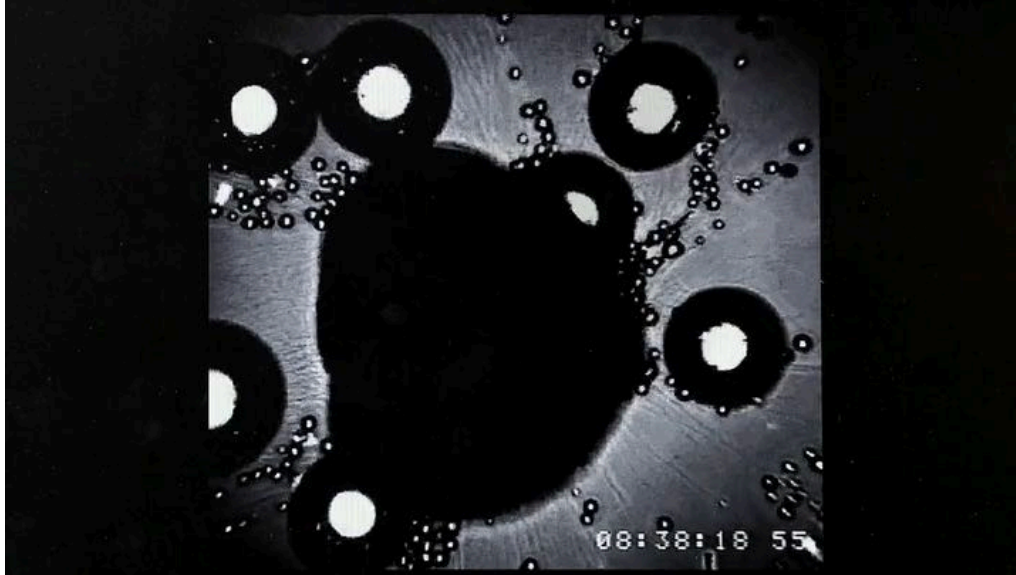
²⁰ For more on Herzog's relationship with parody, see Ames, *Ferocious Reality*, especially pp. 57-65.

²¹ Indeed, the changeless hut set against the visibly different Antarctic background in a way reverses the terms of the human/nature divide that I set about to question in this dissertation, as the human artifact appears constant and the environment subject to permutation.

But it is not just archival footage of Antarctica that produces historical consciousness, the notion that this place too is distinct from year to year, conditional, connected, and contingent. Each in its own way, every one of the various media forms encountered in this documentary seems to open a door to a deep past, and to a narrative of change over time. When the crew visits the underwater diving team whose footage originally inspired the project, Herzog describes the functioning of a single-celled organism collected from the freezing water beneath the ice. He depicts a surprisingly complex process through which these creatures gather grains of sand to form a protective shell. As he speaks, magnified moving images of different kinds show the tiny organisms at work. First, a camcorder attached to a microscope presents a full-color magnified view which, while enlarged, still resembles the sensory experience of looking through the unmediated eye (though it offers the aesthetic enhancement of a shallow depth-of-field). But as the biologist Sam Bowser takes over from Herzog on narration, the footage switches to time-lapse cinematography that reveals operations on a cellular level.



Figs. 3-4 Camcorder shots of undersea organisms recorded by Sam Bowser, and rerecorded in *Encounters at the End of the World*



Figs. 5-6 Microscopic cinematography of marine organisms harvested from beneath the Antarctic ice (*Encounters at the End of the World*)

As Bowser describes the remarkable operation at work, he muses on the organisms' capacity: "There's a certain pattern to the way that they sort the particles," he explains. "They select particular grains; out of everything in the environment, they just end up with them. They're beautiful masons." The comparison of a single-celled organism to a stonemason is a leap of the imagination that requires a dramatic scalar shift: precisely the kind of conversion provided by the

microscope. As the cell is magnified into visibility, the patterns of its actions emerge, and become graphically comparable with those of a much larger and more complex creature. Thinking of these organisms in this way prompts Herzog to ask the scientist if this is “a very early appearance of intelligence,” a question he immediately explains that he asks “with great care.” Posed as it is, the question invites a historical framing of nature: he wonders about an “early” form of intelligence, from a different era, one preceding that in which the stonemason would eventually emerge.²² This question is implicitly premised on Darwin’s theory of evolution, which offered a radical re-imagining of human emergence as a contingent historical process, rather than a divine intervention. By centering microscopic cinematography in the invocation of this historical connection between these organisms and human activity, the film suggests the importance of media forms in the process of historicization. An inversion of MacAyeal’s time-lapse videos, which offer a zoomed out view on both space and time, these extreme close-ups enable a new kind of seeing, which in turn opens the door to new metaphors and conceptualizations.

This connection between technological methods of visualization and the exploration of deep time becomes even clearer in the next scene, in which samples from another dive are analyzed in the lab. Herzog interviews Jan Pawlowski, a prominent zoologist who—like MacAyeal earlier—sits in front of a computer that provides him mediated access to otherwise invisible information: in this case, DNA sequences for the kinds of organisms that Bowser also studies. But here, the distance

²² Both Ames and Reinhild Steingröver have noted the self-reflexive nature of Herzog’s work in *Encounters at the End of the World* (Steingröver, “Encountering Werner Herzog at the End of the World,” in Brad Prager (ed.), *A Companion to Werner Herzog* (West Sussex: Wiley-Blackwell, 2012), pp. 466-484). This scene calls back to the famous Minnesota Declaration, whose twelfth and final point states, “Life in the oceans must be sheer hell. A vast, merciless hell of permanent and immediate danger. So much of a hell that during evolution some species—including man—crawled, fled onto some small continents of solid land, where the Lessons of Darkness continue.” (Reprinted in Ames, *Ferocious Reality*, x).

between unmediated sensory experience and what appears on the screen is even more remote: the laptop displays brightly colored lines and squares on a grid in patterns that resemble glitch art.

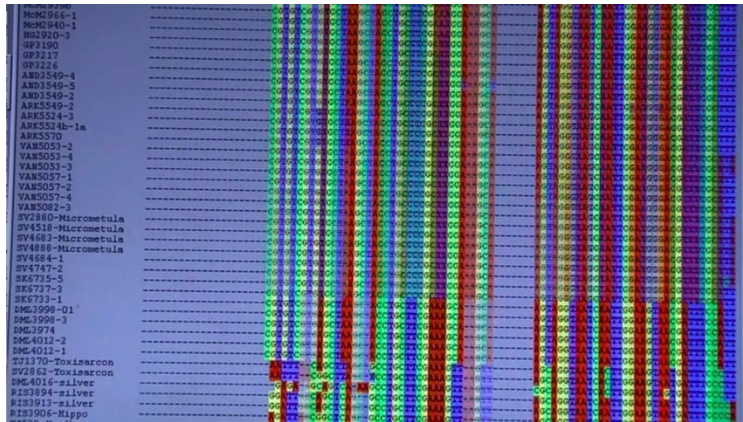


Fig. 7 DNA sequences displayed on a laptop in Jan Pawlowski's lab (*Encounters at the End of the World*)

The camera zooms in to reveal letters behind the colored strips. As Herzog explains in voiceover, “what looks esoteric is in fact one of the fundamental questions about life on Earth. In the same way that cosmologists search for the origins of the universe”—a science similarly powered by tools of extreme magnification and other visualizations of the invisible—“the scientists here are tracing back the evolution of life to its earliest stages.” It is a modernist historical project, a search for origins in a place once thought to have nothing at all to do with life of any kind. With this vast expansion of time scales comes a shift in representation toward the abstract, an abstraction which risks losing the thread of meaning in its ambitious scope.²³ For along with the promise of history offered by these newly comprehensive systems of recording, storage, and representation comes the threat of conceptual chaos posed by volumes of information too large to categorize into any meaningful arrangement.

²³ Ames notes this introduction of abstraction, and gestures toward possible implications for understanding Herzog's work, in *Ferocious Reality*, 262.

In the film's final field visit, yet another form of technical mediation crosses paths with a consciousness of time on a scale that threatens to overwhelm the imagination. The film crew visits Mount Erebus, one of only three volcanos that allow an unobstructed view of the Earth's magma. Perched on the crater's rim, Herzog interviews two volcanologists about their observations, and those observations' significance for human life on earth. One of them describes their latest observation tool, a surveillance camera that he explains was designed to record prison riots, and is hence explosion-proof.²⁴ Encased in thick protective housing, the camera and its footage are invulnerable to the magma bursts that make Erebus's lava lake so treacherous for would-be observers. Introducing archival footage from an attempt to film the magma thirty years earlier, Herzog explains that the climbers who descended into the crater met with "near-disaster" when an explosion injured one of the team and chased them away from their goal. These grainy, full-color images soon give way to a new type of recording: the green-tinged black-and-white stream of CCTV cameras, measured by a time code in the upper right-hand corner. The crisp edges of the lava bursts and sharp contrast of light on dark in these heat-sensitive recordings are a clear departure from the muddy red/orange/brown blur of the older film. The cameras that are recording this new footage perforate the background as a second volcanologist invokes the geological record to discuss a massive eruption event from Erebus that occurred around 74,000 years ago, "that produced thousands of cubic miles of pumice showering large parts of the Earth with fine ash. And these have been demonstrated to have a strong impact on the climate...and may have played an important role in the origins and dispersal of early humans." This acknowledgment of climate's historicity, by way of its impact on human behavior at a species level, is thus juxtaposed with the

²⁴ This scene is one of many that hints at the connection between military and policing technologies and Antarctic exploration, a topic never explicitly addressed by Herzog but which haunts the background of this film.

cutting-edge technology now being used to create an increasingly detailed record of the volcano's activity.

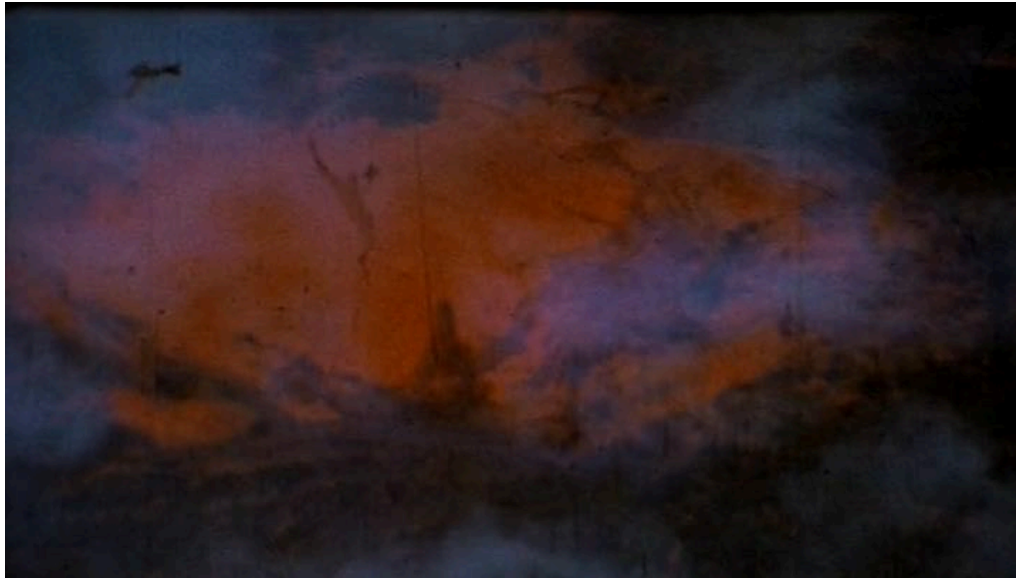


Fig. 8 Video footage from an attempt to enter Erebus thirty years earlier



Fig. 9 CCTV footage from Mt. Erebus in 2007

The time code in the upper corner serves to align the volcano's activity with human time, and an activity graph overlaid on the explosion exemplifies how the data gathered by this surveillance might be re-mediated in a proliferation of epistemologically productive constellations.

Taken together, these encounters suggest the ways in which new media forms pose new questions about history on a geological scale, as well as the challenges inherent in these inquiries. Beginning in a relatively tight frame—the mere hundred years between Shackleton and Scott’s endeavors and Herzog’s own journey—the film quickly zooms out (by way of zooming in) to much larger questions about the historical origin of animal intelligence beneath the sea. In the movement from the rich and complex texture of the microscopic mason to the flat, primary-colored abstraction of the DNA chart, the film subtly thematizes the difficulty of shifting between seemingly incompatible registers of time and space that is demanded by the project of environmental historicization, and which digital conversion tantalizingly suggests may be possible. With the surveillance project on the rim of Mt. Erebus, an attempt to resolve the tension between the twin responsibilities of attention to detail and concession to legibility leads to the production of an endless present, a record which remains meaningless until the eruption whose power will surely wipe out the technology itself, if not the entire species recording it. Offered without commentary, the time-coded video is a gently absurd warning against the dangers into which the temptation of infinite data collection may lead.

Overloaded, Incomplete: The Antarctic An-Archive

The activity of these automated, armored cameras, in which the seconds tick by as scientists wait for the next big burst, thus points to a central challenge that emerges in the technological mediation of nature: the problem of information overload, which threatens at every moment to overwhelm historical consciousness. The scalar disjuncture between the volcanologist’s tale of eons-old events and the second-by-second advance of the volcanic surveillance footage suggests a

mind-boggling accumulation of visual records before the next significant event. Over six billion seconds have passed since the major eruption to which Herzog's interview subject refers; with these new cameras, each of these seconds will be recorded, counted, and stored in its insignificance. It is a proliferation of the record that presents an immense challenge to historical thought, which depends on a careful parsing and selection according to patterns that emerge in a long view, a process in which, as John Durham Peters points out, omission can be as important as inclusion.²⁵

Of course, the dialectical threat/promise of total inclusivity represented by technological mediation is not unique to the contemporary age of digital recording. It was a subject that much preoccupied theorists and observers of technical mediation in modernity. For Siegfried Kracauer, the danger posed by photography far outweighed its potential benefits. He treated the medium like a natural disaster: a "blizzard," a "flood of photos [that] sweeps away the dams of memory."²⁶ In its obsessive documentation of the present, without regard for future significance, the overuse of photographic documentation drained the past of its meaning: for Kracauer, the explanatory function of historical records could not withstand the onslaught of the insignificant banalities indiscriminately preserved by the camera as automated scribe. This anxiety persisted as the twentieth century advanced: in the 1940s, Jorge Luis Borges authored a number of stories that dealt with the problem of information overload. In his widely read "Library of Babel"—itself based on a 1901 short story by the German philosopher-scientist Kurd Lasswitz—a vast library contains all possible 410-page permutations of 25 characters, the overwhelming majority of them meaningless

²⁵ John Durham Peters, "Proliferation and Obsolescence," in Babette B. Tischleder and Sarah Wasserman (eds.), *Cultures of Obsolescence: History, Materiality, and the Digital Age* (New York: Palgrave MacMillan, 2015): 79-96.

²⁶ Siegfried Kracauer, "Photography," trans. Thomas Y. Levin, *Critical Inquiry* vol. 19, no. 3 (Spring 1993), p.432. Here, Kracauer participates in a long tradition of anxiety over the effects on memory of practices that externalize recording, a tradition dating back at least as far as Plato, who critiqued writing itself on similar grounds. We see echoes of this anxiety still today in popular discussions of the changes wrought on memory functions by the ubiquity of access to information by way of Google and Wikipedia.

in any language.²⁷ This fear of information overload resurfaces in the (very) short story “On Exactitude in Science,” in the form of a map so precise it is the same size as the area it details, and “Funes the Memorious,” when a man with an extraordinary memory can recall every detail of a single day—but the process of remembering itself takes a full day.²⁸ Like Kracauer, Borges suggests that a crucial part of information storage includes an element of reduction, lest the historic signal be lost in the noise.

Photography and film are imperfect tools for a methodical stockpiling of the historical record in part because of their well-documented relationship with contingency, discussed at some length in Chapter Two. In her book on an early twentieth century attempt to create a comprehensive film-based “archive of the planet,” Amad incisively analyzes the challenges posed to historicist thought by film’s “attraction to the everyday fragment as the history of the present.”²⁹ The medium’s relationship with the historical record, Amad argues, can be considered “counter-archival”: it “promis[es] the historicist dream of total recall while threatening the nightmare of infinite memory.”³⁰ Rather than a catalogue of events that later prove to be of great significance—what Amad refers to as “the history of the past”—film promises to revolutionize history with its “potential to capture, organize, and store for future referral and resuscitation the unclassifiable, but nonetheless highly valued, fragments of private rather than public life, ordinary rather than

²⁷ This story repeats a theme from Borges’ earlier essay “The Total Library,” in which Borges cites Huxley’s idea “that a half-dozen monkeys provided with typewriters would, in a few eternities, produce all the books in the British Museum.” Here, automated typing technology has enabled the supplantation of human intelligence by animals, and of selection by brute collection. It also recalls Friedrich Kittler’s claim that the typewriter “inverts the material basis of literature.” See Friedrich Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young (Palo Alto: Stanford UP, 1999), 183.

²⁸ See Borges, *A Universal History of Infamy*, trans. Norman Thomas di Giovanni (E P Dutton, 1972), and *Ficciones*, trans. Anthony Kerrigan and Anthony Bonner (Grove Press: 1994).

²⁹ Amad, *Counter-Archive*, 4.

³⁰ *Ibid.*

extraordinary events, and unceremonious rather than epic history.”³¹ Amad, importantly, is discussing an archive rather than a single film; but this preference for the “ordinary,” the “private,” and the “unceremonious” is clearly on display in *Encounters at the End of the World*’s documentation of life on the southernmost continent. Episodic in form, the film never really coalesces around a unified arc, presenting instead a series of fragmentary interviews and conversations whose order seems arbitrary and whose content remains incomplete, constantly reaching beyond the film to an infinite archive of everyday life from which it draws.

The film’s attraction to banality is clear from its second sequence: over footage of sleeping scientists aboard a military plane, Herzog announces in voiceover that he does not intend to make “another film about penguins.”³² Upon arrival, rather than the polar sublime presented by more typical nature films (*March of the Penguins*, *Planet Earth*, *Frozen Planet*, etc.), Herzog finds McMurdo “looking like an ugly mining town, filled with Caterpillars and noisy construction sites.”³³ The base offers interiors to match this underwhelming environment: fluorescent-lit, personality-free boxes house its summer inhabitants. Yet, the director cautions, it is important not to be fooled by these lackluster surroundings. “The bleak Motel 6 drabness of the corridors,” he insists, “is misleading. Behind every door, there is someone with a special story to tell.” Interspersed among interviews with scientists engaged in NSF-funded research are conversations with the support staff who tend to the feeding, transportation, and communications infrastructure that enables scientific research. Many tell extraordinary stories: a bus driver recounts a tale of peril from his days in the Peace Corps in Guatemala, a greenhouse tender who left a PhD program in linguistics discusses his

³¹ Ibid.

³² Ironically, the film reaches its (anti-)climax with a meditation on a penguin striding away from the ocean to certain death. This scene is one of the film’s most-quoted, a (self-reflexive) mark of failure to achieve a stated goal.

³³ Of course, both sides of Antarctica exist; the difference in aesthetic between this documentary and the ones from which it seeks to distinguish itself is a testament to the constructedness of documentary reality.

research into dying languages, a computer expert recalls moments of high drama in improvised journeys across Africa and South America. They are indeed “special stories,” yet one cannot help but notice that they are set in the world beyond the Antarctic Circle, a world whose color and excitement serves only to highlight the dreariness of this most inaccessible destination.

Beyond their persistent interest in banal, everyday settings, these interviews demonstrate a second tendency that is central to Amad’s conceptualization of film as a “counter-archival” medium: namely, fragmentation. Despite being stitched together into a feature-length film, the interviews in *Encounters at the End of the World* leave the viewer with a sense of incompleteness, that there is more to the story. The film shores this up either through narration—suggesting that “behind every door” is another story, turning the dormitory itself into a kind of archive—or through formal choices in sound or editing. Herzog narrates over more than one story in order to explain or abridge it: the linguist in the greenhouse explaining why he had to destroy his PhD research, the traveler and computer expert giving an involved account of her journey through Africa on a garbage truck. In both instances, the viewer can see the interviewee speaking, but can no longer hear what he or she says, leaving a sense of a tale unfinished. Similarly, another exchange spotlights an escapee from the former USSR who is overcome by emotion when asked for details of his flight. Rather than pressing him, Herzog changes his line of questioning, saying, “you don’t have to answer,” leaving the story conspicuously unvoiced. An interview with a pipe-fitter who discusses his Aztec heritage creates a sense of the unfinished by way of an editing choice not unusual in Herzog’s later documentaries: the camera lingers on him after he has stopped speaking, leaving him somewhat awkwardly engaged as he waits for it to turn away. Finally, he returns to work and the film moves on, in a reminder to the audience that each interviewee’s life

continues off camera, where it could potentially be recorded and added to an ever-expanding archive of the everyday.³⁴

As a film, *Encounters at the End of the World* thus shares the “counter-archival” tendencies that Paula Amad identifies in early cinematic recording—and as a hybrid media object that engages extensively with digital forms, it suggests a marked intensification of this trend. Over and over again, the digital media processes highlighted in this film repeatedly invoke the recording and storage of information on a scale that has only become possible with computing technology. Digital DNA sequencing draws on databases containing information about all known life; the explosion-proof cameras trained on Mount Erebus’s crater promise a second-by-second record stretching for thousands of years; the imaging satellites on which Douglas MacAyeal’s time-lapse sequence relies circle the globe for years at a time, producing a constant stream of far-flung observations awaiting processing, selection, and compilation into videos that might make their movement patterns intelligible to human researchers. As Lisa Parks observes, “satellites are constantly and quietly scanning the earth, but much of what they register is never seen or known...satellite image data only becomes a document of the ‘real’ and an index of the ‘historical’ if there is reason to suspect it has relevance to current affairs.”³⁵ While the images used to build MacAyeal’s time-lapse have been marked as part of the historical index, they allude to a repository

³⁴ Considered in the context of Herzog’s full oeuvre, this footage is part of a much larger archive of banality, one which supplies the raw material for films like *Grizzly Man*, *Fata Morgana*, *Stroszek*, *Lessons of Darkness*, *Wild Blue Yonder*, etc. *Grizzly Man*, in particular, has been discussed by critics in terms of the sheer volume of home video footage (over 100 hours) from which the film was edited. See, for example, Christopher Orr, “The Movie Review: ‘Grizzly Man,’” *The Atlantic*, 10 January 2006, <https://www.theatlantic.com/entertainment/archive/2006/01/the-movie-review-grizzly-man/69418/>.

³⁵ Parks, “Satellite Views of Srebrenica: Tele-visibility and the Politics of Witnessing,” *Social Identities*, vol. 7, no. 4 (2001), 594.

of similar images whose extent is nearly unfathomable, and in which it is all too easy to imagine information going missing.

Indeed, Parks' attention to excessive data accumulation in digital infrastructures is not an isolated incident. Borges' parables of overload frequently resurface in contemporary writing on digital media, as theorists contemplate the challenges of making sense of automatically collected information.³⁶ Mark Andrejevic has devoted an entire book to the subject of strategies deployed "to make sense of more data than can be fully understood or absorbed."³⁷ Where Andrejevic emphasizes the effects of what he terms "infoglut" on power and politics, *Encounters at the End of the World* suggests that it has important implications for history as well. In a voiceover that bridges shots of Shackleton's perfectly preserved hut with a series of views showing isolated signs of human activity on the ice (a marker at the geographic South Pole, boxy laboratories perched on stilts above plains of sea ice, steam emitted by a cluster of buildings in some unnamed location on the continent) Herzog muses on the relationship between information and adventure. He observes that the British Empire that once motivated expeditions to the far South has "faded into the abyss of history," then meditates on the consequences of discovery for marking historical significance.

Exposing the last unknown spots of this earth was irreversible, but it feels sad that the South Pole or Mount Everest were not left in peace in their dignity. It may be a futile wish to keep a few white spots on our maps, but human adventure in its original sense lost its meaning, became an issue for the Guinness Book of World Records. Scott and Amundsen were clearly early protagonists, and from there on it degenerated into absurd quests. A Frenchman crossed the Sahara Desert in his car set in reverse gear, and I'm

³⁶ References to Borges appear, for example, in Peters, "Proliferation and Obsolescence"; William Uricchio, "The Future of a Medium Once Known as Television," in Pelle Snickars and Patrick Vonderau (eds.), *The YouTube Reader* (Stockholm: The National Library of Sweden, 2010); Trond Lundemo, "In the Kingdom of Shadows," in *The YouTube Reader*; Ken Hillis, "Modes of Digital Identification," in Wendy Hui Kyung Chun and Thomas Keenan (eds.), *New Media, Old Media* (New York: Routledge, 2005); Wolfgang Ernst, "From Media History to Zeitkritik," *Theory Culture & Society* vol. 30 no. 6 (November 2013); and Laura Kurgan, *Close Up at a Distance: Mapping, Technology and Politics* (Cambridge, MA: MIT Press, 2013).

³⁷ Mark Andrejevic, *Infoglut: How Too Much Information Is Changing the Way We Think and Know* (New York and London: Routledge, 2013), p. 18.

waiting for the first barefoot runner on the summit of Everest, or the first one hopping into the South Pole on a pogo stick.

As the director ponders the excess of information (the loss of “white spots on the map”) that has caused the historical record to degenerate from acts of real significance to a series of increasingly absurd “world records,” the editing underscores the role of media in this descent. Herzog’s melancholy declaration that “human adventure in its original sense lost its meaning” is paired with a static shot of a reflective orb that sits atop the small post marking the South Pole.



Fig. 10 The marker of the geographic South Pole, as shown in *Encounters at the End of the World*

Framed in close-up, the convex surface clearly shows the camera that films it, which rests unattended on a tripod. Further back in this distorted mirror image, a small human figure, an explanatory placard, and an American flag allude to the human and imperial forces that Herzog blames for this cultural loss. Behind the sphere, the shadows of all four inanimate objects—tripod, marker, placard, and flag—stretch toward the upper left corner of the frame, elongated by the low angle of the Antarctic sun. The absence of the human from this shadowy quartet suggests its ephemerality, a durability eclipsed by that of both the markers it fashions to memorialize its accomplishments, and the machines it constructs to record them.

Human ephemerality emerges as an explicit theme near the end of the film, when Herzog imagines the fate of these records, rendered absurd by both the breadth of the present and the depth of the future. Over a series of Antarctic exteriors, followed by a handheld tracking shot down a dark tunnel carved into the ice, the director muses,

Human life is part of an endless chain of catastrophes, the demise of the dinosaurs being just one of these events. We seem to be next. And when we are gone, what will happen thousands of years from now in the future? Will there be alien archaeologists from another planet, trying to figure out what we were doing at the South Pole? They will descend into the tunnels that we had dug deep under the Pole. It is still minus 70 degrees here, and that's why this place has outlived all the large cities in the world. They walk on, and on. And then this: as if we had wanted to leave one remnant of our presence on this planet, they would find a frozen sturgeon, mysteriously hidden away beneath the mathematically precise true South Pole. They stash it back away into its frozen shrine for another eternity. And then they find more memories of a world once green. As if the human race wanted to preserve at least some lost beauty of this earth, they left this, framed in a garland of frozen popcorn.

In the footage that accompanies this narration, the camera moves through a dark tunnel, its way lighted by a smattering of bare bulbs and headlamps, revealing the frozen ceiling, aluminum piping, and human breath that turns to steam in the frigid air. Along the way, the clues found by these imagined future scientists who have outlived the human species reflect the same fragmentation and taste for the absurd that characterize many of the interviews scattered throughout this film. Projected as the last remaining traces of a species that doomed itself to extinction, the frozen sturgeon, photographs and illustrations of flowers accompanying a silly poem, and a popcorn garland become a reflection on natural historiography and its mediation.



Fig. 11 Future relics of McMurdo: a popcorn garland, images of flowers, silly poems (*Encounters at the End of the World*)



Fig. 12 The sturgeon, a mysterious messenger from a future past (*Encounters at the End of the World*)

In its enormous scope, conferred both by the scale of glaciological temporality (which preserves material across epochs and exceeds the natural life of entire species), and the global status of Antarctica as the “end of the world,” the film suggests that any attempt to document the southernmost continent will be foiled by the counter-archival tendencies inherent in the place itself. Frozen fish and popped corn alike speak to the impossibility of separating meaningful details

from insignificant information: we cannot know in the present which records will seem crucial in the future, especially when we are dealing with a system (like the earth, or its digital mediation) whose scale overwhelms our capacity for legible processing. As a result, data collection becomes either comprehensive or scattershot, a totalizing accumulation or an assortment of random details, two methods that are equally anarchic in their scope. Among the most important encounters to be had at the end of the world, it seems, are the archival challenges posed by endless recording and the anxious will to decode an uncertain future.

Dreams of Future Past

This turn to the future alludes to a central characteristic of all archival work: its dual orientation at once toward what has been, but also to what is yet to come. As Amad asserts, “the archive bets on its indispensability not only to the present (soon-to-be-past), but, more importantly, to the future, in the hope that its salvaged documents will be remembered, consulted, and studied.”³⁸ The archive, and the film archive especially, compiles evidence of the present to ensure a legible past for succeeding generations. Early film theorists recognized and wrote extensively about this tendency: already in 1898, a mere three years after the emergence of the moving image camera, the Poland-born Parisian Boris Matuszewski wrote an essay urging the establishment of a film archive in Paris.³⁹ By ten years later, similar calls arose in Germany, where Ludwig Brauner wrote rapturously of film’s potential as a historical medium. Moving images, he declared “would preserve in living form particular moments from the developmental history of our cultural sites for the

³⁸ Amad, *Counter-Archive*, 1.

³⁹ Amad quotes extensively from Matuszewski’s essay, noting in particular the distinction he draws between political history (symbolized by “meetings of heads of state”) and a “less official ‘anecdotal history’” to which he saw film as particularly inclined. See Amad, *Counter-Archive*, 4.

coming generations.”⁴⁰ Even in the United States, as discussed briefly in Chapter One, cinema was seen as promising a kind of living posterity of unrivalled historical potential.⁴¹ In these essays, and many others like them, film is like Benjamin’s Angel of History, looking backward but moving forward, a rear-view mirror onto an ever-expanding field of historical occurrences.

The future-oriented address of history has also been noted by Dipesh Chakrabarty, who writes, “the discipline of history exists on the assumption that our past, present, and future are connected by a certain continuity of human experience. We normally envisage the future with the help of the same faculty that allows us to picture the past.”⁴² The prospect of climate crisis and the resultant demise of our species, he argues, undermine the possibility of historical thinking because it is impossible for a human to imagine a time without humanity. Chakrabarty is reflecting on Alan Wiseman’s book *The World Without Us*, but Herzog, too, looks toward a posthuman future in a way that highlights one of its central conceptual challenges: namely, the meaninglessness of history in the absence of human actors. Interestingly, the future excavators of our mysterious past are imagined *sans* machine: this is not a techno-utopian vision in which the dream of total record has been achieved, where some shadowy successor species utilizes virtual reality goggles and networked connectivity to experience the past “in living form.” Instead, the future historian (or perhaps archaeologist, should such disciplinary divisions linger beyond the demise of humanity) is relegated to the concrete material trace, a smattering of clues buried in the natural preservation chamber of the ice sheet. Why such archaic methods persist is left to the imagination: is it the

⁴⁰ Ludwig Brauner, “Cinematographic Archives” [1908], trans. Alex H. Bush, in Kaes, Baer, and Cowan, eds., *The Promise of Cinema: German Film Theory 1907-1933*, 75.

⁴¹ See p. 50 of this dissertation.

⁴² Chakrabarty, 197.

obsolescence of storage forms that troubles media historians even today?⁴³ Or an ecological collapse that has rendered unavailable such infrastructural supports as electricity or broadband? Perhaps these distant figures are not our descendants at all, but those of the sturgeon, and they have come to the ice to seek the last trace of their own biological ancestor. Whatever the cause, this scene alludes with humor and eloquence to the historical crisis located at the intersection of geologic and technological epochal change.

A sense of significant change is, of course, also related to the impulse to archive everyday life. Amad notes that the moving image was a particularly appropriate historical medium for the early twentieth century because its tendency to record banal and seemingly uninteresting (from the perspective of the present) details responded to a sense that every aspect of life was undergoing rapid and radical change. Film was a perfect tool for the early film archive's mission "of capturing diverse ways of life that were in danger of disappearing or being homogenized."⁴⁴ Indeed, the archivists whose work Amad investigates were not alone in this understanding of film's power: Brauner, in the essay quoted above, notes film's unique ability to inform future viewers about "the life and goings-on in a small city back then."⁴⁵ He is interested not only in the "particular moments" of significance for our "cultural history," but also quotidian details like "clothing and shoes...the way of walking, the salutations, the social forms, the types of movement on the street, the traffic on the street."⁴⁶ It is a vision of preservation in the face of great change. Similarly, *Encounters at the End of the World* is positioned at a transitional moment. The title works in both a spatial and a temporal register: the film unfolds at the physical "end of the earth," but also gestures

⁴³ For more on the challenges posed by technological obsolescence to the contemporary media historian, see Peters, "Proliferation and Obsolescence."

⁴⁴ Amad, 10.

⁴⁵ Brauner, 75.

⁴⁶ Ibid.

in repeated references to global warming to a version of apocalypse, the demise of a humanity that has become over-reliant on unsustainable infrastructures whose failure seems assured.

Yet the vision of the sturgeon's future excavation rests on a strange assumption about the ice itself: namely, that it will survive the coming crisis which lurks in the background of this entire film. In treating the tunnel as a long-term storage site for the last traces of the human species, *Encounters at the End of the World* imagines the South Polar ice cap's persistence. Here, according to Herzog's speculative fiction, it is "still minus 70 degrees," a fact that defies the very logic of global warming that would seem to suggest the imminent approach of world's end. The sense of impending change that generates a desire to create a time capsule beneath the ice simultaneously threatens to destroy its archival capacity, a problem left unacknowledged by this film. It leaves the viewer with a vague sense of dread over an impending loss that gradually seems more and more total: if the sturgeon is the only trace we will have left, what will there be when the ice caps liquefy and return it to the sea?

This sense of loss echoes an earlier moment in the film in which Herzog interviews William Jirsa, a former academic linguist, about what brought him to Antarctica. Standing in a greenhouse full of lush and leafy plants of a kind unimaginable outside its walls, the young goateed man recounts that as part of his graduate research, he "had lined up to do some work with one of the people who was identified as a native speaker, and a competent native speaker, of one of the languages of the Winnebago people." As Jirsa continues to speak on camera, Herzog begins to narrate, turning the linguist's microphone down to a barely audible level. In voiceover, the director explains,

To make a complicated story short, he ran into New Age ideologues who made insipid claims about black and white magic embedded in the grammar of this

language. Hence, in this stupid trend of academia, it would be better to let the language die than to preserve it. He had to destroy his entire PhD research.⁴⁷

At this point, the sound shifts back to full volume on Jirsa, who paints a dire picture of linguistic devastation. “So just imagine,” he says, “ninety percent of languages will be extinct probably in my lifetime. It’s a catastrophic impact to an ecosystem to talk about that kind of extinction. Culturally, we’re talking about the same thing.” Reflecting on this statistic, the filmmaker muses,

it occurred to me that in the time we spent with him in the greenhouse, possibly three or four languages had died. In our efforts to preserve endangered species, we seem to overlook something equally important. To me, it is a sign of a deeply disturbed civilization, where tree-huggers and whale-huggers in their weirdness are acceptable, while no one embraces the last speakers of a language.⁴⁸

Although Herzog’s narration opposes ecological conservation to linguistic preservation, his commentary on language can also be read as a metaphor for the relationship between natural history and mediation that informs this film’s approach to the Antarctic environment. Pitting William Jirsa against the loss of civilization, Herzog transforms the ex-academic into a tragic hero in a struggle against time and its relentless erosion of entire cultures and epistemologies.⁴⁹ Jirsa’s weapon in this battle is the same wielded by Herzog: technologies of recording, storage and transmission. His use of the word “ecosystem” emphasizes the parallel between his project to rescue dying languages for posterity, and Herzog’s focus on the South Polar ice cap at a time when it is imminently threatened by rising temperatures. Both adventurers are united in the mission of

⁴⁷ Without knowing more about the actual circumstances described, I do not fully endorse this description of what happened, given the quite complex ecosystem of concerns that can trouble anthropological research.

⁴⁸ Given that one theory for the near-disappearance of the Ho-Chunk population in the seventeenth century is a disease epidemic resulting from contact with European settlers, the imagery of “embrace” here is problematic and somewhat naive.

⁴⁹ It is worth noting that the disappearance of indigenous languages in the Americas bears a direct relationship with the military-scientific complex that supports Herzog’s own journey to the Antarctic. For more on the relationship between imperialism and scientific exploration, see Lisa Bloom, *Gender on Ice: American Ideologies of Polar Expeditions* (Minneapolis: University of Minnesota Press, 1993) and Glasberg, *Antarctica as Cultural Critique*.

salvage ethnography, an effort to use the tools of modernity to preserve populations and environments which are only disappearing because of modernity's impacts.⁵⁰

Yet even as it upholds the mission of preservation by technological reproduction, this scene suggests the futility of the exercise of attempting to capture time by way of recording technology: in the time it takes to film the expert discussing his lost work, three or four more languages have died, lost like the mass of a rapidly melting glacier. It is another subtle gesture to the immensity of potential records, and to the relentless approach of a future in which they will become valuable. By referencing this loss, Herzog suggests the myriad other subjects on which a camera could be trained at this very moment, and what is vanishing without a trace because he has decided to film this conversation in this greenhouse. Like the unrecorded stories lurking behind McMurdo's dormitory doors, these ghostly languages signify the lacunae inherent in any process of selection, the lack of completeness that haunts every historical project. But at the same time as he seems to lament these missing links, Herzog references the necessity of elision to efficient comprehension, speaking over Jirsa "to make a complicated story short." At one and the same moment, the film mourns and celebrates the incompleteness of the historical record that will form the material basis of humanity's future past. In doing so, *Encounters at the End of the World* engages a dialectic that has emerged as central to the making of history in an age of machine vision and automatic inscription: namely, the struggle between contingency and control.⁵¹ It is a conflict that has been central to parsing the distinction between history and science, human processes and natural affairs—and it is

⁵⁰ Fatimah Tobing Rony explores the problematic dynamics of salvage ethnography in some depth in her book *The Third Eye*; of particular interest is her chapter on Robert Flaherty's *Nanook of the North* (1922), "Taxidermy and Romantic Ethnography: Robert Flaherty's *Nanook of the North*." See Rony, *The Third Eye* (Durham, NC: Duke UP, 1996).

⁵¹ As discussed in Chapter Two, Mary Ann Doane has laid out convincingly the project of cinema as part of a much broader strategy of managing contingency. In Herzog's film, we see a development of her ideas at which she only hints: namely, what happens when the accumulative tendency of film meets the technological potential of digital storage.

also critical to understanding the dissolution of these boundaries as we move into an uncertain future.

The Science of History

In thematizing the challenges of creating a complete record, all the while questioning its value in the first place, *Encounters at the End of the World* draws attention to an important area of convergence between history and the so-called “natural sciences,” disciplinary groupings whose colliding and overlapping edges have long been a subject of historiographical debate. This convergence centers on the attempt to gather a maximally complete data set from (or record of) the past and present, in the interest of predicting what is to come in the future. In the late 1960s, in his posthumously published theory of history, *The Last Things Before the Last*, Siegfried Kracauer notes that this question “already caused German 19th century historians to wage a war on two fronts,” and yet, 100 years later, “the debate on whether or not history should be considered a science continues to fill the professional journals and is still far from subsiding.”⁵² This methodological question is premised on another, more fundamental categorization, to which Kracauer also attends: namely, the difference between human affairs and natural processes, and the respective roles of contingency and determinism in each. In his analysis, nature is subject to “laws which enable us to make predictions,” and “we may rest assured that natural causes will continue to produce their predicted effects for an indeterminate time.”⁵³ The domain of nature is one of determinism and causality, rather than freedom and chance. “Human affairs,” on the other

⁵² Kracauer, *History: The Last Things Before the Last*, ed. Paul Oskar Kristeller (Princeton: Markus Wiener Publishers, 1969), 17-18.

⁵³ *Ibid.*, 19, 21.

hand, “transcend the dimension of natural forces and causally determined patterns.”⁵⁴ Human history is the “realm of contingency, of new beginnings,” in which the working of the future cannot necessarily be predicted from what has happened in the past.⁵⁵ Yet in the early twenty-first century, as Nicholas Baer observes, drawing on Chakrabarty, the increasingly irrefutable evidence of anthropogenic climate change—the interference of human affairs in natural processes on a global scale—throws into question this natural stability and predictability, and thereby the neat distinction between these two concepts. In becoming “geological agents,” to use Chakrabarty’s term, humans have introduced contingency into the natural order of things.⁵⁶

While Chakrabarty locates the collapsing distinction between human and natural history, founded on the loss of nature’s stability, in the recognition of human-caused global warming, *Encounters at the End of the World* suggests that perhaps the categories have never been so neatly divided. Mediated by technologies and theories that can zoom out far enough to contemplate epochal change, and in so close as to witness the activity of microbial organisms, the natural world encountered in this film is as full of chance happenings as any narrative of human endeavor.⁵⁷ The film’s attention to evolution—perhaps the premiere example of contingency at work in nature—is an instructive, but not the only, example. From volcanic eruptions that scatter populations around the globe, to microscopic battles for undersea survival, to the wanton loss and seemingly random preservation of “memories of a world once green,” evidence abounds of contingency and newness in the non-human world. Indeed, by contemplating the study of human activity from the imagined “external” perspective of whatever future species happens to evolve after our demise, Herzog

⁵⁴ Ibid., 29.

⁵⁵ Ibid.

⁵⁶ Chakrabarty, 206.

⁵⁷ Kracauer admits that the distinction is not so neat, but finds the similarity in the partial determinism of human history, particularly on a societal level, rather than any sense of contingency in nature.

underscores humanity's intertwinement with the natural processes upon whose transcendence Kracauer's understanding of history is premised.

It makes sense that contingency would emerge as a major theme in a film that brings together multiple forms of time-based mediation, from digital video to archival film to microscopic cinematography and time-coded surveillance footage. As Doane argues in *The Emergence of Cinematic Time*, among the primary drives of moving image media is “the imperative to domesticate contingency.”⁵⁸ In its ability to capture any and every fleeting moment for repetition, examination, or simple storage and accumulation, the cinema bears a special relationship with the randomness haunting both historical and scientific archives. Yet the potential of limitless capture, she observes, poses its own threat—a threat of which *Encounters at the End of the World* seems self-reflexively aware: “because film is capable of registering and recording singularities, contingencies—theoretically without limit—it inevitably raises the specter of an archive of noise, linked to issues of legibility, cataloguing, and limitless storage.”⁵⁹ The accumulation of detail regardless of its apparent import, a technique intended to manage the threat of irrational chance, can simply throw randomness into sharper relief by overwhelming the archive's capacity to rationalize. Indeed, when facing down the volume of information made available by automated recording and digital storage technologies, the act of history-making itself becomes subject to contingency, the gamble that the right piece of information has both made it into a depository, and can be located and retrieved.⁶⁰

Perhaps the clearest figure of this archival contingency offered up by *Encounters at the End of the World* is the sturgeon in the ice, and the imaginary future archaeologists faced with the task of

⁵⁸ Doane, 25.

⁵⁹ *Ibid.*, 222.

⁶⁰ The vulnerability of the archive to chance and error occurs both at the stage of recording/storage and retrieval/processing, as noted by Parks in “Satellite Views of Srebrenica.”

decoding this curious object. It is no coincidence that a film so preoccupied with the historical challenges of the present takes place on the still ice-bound continent of Antarctica. If, as Amad argues, the archival impulse is motivated in large part by a sense of rapid and radical change on a large scale, what more appropriate place to document in the midst of global warming than the coldest place on Earth? As Elena Glasberg and Lisa Bloom have noted, the poles have come to “stand in for the whole earth on the verge of ecological collapse,” making the Antarctic an ideal location to encounter the end of the world, and to attempt to preserve a few last scenes before it all melts away.⁶¹ Yet even that gesture is futile, as the film maintains no illusion that such an end could be forestalled, or that a perfect record, indeed any record, might be achieved and left behind. Instead, it presents as the last hope of historical conservation a material whose vulnerability could not be more obvious, and which is doomed to fail at the task of delivering meaningful messages from the past. (Popcorn garlands are hardly a Rosetta Stone.) In bringing together a two million-year history with a sense of constant threat and disintegration, the ice is the figure *par excellence* of the historical crisis promised by climate change. It is indeed “going to be scary to see what happens when these babies get north”: most frightening may be how little will remain to be seen at all. In its scale, its ephemerality, and its multi-faceted relationship with contingency, the ice sheet—a seeming monolith that turns out to be full of cracks and potential for unexpected change—begins to resemble history itself.

⁶¹ Lisa Bloom and Elena Glasberg, “Disappearing Ice and Missing Data: Climate Change in the Visual Culture of the Polar Regions,” in *Far Field: Digital Culture, Climate Change, and the Poles*, ed. Jane D. Marsching and Andrea Polli (Bristol: Intellect Press, 2012), p. 120.

Chapter Four
Scaling Sight:
Time-Lapse, Glacial Death, and Historical Loss in *Chasing Ice*

The video opens with a vista that conforms to conventions familiar from nineteenth- and early twentieth-century Arctic landscape depiction: an imposing range of snow-covered peaks fades into dense fog that obscures the image's left background.¹ Stretching between the towering formations, creeping up their slopes, a vast, craggy, pocked field of ice—black, white, a patchwork of greys—ends abruptly in a sheer face that rises up from the steely waters of Prince William Sound in the bottom right corner of the frame. The Sound's surface is spotted with chunks of ice floating in a vanishingly thin frozen layer that lies atop the saltwater like an oil slick. Dark lines score the pale surface of the icy expanse, drawing the eye back toward the glacier's origin, obscured by heavy cloud cover. As indicated by a caption in the bottom left corner, this mass of frozen freshwater is the Columbia Glacier in Alaska. According to NASA, Columbia's terminus retreated twelve miles between 1980 and 2014, during which time it lost roughly half its thickness and volume, making it one of the fastest-moving glaciers in the world.² "Fast," of course, is a relative term: to the chronicler of the cryosphere, Columbia is melting like an ice cream on an August afternoon in New York City. Yet to the human eye, at any given moment, it looks as eternal, as unchanging, as

¹ "Columbia Glacier, Alaska," Earth Vision Institute, accessed May 12, 2016, <http://earthvisioninstitute.org/share-this/columbia-glacier-alaska/>.

² "Columbia Glacier, Alaska," *World of Change*, NASA Earth Observatory, accessed May 12, 2016, http://earthobservatory.nasa.gov/Features/WorldOfChange/columbia_glacier.php. It is important to note that the term "fastest-moving" here, while common parlance in popular scientific discussions of glaciers, relies on a notion of "movement" that is quite complicated. The glacier itself is not "moving" in the sense that a human or animal body, or even an inanimate object like a car or train would move. Rather, its composition is transforming, its shape changing, and the ice that composes it is slowly turning to water and flowing out to sea.

any Romantic conceptualization of the remote Arctic would have it be. And then the video begins to play.

The first feature of the seascape to draw the eye is the flickering surface of Prince William Sound, which flashes white, grey, teal, and black, first iced over, then bare. About three seconds into the video's movement, the glacier's terminus—the sheer face that extends to the water's edge—appears to take a dramatic leap backward, toward mountains that tower in the distance, the clouds that once obscured them having given way to bright sunlight. The Sound, which at first occupied only a sixth of the frame in the lower right corner, now brushes the image's midpoint, and the terminus continues its flickering retreat. After eight seconds, the video pauses, and the camera pans left. More mountains, previously cut out of the composition, now appear on the screen's left edge, and those on the right slide out of view. The frame is following the ice. Once again restricted to about a sixth of the screen, the water, white and blanketed in ice and snow but clearly distinguished by the glacier's sharp edge, seems to advance aggressively, appearing to take large bites out of the ice field, which flows haltingly to meet the encroaching sea. In the background, the mountains reveal the fleeting passage of seasons as they turn from white to deep blue and back again, flickering through sunny and cloudy days like blinks of a geologically timed eye. By 30 seconds in, water fills nearly two-thirds of the frame, now stretching all the way from the left edge to the right, and showing no signs of stopping. Again, the framing changes to accommodate the glacier's retreat, this time zooming in and tilting up so that the pale, ice-slicked water comprises only the image's lower half. And still, the retreat continues. Medial moraines snake their way into the water, the terminus crumbles away, until motion again halts, 48 seconds after it began, and a stunningly beautiful still image once more throws the viewer back into a sense of timelessness:

sapphire and snow-white peaks rise up under towering cumulus clouds, framing a striped white field that ends in glassy water, which in turn reflects like a mirror the blue and white of the sky and its vapors. For good measure, the video rewinds and then repeats its action at quadruple speed, ending on that picture perfect view, which hides behind its mask of eternal stillness a glaciological movement of nearly unthinkable proportions.

This time-lapse video is part of a program called the Extreme Ice Survey (EIS). Founded in 2007 by environmental photographer James Balog, EIS is a long-term, interdisciplinary documentation project involving earth scientists and media artists. Seeking to “give a ‘visual voice’ to the planet’s changing ecosystems,” EIS creates time-lapse videos like this one demonstrating glacial retreat all over the globe.³ In order to make the videos, EIS team members have stationed digital cameras with automatic timers set to record one frame per daylight hour at 24 separate locations in Antarctica, Greenland, Iceland, Alaska, Canada, Austria, and the Rocky Mountains. Once installed, the cameras are left for months—or even years—at a time, until the surveyors return to collect memory cards (which contain roughly 8,000 images per camera per year, according to the project’s website). Images are then combined to make videos “that reveal how quickly climate change is transforming large regions of our planet.”⁴ With raw footage stock at a maximum resolution of one frame per hour, a video like this one can present in 48 seconds Columbia Glacier’s retreat over a period of seven years. This compression factor enables the dramatic visualization of changes whose pace, though alarmingly fast by their own internal logic, renders them effectively invisible without the aid of mediation. In so doing, EIS attempts to resolve a

³ “Extreme Ice Survey,” *Extreme Ice Survey*, accessed April 2016, <http://extremeicesurvey.org>. Though much more developed in the Arctic, since 2014 EIS has had cameras stationed in the Southern Hemisphere as well, on South Georgia Island near the Antarctic Peninsula.

⁴ “Extreme Ice Survey.”

crucial challenge for climate change communications, namely the enormous scalar difference between the temporality of human perception and that of geologic change. In so doing, the videos present a compelling example of the formative role played by media technologies in laying the conceptual groundwork for global climate change, by way of a graphic demonstration that the melting of the ice is inextricably interwoven with the temporality, and causality, of human action. At the same time, the fascination exerted by this illusion of movement highlights an essential element of cinematic mediation: namely, the ability to bring what is still into motion, and to allow access to dramatically different temporal epistemologies.

In this chapter, I analyze both EIS videos and the 2012 film *Chasing Ice*, which documents the conceptualization and establishment of EIS. First, I place Balog in film historical context. At first blush, both the film and its object seem to be on the bleeding edge of interdisciplinary efforts to communicate with the lay public about the science behind climate change: Balog and his team use the latest technology to create never-before-seen views whose scope relies on computing tools with immense storage capacity and long-term automation capability. But a closer investigation reveals a deep entrenchment in quite archaic approaches to the natural world, employing strategies and displaying attitudes that go back at least to the advent of cinema. Historical connections that belie the film's claims to radical novelty come through most obviously in its main formal element: the time-lapse videos EIS was founded to create. Though positioned by *Chasing Ice* as a pioneer, Balog's use of time-lapse cinematography recalls efforts from the nineteenth century in which the technology was similarly used to make natural science legible to a lay public. This fascination with temporal manipulation is intimately related to an investment in indexicality that accompanied the emergence of photography and development of cinema, and which is echoed in Balog's discussion

of his work. In conjunction with the anthropomorphization of the glacier, these appeals to material embodiment and the project's elevation of witnessing over intervening begin to raise uncomfortable ethical questions that put it into dialogue with films documenting human suffering and death.

While *Chasing Ice* resonates in many ways with an earlier media and scientific era, it is also unmistakably a product of its own digital time. Like *Encounters at the End of the World*, discussed in the previous chapter, the film participates in a hundred year-old tradition of popular scientific media production in far-flung corners of the globe, but also brings to bear perspectives and approaches informed and undergirded by twenty-first century technological infrastructures. The computing technologies on which the project relies introduce new conditions for representing and analyzing what is recorded; most crucial among these are automation capability and exponentially increased storage capacity. EIS's videos are only possible due to the computing technology that controls their automated capture, and the storage of thousands of images on a single tiny chip, not to mention the ability to process all those images into smooth, legible videos that shock with their uncanny mobilization of the apparently immovable. Such enormous quantitative shifts in the breadth and the depth of data that can be both recorded and processed effect qualitative changes on historical understanding. Subject to the linear nature of cinematic motion, the unfolding of history takes on a sense of inevitable progression, an unstoppable motion that obscures the conditions of its capture as a series of discrete moments.

Finally, *Chasing Ice* does not emerge from a vacuum: these same technologies have radically changed the function of nature and environment in the popular imaginary, and this film is unmistakably a product of that context. *Chasing Ice* puts EIS videos into a visual cultural context

configured according to the logics of computing and satellite networking. Explanations of the climate shifts that cause the glaciers' dramatized retreat are supported by charts and other visualizations of climate data; the stakes of Balog's mission are underscored by network TV broadcasts of weather-related disasters all over the globe. Like *With Byrd at the South Pole* and *Encounters at the End of the World*, *Chasing Ice* relies on media technologies that collapse time and space to communicate the idea that global warming is directly related to what seem to be far-removed times and places. Indeed, media technologies are arguably a necessary condition for understanding climate as a globally networked set of effects and flows, an idea that would be inconceivable without the kinds of computing technologies that power EIS's project.⁵ With its capacity to gather, store, and process enormous amounts of variable data, computing promises to grapple with both space and time on a geological scale, in a way that is both quantitatively and qualitatively new.

This new visibility of the earth as a whole, the novel conception of the interconnectedness of weather systems and climate effects, has coincided with a shift in scientific and popular perceptions of the natural world, from the passive, unchanging, and unchangeable, to the active, mutable, and vulnerable. In the first two chapters of this project, I examined the participation of cinema and wireless radio of the 1920s in helping to produce this shift. Eight decades later, visual and communications technologies continue to grapple with the questions raised by changes we cannot see precisely because we are immersed in them. The global scale of glacial collapse demands a perspectival shift for which the digital technologies at the center of *Chasing Ice* become the

⁵ See Thomas Levenson, *Ice Time: Climate, Science, and Life on Earth* (New York: Harper & Row, 1989), as well as Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge: MIT Press, 2010).

primary vehicle. This making-perceptible of the earth as a whole suggests its historicization on a scale compatible with human time, thus enabling—perhaps demanding—a new approach to the environment as a historical phenomenon. And yet, as *Chasing Ice* reveals, this task is fraught with tension, aggravated by the competing impulses and capabilities of the technologies deployed by the film. This tension, already identified by Siegfried Kracauer in the late 1960s as a primary result of an increasingly connected world, is between what Kracauer calls “macro-history” and “micro-history.”⁶ This dialectic emerges in the film multiple guises: between temporal modes reliant on elision and those that require duration; between abstract and concrete approaches to the glacial environment; between rational and affective responses to the material at hand. In its attempt to resolve these competing priorities, *Chasing Ice* relies on time-lapse—a technology that removes interstitial moments to create a sense of relentless motion—in order to demand the very intervention this ceaseless forward drive seems to preclude. In its attempt to find a signal in the noise of comprehensive recording, the film points the way to a destruction that feels increasingly inevitable. It is a conundrum that reflects the dual temporal modes of the glacier itself, as it mediates both the deep past and the persistent present in a confusion of historical address.

“*With expanded senses*”: *A Brief History of Time-Lapse*

In its introduction to the conceptualization and implementation of EIS, *Chasing Ice* lays emphasis on the project’s novelty. In a voiceover that accompanies a montage of shots showing digital photographic equipment—cameras, tripods, wiring, chips—Balog explains,

I thought that basically you could just buy all this time-lapse equipment off the shelf, slam it together, and put it out there. I was so naive about that. There was a custom computer that needed to be built, and there were a thousand little engineering details

⁶ See Kracauer, *History*, especially Chapter Five, “The Structure of the Historical Universe,” pp. 104-138.

that needed to be worked out, and a lot of trial and error, because people hadn't built this stuff before.

This dramatization of technological innovation as itself part of the spectacle is a common trope of the contemporary nature documentary, but in this case it ignores a long history of interest in how moving pictures, with their ability to manipulate time, might be the key to unlock the mysterious, because imperceptibly slow, metamorphosis of natural objects.⁷ In his history of time-lapse and slow-motion cinematography, *Perspektiven einer anderen Natur* [*Perspectives of Another Nature*], film historian Andreas Becker traces the connection between inquiry into the inner workings of nature and the development of time-lapse.⁸ According to Becker, the first prototype for the time-lapse camera was developed in 1893 by Ludwig Mach, son of the famous physicist Ernst Mach; the younger Mach was much influenced by his father's reflections on the potential of techniques like chronophotography to broaden the field of visually observable phenomena.⁹ In 1888, in a text entitled "Remarks on scientific applications of photography," Ernst Mach wrote,

Should the principle of time-reduction not also be of value? Indeed, let us consider the growth of a plant, the development of an embryo, the limbs of the DARWINIAN genealogical tree, recorded photographically and presented in a rapid progression of "nebulous images"! What an intellectually stimulating impression that would make!¹⁰

As Mach's text demonstrates, from the start, time-lapse was intimately tied up with a scientifically-based fascination with the imperceptible metamorphosis of objects, especially living objects, over

⁷ *Planet Earth* (2006), for example, the BBC's enormously successful nature documentary series, contains numerous references to the technical challenges of obtaining footage. David Attenborough's *Frozen Planet* (2011) DVD collection includes making-of documentaries about each episode. The popular documentaries *March of the Penguins* (2005) and *Winged Migration* (2001) also include, in their credit sequences, meta-documentary shots demonstrating how some of the more impressive footage was obtained.

⁸ Andreas Becker, *Perspektiven einer anderen Natur: Zur Geschichte und Theorie der filmischen Zeitraffung und Zeitdehnung* (Bielefeld: Transcript Verlag, 2004). All translations from the text are my own.

⁹ Becker, 45.

¹⁰ Quoted in Becker, 43. It is interesting that the manipulative capacity of time-based media immediately sparked an interest in Darwin and a new sense of the accessibility of natural history, also a preoccupation of *Encounters at the End of the World*, as discussed in Chapter Three.

time.¹¹ Nor were the Machs the only inventors who foresaw great potential for time-lapse in the visual sciences: French physiologist Étienne-Jules Marey, whose contributions to cinema through the development of chronophotography are well known, also wrote of the technology in his 1892 treatise *La Photographie du mouvement*. Remarkably—and most relevantly for Balog’s project—Marey predicted that time-lapse might be used to unlock the secrets of glacial ice: “We may even hope that one day, with the help of photographs taken at very long intervals, we will be able to follow the slow locomotion of glaciers and the geological transformations of the surface of entire countries...”¹² Revisiting Marey’s observations now recalls the tremendous impact on historiographical thought of another medium, discussed in Chapter One: namely, aerial photography. The medium’s capacity for scalar shift produced a qualitative rethinking of the nature of natural history, due to the radical reframing of “the surface of entire countries.” Amad details this shift in her discussion of the emergence of human geography in mid-century France, a discipline whose “interest in the dynamically evolving interaction between humans and their environment,” she argues, was only made possible by the introduction of the aerial perspective.¹³ Far from a radical conceptual innovation, EIS’s project of making invisibly slow movements visible through photographic acceleration is in fact a contemporary example of the fascination long exerted by time-based media’s capacity for temporal manipulation.

Chasing Ice makes clear that the power of time-lapse, when applied to glacial environments, is about more than building scientific or historical knowledge. The film is far more interested in

¹¹ Becker’s informative history traces this conceptual impulse toward time-lapse as a tool for thinking through the temporality of nature to long before even still photography was invented, but for the purposes of my project, I will remain within the realm of moving image technology.

¹² Quoted in Becker, 106. Unfortunately, I have yet to find a copy of this text, *La photographie du mouvement*, in the original French, so this quote is a re-translation from the German edition, translated from the French by A. von Heydebreck (1985).

¹³ Amad, 50.

the technology's affective and phenomenological effects on its viewers, as demonstrated in a sequence featuring time-lapse footage of Alaska's Mendenhall Glacier. The ice on screen appears to flow, like a river that has frozen over but refused to stop moving, into the proglacial lake with which it shares its name. Accompanying this uncanny motion in voiceover, Balog muses, "there's such a strange, bizarre fascination in seeing these things you don't normally get to see come alive." Like *With Byrd at the South Pole*, *Chasing Ice* directs the viewer's attention to the glacier's seeming double nature: still and moving, organic and inorganic, alive and dead.¹⁴ As an activist documentary, the film's goal is to share this fascination with "the public," to provide them with "something that grabs them in the gut," as Balog puts it. Chafing at the limitations of the purely cerebral address of scientific communication, *Chasing Ice* seeks to unleash the strange power of the cinema, a visual medium that somehow reaches out to touch its viewers and elicit a visceral response.¹⁵ In the glacier, an object which shares its liminal perch between states of animation and arrest, time-lapse as a technique meets its match.

Here, again, *Chasing Ice* participates in a long tradition. As evidenced by a number of essays published in early German film periodicals, time-lapse cinematography in the early twentieth century was not confined to the laboratory or university, but provoked a broadly enthusiastic response from popular audiences as well.¹⁶ More than just a scientific curiosity, time-lapse was

¹⁴ As noted in Chapter One, this tension brings glacial ice close to analog film, which is characterized (particularly by Laura Mulvey in *Death 24x/Second*) by a similar set of seemingly irreducible oppositions.

¹⁵ The appeal to physical sensation as an essential part of the viewer's experience has been a topic of much interest in film theory. Linda Williams examines the nature of bodily reactions to the screen as a kind of generic definition in the case of horror, melodrama, and pornography (Williams, "Film Bodies: Gender, Genre, and Excess," in Leo Braudy and Marshall Cohen, eds., *Film Theory and Criticism*, 7th Ed. (Oxford: Oxford UP, 2009), 602-616. Perhaps more directly relevant to this chapter, Jennifer Malkowski explores the sublime as a category of "visceral experience" put to troubling use in the documentary *The Bridge*, which shows multiple suicidal leaps from the Golden Gate Bridge (Malkowski, *Dying in Full Detail: Mortality and Digital Documentary* (Durham: Duke UP, 2017), p. 126.

¹⁶ This public consideration of early cinema in Germany has come to be known as the *Kinodebatte*, or "cinema debate." Germany's vibrant journalism industry and broad interest in art and cultural politics lent themselves to a lively, wide-ranging discussion in a number of periodicals, from the specialized to the general, about this new device and the

considered to provide a new kind of visual access to the natural world, an attraction equal in power to journeys around the world or scenes of urban activity.¹⁷ Evidence abounds that its attractive power, in the eyes of many observers, equaled that of journeys around the world or scenes of urban modernity. As so often in early cinema theory, it provoked meditations on the augmentation of human vision through the application of the machine. Already in 1907, for example, the painter Gustav Melcher declared, “The cinematograph is a new visual organ: an expanded and improved eye.”¹⁸ Musing on all the things contemporary people could see with the aid of the cinema, Melcher included “the growing of the grass, the blooming and the wilting of the flowers in five, three, or even two minutes.”¹⁹ A few years later, in 1911, Berlin-based doctor Eduard Bäumer wrote of how “the moving picture camera...can help us to expand our sensory experience, to perceive movements that would otherwise remain imperceptible.”²⁰ Bäumer, too, seized on plant growth as a prime subject for time-lapse photography: “They grow before our gaze, bend, and stretch, and already the blossom is resplendent in all its beauty...the moving picture camera shows us indirectly that even this life of plants, seemingly so strange, exists and is driven from within.”²¹ The prominent avant-garde filmmaker Hans Richter remarked that “time-lapse photography brings a bud to bloom in 60 seconds,” and architect and city planner Bruno Taut advocated the use of time-lapse to depict “the growth of plants from the seeds to the leaves to the

moving pictures it created. For a comprehensive overview of the *Kinodebatte*, see the edited collection of newly translated essays *The Promise of Cinema* (2016), which I cite frequently in this dissertation.

¹⁷ For more on the broad appeal of popular-science films, see Oliver Gaycken, *Devices of Curiosity: Early Cinema and Popular Science* (Oxford: Oxford UP, 2015).

¹⁸ Gustav Melcher, “On Living Photography and the Film Drama,” trans. Alex H. Bush and Jon Cho-Polizzi, in *The Promise of Cinema: German Film Theory 1907-1933*, ed. Anton Kaes, Nicholas Baer, and Michael Cowan (Oakland, Calif.: University of California Press, 2016): 18. Hereafter, essays coming from this collection will be cited using the abbreviation *TPOC*.

¹⁹ Melcher, 19.

²⁰ Eduard Bäumer, “Cinematograph and Epistemology,” trans. Sara Hall, in *TPOC*: 80.

²¹ *Ibid.*

entire tree.”²² Like viewers a century later encountering EIS videos, these writers were riveted by the aesthetic experience of seeing formerly invisible processes by means of subjecting time to scalar adaptation.

Marey’s prediction that time-lapse would have applications beyond the mere blossoming of flowers proved correct long before EIS; several early theorists and filmmakers wanted to push beyond the botanical to other types of objects. Bäumer proclaimed,

by no means do we need to confine ourselves to the living world; certain events in the inorganic world are also ascertainable for the cinematograph. A particularly suitable object would be a crystal formation...The crystal, the individual of the inorganic world, would appear as if alive...With expanded senses, we will recognize motion in places where the naked eye cannot see it and come to understand more and more natural processes.²³

Likewise, Taut encouraged the use of time-lapse for “crystallizations in ice, snow, rocks, and the like.”²⁴ As discussed in Chapter One, film was widely analyzed for its capacity to call into question naturalized distinctions between animate and inanimate, living and dead, organic and inorganic. Time-lapse, which intensifies the dialectic between stillness and motion that haunts every film-based moving image, evokes a search for precisely those matters whose composition and operation seem to straddle these boundaries. The glacier—itsself a rock composed of highly compressed snow and ice—is just such a boundary object, and time-lapse the ideal technology to reveal its uncanny movements.²⁵

Although the vast majority of early time-lapse films focus on in-studio shots of very small (or even microscopic) objects, there are exceptions. In his fascination with the moving landscape,

²² Hans Richter, “New Means of Filmmaking,” trans. Nicholas Baer, in *TPOC*: 473; Bruno Taut, “Artistic Film Program,” trans. Alex H. Bush, in *TPOC*: 533.

²³ Bäumer, 80-81.

²⁴ Taut, 533.

²⁵ For an accessible explanation of the formation and geological nature of glaciers, see Robert P. Sharp, *Living Ice: Understanding Glaciers and Glaciation* (Cambridge: Cambridge UP, 1988).

the *Bergfilm* pioneer Arnold Fanck used the technique to highlight the uncanny motion of clouds, another inorganic yet highly mobile natural phenomenon.²⁶ Writing in 1925 in response to

Fanck's early *Bergfilm Der heilige Berg* [The Holy Mountain], Kracauer is in raptures over

cumulus clouds, giant white massifs that disintegrate, seas of clouds that well up and ebb away, striped drifts and vast herds. Faster than in reality, they rush by and dissipate, cheated of their duration by the time lapse....Rarely have such heavenly settings been seen in film; their curious allure derives above all from the fact that processes requiring many hours to unfold in nature are here presented in a few minutes. The cloud events concentrate and the distortion of time produces an enchanting optical intoxication.²⁷

Although hardly possessing the same sense of revelation as a time-lapse video of a crystal formation—who among us has not seen the clouds move?—these shots manipulate temporal perspective in a way that, for Kracauer, proves an irresistible attraction. It is the attraction inherent in witnessing a change of state, whether from solid to liquid or liquid to vapor, that appears as movement but is not reducible to it. Kracauer's "enchanting optical intoxication" recalls Balog's sense of "strange, bizarre fascination," and reminds us that time-lapse has long been seen as a magical key to unlock other temporalities that remain alien in spite of being all around us, all the time. Under the spell of time-lapse cinematography, objects that seem inert to the unmediated eye suddenly become evidence of the idea that the world, on every level, is a system of moving processes and dynamic change, rather than a passive, inert mass.

"Visible, photographable, measurable": Photographic indexicality and the truth claim of EIS

The peculiar power of time-lapse rests not only in its the ability to manipulate representations of time, but in another element of photographic representation that has been

²⁶ Clouds bear an interesting relationship to glaciers as a vaporous formation of the chemical compound—H₂O—of which ice is the solid form.

²⁷ Siegfried Kracauer, "Mountains, Clouds, People," trans. Nicholas Baer, in *TPOC*: 97.

central since the technology's emergence: namely, the photograph's indexical relationship to its object. The concept of indexicality comes from Charles Sanders Peirce's semiotic theory, in which signs are divided into three types: the icon, the symbol, and the index. While the icon resembles its referent and the symbol bears a conventional or habitual connection to what it designates, the index is existentially related to its object. In Peirce's own words, the index is "physically connected" to its object; a classic example is a weathervane as an index of wind, or a sun-dial as an index of the time of day.²⁸ Given photography's technological operation as a physical imprint of the light reflected by the objects in frame at a given moment, it has long been said to have an indexical relationship to its referent (though the advent of digital photography has thrown this relationship into crisis, resulting, in part, in the resurgence of indexicality as a topic of interest within recent film theoretical writing).²⁹ Put more simply, photography is traditionally understood as having a special relationship with reality; it is seen as a genuine, direct, physical representation of the world it depicts. The photographic basis of time-lapse—its intimate connection to its referent—lends it a sense of physical reality that distinguishes it from other forms of animation. Rather than a world imagined or fabricated, time-lapse produces a bodily sense of co-presence with moving actors who are hiding in plain sight.

Photography's seemingly direct access to reality was central to cinematic reception from the technology's early days. It was, as Doane relays, "the major stake of Marey's representational practices," which culminated in chronophotography.³⁰ It was also a topic for heated debate in the

²⁸ Charles Sanders Peirce, *The Essential Peirce: Volume 2*, ed. Nathan Houser and Christian Kloesel, (Bloomington: Indiana University Press, 1998), accessed April 25, 2016, <https://muse.jhu.edu/book/14827>.

²⁹ See, for example, Doane, *The Emergence of Cinematic Time*; Philip Rosen's *Change Mummified* (University of Minnesota Press, 2001); Tom Gunning, "Moving Away from the Index," *differences* 18.1 (2007): 29-52; Laura Mulvey, *Death 24x a Second* (London: Reaktion Books, 2006).

³⁰ Doane, 47.

German *Kinodebatte*, where the bureaucrat Robert Breuer makes the daring assertion (if, in 1927, not yet so unpopular as it would come to be) that “*Metropolis* was bad” due to its reliance on special effects and fakery.³¹ He explains its failure by making an ontological claim about the medium: “film aspires to factuality as it is. We cannot rid ourselves of the notion that film contains truth—primitive reality captured by the lens, plate, and filmstrip.”³² This opinion resonates with André Bazin’s famous—or, depending on one’s stance, infamous—declaration in his classic 1945 essay “The Ontology of the Photographic Image” that “the photographic image is the object itself...it shares, by virtue of the very process of its becoming, the being of the model of which it is the reproduction; it is the model.”³³ He makes clear his adherence to a Peircean semiotic logic when he describes the relationship between photograph and object as “after the fashion of a fingerprint”—a close analog to the footprint, one of Peirce’s most favored examples of an indexical sign.³⁴ Theoretical investment in film’s indexicality continued into the 1960s with Kracauer’s impassioned assertion, in his final completed work *Theory of Film* (1960), that “the cinema can be defined as a medium particularly equipped to promote the redemption of physical reality.”³⁵ Although such claims to indexicality on behalf of film have been hotly disputed—indeed, in the case of Bazin leading to a decades-long drift out of fashion in academic scholarship—the enduring question of film’s special representational relationship to the external world is central to understanding its role in framing the rhythms and textures of nature.

³¹ Robert Breuer, “The Film of Factuality,” trans. Tara Hottman, in *TPOC*: 444.

³² Breuer, 445.

³³ André Bazin, “The Ontology of the Photographic Image,” in *What Is Cinema? Volume I*, trans. and ed. Hugh Gray (Berkeley: University of California Press, 1967).

³⁴ Bazin, 15.

³⁵ Siegfried Kracauer, *Theory of Film: The Redemption of Physical Reality* (Princeton: Princeton University Press, 1997): 300.

And in fact this element of photography is absolutely central to the mission of EIS, as rapidly becomes clear upon viewing *Chasing Ice*. Early in the film, Balog describes how he came to photography in the first place: “I was about twenty-five, and I was finishing my master’s degree in geomorphology. And I loved the science, but I wasn’t interested in being a scientist. The modern world of science was all about statistics and computer modeling, and that just wasn’t me.” This aversion to computer modeling and statistical analysis surfaces repeatedly in *Chasing Ice*, and it becomes clear that it informs the film’s framing of the work EIS is doing. The glacial photographs are presented as “forensic evidence” of climate change, and Balog clearly describes his vision of the videos’ role in the public discussion of global warming:

I realized, the public doesn’t want to hear about more statistical studies, more computer models, more projections—what they need is a believable, understandable piece of visual evidence, something that grabs them in the gut. So I created this project.³⁶

Here, there is a twofold physical connection: first, between the camera and the landscape, and second, between the image and the observer. This kind of experiential communication is part and parcel of the Peircean understanding of the index, which, Peirce writes, “acts on the nerves of the person addressed and forces his attention.”³⁷ Although the physical inscription of light on a celluloid surface has disappeared from the photographic process in a digital era, Balog’s fetishization of the “real,” as opposed to the virtual or the abstract, forms the basis for the EIS project’s meaning.

Indeed, this commitment to the truth value of photography goes so far as to challenge the intuitive existential relationship between a photograph and its object; rather than representational, the photograph becomes presentational, not just physically connected, but physically equivalent to

³⁶ *Chasing Ice*

³⁷ Peirce, 5.

its referent. This becomes clear in a scene in *Chasing Ice* in which the EIS team for the first time successfully gather memory cards loaded with frames of the landscape. Framed alone with the camera against a background of water, mountain, and bluish white glacial ice, Balog holds up the card, remarking, “Here’s the memory of the camera, and this is actually—that’s an interesting thought—this is the memory of the landscape; that landscape is gone. It may never be seen again in the history of civilization, and it’s stored right here.” Balog’s penchant for truism aside, this approach reveals a deeply held belief in photographic (even digital photographic) indexicality; it is interchangeable with memory, not as an abstraction, but as a material, experiential replacement. At times, photographic recording and representation even become a litmus test of reality: only insofar as a process is photographable is it real. In a clip shown toward the end of *Chasing Ice*, Balog discusses EIS at a TED talk. Speaking in front of a screen that prominently reads “FUTURE” in all caps, Balog declares of global warming, “It’s real. The changes are happening, they’re very visible, they’re photographable, they’re measurable.” Here, Balog aligns himself with a visual regime familiar from histories of cinematic modernity in which photography is harnessed to statistical measure as a means to create order out of chaotic, boundless contingency. Through measurement, inscription, and transmission—that is, through mediation—EIS and *Chasing Ice* seek to manage the crisis of nature by provoking an affective response to the glacier’s dramatic physicality.

These references to physicality, in conjunction with frequent references to the human body as a metaphor for glacial mass, emphasize the ethical dimension of *Chasing Ice* and bring the film into conversation with documentaries that bear witness to human suffering and death. Glacier photography is compared to portrait photography; the ice formations are described at various

points throughout the film as “unhealthy,” “like a decrepit old man falling into the earth and dying,” “literally dying before my eyes.” With these appeals to mortality, the film raises interesting questions about the responsibility of the recording agent in moments of injury or death. These stakes become clearer in light of Jennifer Malkowski’s examination of the 2006 documentary *The Bridge*, which centers around footage of several suicides committed by jumping off the Golden Gate Bridge. Analyzing not only the film’s form but also its production, exhibition and reception, Malkowski indicts *The Bridge*—which was shot with manned cameras pointed 24 hours a day at the world-famous landmark, precisely in order to capture suicide footage—for prioritizing observation over intervention, and for its marked aestheticization of the suicidal act. Like James Balog, Malkowski is attentive to the visceral effect on the spectator of what is on screen: “these individuals...plummet with the heavy weight of their embodiment, pitched downward with unattenuated speed. As an audience, we sense their materiality. We believe in it, in a practical, painful way.”³⁸ Part of what troubles Malkowski is the way in which the footage was gathered, by way of what she defines as “the expectant gaze. Characterized by the new, technologically enabled ability to simply run a camera and *wait*, the expectant gaze is accompanied by an ambivalent desire for death to occur.”³⁹ Compounding the unsettling notion of cameras and camerapeople who sit and wait for others to die in their line of sight is the film’s framing and editing, which result in an “amplification of the sublimity in...death” and elevate the individuals filmed to star status.⁴⁰ Her analysis turns on the quandary of finding spectacle and entertainment in acts of human pain and suffering, and the terrible beauty of watching an irreversible catastrophe unfold.

³⁸Malkowski, 152.

³⁹ *Ibid.*, 116

⁴⁰ *Ibid.*, 150

In this sense, *Chasing Ice* and EIS share many qualities of *The Bridge* that can lend some discomfort to the undeniably spectacular viewing experience of watching glacial collapse unfold in at a dramatically accelerated pace. Like the cameras stationed at the Golden Gate Bridge, those that capture the ice's demise employ an "expectant gaze," waiting for a spectacular tale of disaster to present itself for registration on the camera's memory chip. There are important differences to the equation, however: EIS cameras are unstaffed, and of course the idea of a single cameraperson intervening in a glacial calving event is absurd. The ethical weight of non-intervention shifts from the individual cameraperson or director to the social infrastructures undergirding the project, the society more focused on creating a beautiful picture of global decay than trying to do anything to stop it. Further, as compared with *The Bridge*, EIS's creation of the mortal image demands more active shaping and molding. Malkowski notes that unlike many other films, whether fictional or documentary, that depict falling bodies, *The Bridge* eschews temporal intervention: no slow-motion or acceleration is deployed during the shots of falling. The videos in *Chasing Ice*, on the other hand, and the physical sensation of witnessing death that they produce in the viewer, are actively fashioned, animated from sets of still images. It is a deliberate sculpting of a visceral experience, a "negative pleasure" for the viewer who, it is supposed, will be moved to some kind of action. Like Eric Steel, the director of *The Bridge*, who claims that the film's ultimate goals are education and suicide prevention, yet fails to adapt to the guidelines of this field or truly dedicate any time to informing viewers, *Chasing Ice* claims an interventionist stance in global warming but simultaneously disdains scientific method, preferring instead the plane of entertainment and avoiding the discomfort of making a concrete ask of its viewers. How, exactly, one might prevent the glaciers from collapsing is never explicitly addressed. Instead, the film offers them up in the

throes of death as a breathtaking vision of the destructive power wielded by the viewers in aggregate, even as those same viewers are rendered powerless by the enormity and complexity of the problem at hand.

New Media, New Problems: Chasing Ice and the Digital

Beyond its uncomfortable relationship to the aesthetic experience of catastrophic events, *Chasing Ice* shares with *The Bridge* a medium-specific (and historically determined) reliance on digital video technology. Although, as explored earlier in this chapter, the former film bears striking resemblance to its hundred year-old media predecessors, it also differs in crucial ways. These differences, which show through both in the film's aesthetic choices and its basic argument, are intimately interconnected with scientific and technological developments of the late twentieth century. In particular, the film relies on technologies that support dramatic shifts in scale when it comes to conceptualizing both time and space: satellite photography, digital information storage, and complex automated processes of data gathering and analysis. Each of these developments has contributed to a radically reconfigured notion of the earth, and of the relationship between human life and its environment. This reconfiguration has included the conceptual emergence of anthropogenic climate change, which, as alluded to earlier, posits the end of a scalar disjuncture that was once at the heart of humanistic understandings of the natural world. These developments both provide the context for and explicitly inform the Extreme Ice Survey and *Chasing Ice*, sometimes in ways that challenge even their producers' intent. As much as James Balog may embrace an ethos proper to an earlier media era—one characterized by unexplored frontiers and an existentially "real" basis for photographic representation—his work is ultimately inseparable from

the digital technologies that enable it, and the field of data visualization in which it participates. This field is characterized by an epistemology of modeling and projection in which EIS videos are intimately intertwined. These technological formations are a crucial part of what Paul Edwards identifies as the “knowledge infrastructure” of climate change.⁴¹ Rather than departing dramatically from this culture of modeling, analysis, and re-analysis, *Chasing Ice* and EIS are defined and shaped by the conditions and questions of a global climatology whose existence is premised on scale-shifting technologies that bring together wildly different notions of space and time.

One such technology is the satellite. In 1967, ATS-3 (Applications Technology Satellite 3) produced the first color image of the full-disk Earth seen from space. Numerous scholars of media and cultural history have analyzed how this image, and the Apollo images that followed it (most famously, “Earthrise” and “The Blue Marble”), immediately became central to the ecologically minded counterculture, with the ATS image gracing the front cover of Stewart Brand’s *Whole Earth Catalogue* in 1968.⁴² Writing in the immediate aftermath of these images’ public appearance, historian Beaumont Newhall declared in 1969, “the airborne—and now the spaceborne—camera has brought to all mankind a new conception and understanding of the universe.”⁴³ For the environmental movement, the most important element of this understanding was the fragility

⁴¹ Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge, MA: MIT Press, 2010).

⁴² For a more detailed analysis of the role played by whole earth images from space in emerging ecological discourse, see Denis Cosgrove, *Apollo’s Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2003). Lisa Parks also addresses the importance of the “Earth-shot” in the new global imaginary of the 1960s in her excellent analysis of satellite television, *Cultures in Orbit* (Durham: Duke University Press, 2005). For more on the shaping role played by Stuart Brand and the *Whole Earth Catalogue* in digital culture, see Fred Turner’s excellent and engaging *From Counterculture to Cyberculture* (Chicago and London: The University of Chicago Press, 2006).

⁴³ Beaumont Newhall, *The Airborne Camera: The World from the Air and Outer Space* (New York: Hastings House, 1969): 122.

highlighted by the image of the entire earth dwarfed by the frame, no bigger than a child's plaything. It was not only visible in its entirety, that entirety seemed newly vulnerable to physical damage. This novel conception was, as Paula Amad incisively observes, intimately related to a relativization of scale. In an article outlining the history of aerial views and their cultural-political import, she writes,

the monuments of physical geography (mountains, rivers, and ravines) stood side by side with the monuments of man (railways, irrigation tanks, bridges, houses, and roads)...By simultaneously demoting man...while humanizing his environment...the aerial view provided a shift that would be crucial in the eco-environmentalism that human geography bequeathed to the late-twentieth century. Aerial, space, and satellite images may make humans invisible but they also bring into visibility collective human responsibility for the earth's future.⁴⁴

Thinking from a media historical perspective sheds a different light on Dipesh Chakrabarty's much-cited diagnosis of a crisis in historical thought posed by the new claim by climate scientists that humans are a "geological force," operating at the scale of environmental change. For Chakrabarty, this crisis is unleashed by a "tipping point," some material moment in ecological conditions at which humanity achieved a new scale of impact.⁴⁵ What his argument omits, as becomes clear when considering the history of the reception of aerial and satellite photography of the Earth, is the crucial role played by visual and communications media in the conceptual equivalency drawn between human and environmental experience in time. The understanding of the planet as an interconnected system, and the climate as a unified crisis that can be traced through historical time, is inseparable from the technology that enables its representation.

⁴⁴ Paula Amad, "From God's-eye to Camera-eye: Aerial Photography's Post-humanist and Neo-humanist Visions of the World," *History of Photography* 36.1 (February 2012), 74-75.

⁴⁵ Chakrabarty, 205. Certainly, my intention here is not to deny that real shifts in climate are taking place, or to argue that they are merely a question of perception; I agree with Chakrabarty and the general consensus among climate scientists. But I do not think that the imaginary of this problem can properly be discussed without reference to the technological media that are its enabling conditions.

The media tools that have enabled this representational rapprochement between the human and the geological have played a crucial role in shaping the very science of climate from which the idea of anthropogenic warming has emerged. In his book *Ice Time*—written in the late 1980s, the very moment that climate change was emerging into public consciousness—Thomas Levenson makes a compelling argument that “climate science lives and dies by the computer; it cannot live without it.”⁴⁶ This indispensability is intimately related to ideas of a new type of vision enabled by computing and big data. He refers to climate science as “a new view,” “a new way of looking,” “a lens,” through which “the earth looks different”; the computer is “a tool that built, in effect, a novel window from which to peer out of theory and into the weather.”⁴⁷ He, too, connects this new science to earth imaging from space: “that picture of the earth, whole, blue, and unmistakably alive—a picture that carries the emotional force of the idea and of the science that attempts to explain it.”⁴⁸ Levenson does not neglect the importance of data and its manipulation to climate science, but he starts with this notion of the picture. Only from an extremely zoomed-out perspective can a globally understood climate exist. This zoom is not only spatial; Levenson argues for a dramatically increased temporal perspective, as well, a graphic demonstration of the “deep time” that emerged in the eighteenth century, which only becomes possible with the scalar manipulations of computing. Only by zooming out on time does the modern notion of climate (from which, it is important to add, the recognition of climate change has emerged) become available:

For climate science, the first task has been to draw an empirical picture of what it is that constitutes climate. On every time scale that picture has been modified. On the billion- and million-year time scales, climate is essentially a problem of geology and evolution... From hundreds of millennia to hundreds and thousands of years, climate appears as a dynamic system, a set of feedback loops that regulate conditions of temperature,

⁴⁶ Thomas Levenson, *Ice Time: Climate, Science, and Life on Earth* (New York: Harper & Row, 1989): 96.

⁴⁷ Levenson, xii, 72, xiii, xiv, 104.

⁴⁸ Levenson, 18.

atmospheric chemistry, and so on...In the narrowest perspective, however, the issues become those of seasons and of weather, the mechanisms that control drought cycles or times of flood.⁴⁹

Here, Levenson demonstrates in his own language the importance of visualization to our understanding of global space-time (and space-time as global). This paragraph, like his book in general, relies on metaphors from visual and communications media: we need “a picture” of the climate, which emerges as “a set of feedback loops.” The role of digital media in climate science is to provide the capacity to shift temporal perspective, to look at the same set of data across time as a manipulable parameter. Yet in doing so, the technologies themselves lend their own operative principles as structuring metaphors to the way climate is discussed and understood, in a discursive dispersal of ideas that goes on to shape fundamental concepts.

Indeed, the influence of the discursive shift in conceptions of climate enabled by digital technology is everywhere in *Chasing Ice*, starting with the film’s first shots. Even before Balog is introduced, the film opens with a montage of TV news clips broadcasting a range of climate disasters, from Texas to Nepal to Russia. Satellite maps show the locations of extreme weather, while an interview with the founder of the Weather Channel denies the imminent melting of the polar ice caps. The message is clear: these disasters—hurricanes, droughts, wildfires—are linked to the same anthropogenic forces that are melting the glaciers. And it is visible (as graphic display) and viewable (as broadcast) due to the same technology that provided a first picture of the earth as a whole: the satellite. Several times over the course of the film, images of the Earth as seen from a satellite are used to demonstrate the location of EIS’s cameras, or show areas of rapid glacial melt. Moreover, these are not the only new media technologies mobilized to contextualize EIS’s videos. Throughout the film, charts and graphs visualize precisely the statistics and data modeling that

⁴⁹ Levenson, 79.

Balog protests so loudly against; there is even a computer animation demonstrating the process by which the Greenland ice sheet is melting from above and below. In this populated field, time-lapse is seen as merely one among a number of strategies to instrumentalize data in the service of a visual narrative—what media scholar Sean Cubitt has called a “data-fication of the photographic image.”⁵⁰ In spite of Balog’s many appeals to photographic indexicality, his project relies as much as any other computer model on practices of data manipulation.

Thus *Chasing Ice* and EIS are embedded in a much larger system of thought that itself emerges from an intersection of technologies, institutional structures, and political pressures. Edwards describes how satellite images of earth from space “fell directly into an overdetermined semiotic web,” in which “notions of a ‘global Earth’ had begun to emerge in language, ideology, technology and practice.”⁵¹ Similarly, the EIS videos enter a web of satellite forecasting, the scientific tracking and modeling of climate shifts in multiple elemental media: meteorology (air), oceanography (water), geology (earth), volcanology (fire).⁵² They are part of a much larger conversation that attempts to grapple with the questions of history raised by the new perspectives enabled by global communications infrastructures. These questions play an indispensable part in shaping how *Chasing Ice* puts the century-old technique of time-lapse to new use. To the idea that the world is moving at a rate obfuscated by sheer duration, contemporary notions of climate change—aided by computer-based visualization techniques—have added the concept of nature’s vulnerability, on a systemic level, to human interference. As discussed above, Chakrabarty proposes as one of the central intellectual crises of the early twenty-first century the notion that

⁵⁰ Sean Cubitt, “Everybody Knows This Is Nowhere: Data Visualisation and Ecocriticism,” in *The EcocinemaReader: Theory and Practice*, ed. Stephen Rust, Salma Monani and Sean Cubitt (Routledge/American Film Institute, 2012): 278.

⁵¹ Edwards, 3.

⁵² I borrow the notion of elemental media from John Durham Peters’ *The Marvelous Clouds*.

humans are “geological agents,” which is, primarily, a question of scale. “To call human beings geological agents,” he writes, “is to scale up our imagination of the human...we can become geological agents only...when we have reached numbers and invented technologies that are on a scale large enough to have an impact on the planet itself.”⁵³ It is important to note that Chakrabarty phrases the change as one of scale, for scalar manipulation is the primary tool of time-lapse, and resolving scalar disjuncture is at the heart of *Chasing Ice*’s project. Balog believes that “our brains are programmed to think that geology is something that happened a long time ago...we don’t think that that can happen during these little years that we each live on this planet...We’re living through one of those moments of epochal geologic change right now, and we humans are causing it.” Of course, rather than scaling up the human, Balog is scaling down the glacial, to a size that enables the viewer to see “the collapse,” diagnosed by Chakrabarty, “of the age-old humanist distinction between natural history and human history”—in Balog’s terms, the idea that geology is happening now.⁵⁴ In bringing together the deep past with the unfolding present, *Chasing Ice* thus sets up a clash of temporalities that sheds new light on a historiographical conundrum centuries in the making.

A Tale of Two Temporalities: Time-Lapse, Duration, and the Competing Historical Modes of Chasing Ice

EIS’s time-lapse videos form the spectacular centerpiece of *Chasing Ice*, the endpoint of the film’s heroic quest. Most of the film documents the difficult work of realizing the project, from conception to completion, underscoring its urgency and the stakes of failure (namely, that the global climate will collapse and no one will notice). Time-lapse becomes the pre-eminent tool to

⁵³ Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry* 35.2 (Winter 2009), 206-207.

⁵⁴ Chakrabarty, 201.

handle the problem of scale that Balog sees as the primary roadblock to global action to prevent climate change. In deploying this tactic, *Chasing Ice* embraces a historiographical approach that favors the wide angle, the schematic narrative, what Siegfried Kracauer calls “macro historiography”: histories focused on large “long-range events,” rather than “an endless continuum of microscopic incidents, actions, and interactions.”⁵⁵ It is precisely the long-range event—in this case, glacial collapse—which time-lapse is perfectly suited to capture. Indeed, Kracauer himself uses filmmaking techniques as metaphors to describe different modes of historical thought: he compares the long view of history to an aerial photograph, which is “bound to bring normally unseen patterns and configurations into focus.”⁵⁶ Although Kracauer prefers a spatial metaphor, the time-lapse is a temporal response similar challenges of historical scale. As Andreas Becker points out, the sort of perspectival shift afforded in spatial terms by the cartographic sketch (or aerial photograph) is replicated temporally by the elisions of time-lapse.⁵⁷

With time-lapse, EIS and *Chasing Ice* attempt, in Kracauer’s terms, a “macro-history” of the glaciers they study. Leaving aside the “microscopic incidents, actions, and interactions” in any glacier’s history, these videos instead reveal the larger pattern at work: namely, one of loss and deflation.⁵⁸ Indeed, the project works doubly against building a catalog of meaningful small moments in the glacier’s shifting, drifting life. First, the images’ randomization prevents any intentional grasping of particularly significant events: once an hour, no matter what happens, the programmed camera snaps a picture. No conscious analytical capacity determines if perhaps the

⁵⁵ Kracauer, *History*, 115, 107.

⁵⁶ Kracauer, *History*, 42. Paula Amad has written extensively on the importance of aerial photography as a technique to the shifts in French historiography of the 20th century, specifically the attention of human geographers to large-scale histories that took on regions, epochs, and even (in the case of Braudel), climate. See especially *Counter-Archive*, Chapter 2.

⁵⁷ Becker, 33.

⁵⁸ Kracauer, *History*, 112.

photo should be taken after forty-seven minutes, or if an event of such great significance is occurring that this time several images should be captured one after another. The goal is not the particular, but the mean. A statistics of historical process, mathematical proof to justify a global sense of dread at a change whose magnitude, until reduced along at least one axis, is difficult even to conceive. Second, the individual images cannot tell meaningful stories from the life of a given glacier because they are still. (And this is one of the central tensions at work in *Chasing Ice*, a tension borrowed from analog cinema.) The project's fascination is with the appearance of movement, but it works by way of the still image. The glaciers, melting, are frozen and refrozen in bits and bytes to the end of being stitched back together to form a renewed (and changed) sense of motion. They become visible through loss, in a progression by subtraction that reflects the curious nature of the glacier itself, which has emerged into dramatic visibility as a result of its rapid disappearance.

Yet for a film in which they are so central, the EIS time-lapse videos occupy a strikingly small amount of screen time. Only an hour into the film's 75-minute runtime does the viewer see the first example, framed in one of Balog's instructive lectures. Reaction shots of stunned attendees, their shock and horror palpable, teach the film's own viewers how to react to this tampering with the passage of time. (They have been, it appears, successfully "grab[bed] in the gut," subjected to the negative pleasure of watching glacial death.)



Fig. 1 An awestruck viewer “grabbed in the gut” by EIS videos (*Chasing Ice*)

After the first video, several more follow, interspersed with televised footage of Balog’s world tour, interviews with climate scientists, and data visualizations providing more information about glacial recession in the past several decades. Also populating this rich visual field is another kind of glacial spectacle, one that occupies the opposite end of Kracauer’s historiographical continuum, embracing the particular, the immediate, the recording of the present in duration. Throughout *Chasing Ice*, the camera will pause to linger on a calving glacier, letting these slow and powerful movements play out in real time. Rough faces rupture, then crumble to a flow of snow-white dust that pours into the sea; large icebergs break off and roll in the water, sometimes showing the deep marine ice whose color indicates its age (the weight of the ice above gradually pushes out any air bubbles, which are the element that gives newer ice its white hue). These meditations in duration culminate in a subplot woven throughout the film’s final act. Balog sends two of his assistants to camp out near Ilulissat Glacier in Greenland, an enormous formation that the film refers to as

“the mother of all glaciers,” rumored to have put off the iceberg that sank the *Titanic*.⁵⁹ The two are there to wait for a massive calving event. Due to Ilulissat’s size—its terminus is five miles wide—it promises events on an enormous scale. Eventually, it delivers, in a moment that, in direct juxtaposition with time-lapse videos, dramatizes the difficulty inherent in the undertaking of mediating glaciologic change.⁶⁰

Chasing Ice builds tension and expectation by following the assistants, Adam and Svavar, to Ilulissat, then leaving them and periodically returning. The third check-in on Ilulissat opens with a shot of Adam out in front of their yellow tent. A title in the bottom left corner of the screen informs the viewer that it is Day 17 of “glacier watching.” After a close-up view of one of the cameras, the next shot shows Adam in the tent interior, on a satellite phone explaining to Balog how things are going. As he speaks with his boss, a series of external shots show the glacier, unmoving in the bright sunlight. Suddenly, a low boom rings out, and ice begins to crumble and flow in a growing rift that appears as the ice quakes and rises. Svavar calls to him from off camera, “It’s starting, Adam, I think. Adam, it’s starting...Call him back!” The camera stays on Ilulissat as, on the audio track, Adam ensures that all the cameras are still running. As the calving begins, Svavar comments incredulously on its size and power. After a single reverse shot of Adam focusing a camera, the film returns to the glacier and stays with it for the duration of the calving sequence. From its initial position on the area where the calving started, the camera zooms and pans, showing peaks of ice running into avalanche across the width of the formation. Svavar and Adam’s voices give way to the utterances of the glacier, which—as often noted in first-hand accounts of

⁵⁹ This reference to the sinking of the *Titanic*, the event *par excellence* of happenstance in industrial modernity, only underscores the relationship of the glacier to contingency which I draw out in Chapter Two.

⁶⁰ The episode recalls the adventures of Hans Schneeberger, the cameraman on *Avalanche* who was sent by Arnold Fanck to wait across a promising snow cliff for a monstrous avalanche. See page 91.

calving events—sound like ballistic missiles, the crumbling peaks resembling buildings at the moment of implosion. As this miles-wide segment of ice rolls into the ocean, a wave of charcoal-grey water rises through white foam, and the bottom of the glacier rears from the sea, its dark blue end resembling the head of a gargantuan sea creature. As it falls back into the ocean, another boom shakes the camera, its quaking a demonstration of the enormous forces at work in the sea below the cliff on which it is perched. Close-ups show the roiling sea pouring over enormous sections of crystal blue ice that has not seen the light of day for many millennia. Propelled by the force of breaking away from the main glacier, towers of ice shoot up into the air—as much as 600 feet, as Adam explains in voiceover during the last minute of the sequence—and fall back into the ocean, sending up clouds of spray and snow. He compares the event to the destruction of Manhattan Island for scale, as the field of blue and white formations rumbles, shakes, rolls and disintegrates, its motion every bit as uncanny as the time-lapse videos that precede and follow it.⁶¹ At the end of the sequence, a title reveals that the three minutes and ten seconds of screen time given to the event represent a calving duration of 75 minutes.

In this sequence, the glacier becomes an object of “micro history,” the small moments and details that are left out of “high-magnitude history.”⁶² The scene’s structure underscores the very elements of glacial collapse that go missing in the time-lapse: its slowness, its volume, and, most interestingly, its contingency. Although the calving sequence feels long, composed of seventeen shots of up to 20 seconds in length, the final title reveals that even this is a compression of time, from 75 minutes down to just over three—a fact that implicitly emphasizes just how much is elided in a time-lapse video that covers three years in 48 seconds. (Were this glacier to have an EIS

⁶¹ Recall Fanck’s observations on the uncanniness of iceberg movement, discussed in Chapter Two.

⁶² Kracauer, *History*, 126.

camera trained on it, there would be at most two images from this calving.) The sense of duration is augmented by the sequence's sound design, which omits any voiceover or profilmic dialogue for over half of the calving process. Instead, the violent booms and cracks of rupture, the very sounds that disappear in time-lapse videos, take over the soundtrack. The camera zooms in and out, panning across the glacial surface which always fills the entire frame; there is no end in sight. Sound and image work together to immerse the spectator in the calving event, their constant movement and shifting perspective engulfing the senses. This aesthetics of immersion contrasts sharply with the time-lapse video, whose effect is predicated on a constant, static frame, one which gives an overview of the entirety of the glacial terminus. As the seconds tick by, every moment filled with a sense of overwhelming energy and motion, glacial time seizes the spectator, demanding that the watcher wait, look, and listen until the process is complete. Indeed, by starting the sequence with Adam's phone call with Balog, interrupted by the arrival of the long-awaited event, the film dramatizes the glacier's failure to adhere to the strictures of human time. It is a stark reminder of the glacier's contingency, the "any moment whatever" of its calving process, the management of which is central to both the time-lapse and the real-time surveillance of Ilulissat.

These efforts at surveillance highlight once again the importance of new media technologies to *Chasing Ice*. At the end of the calving sequence, Adam notes in voiceover that this was "the largest calving event ever caught on tape." His slip of the tongue—no tape was involved here—is a reminder of the technological conditions of possibility for recording this event. To leave a camera running for weeks at a time, virtually unattended, requires digital technologies of automated capture and storage. This kind of 24-hour surveillance is unthinkable on celluloid, magnetic tape, or any other medium whose material realities pose considerations of physical space

limitations.⁶³ (Here is where the historical and technological specificity of Malkowski’s “expectant gaze,” premised on the ability to record endless amounts of footage while awaiting a cataclysmic event, truly comes into play.)⁶⁴ Although this new media project is animated by longstanding fantasies about the power of moving images to capture any- and everything, its technological supports enable this work on a scale that raises new questions about the intelligibility of captured information. Like *Encounters at the End of the World*, the juxtapositions in *Chasing Ice* of the close-up and the long view—or the detailed unfolding of a particular moment and the long-range perspective that remove it from sight—give an impression of the dizzying mass of information with which any natural history must grapple in an age of automation and computation. Unlike Werner Herzog, however, who responds to the onslaught of data with gestures to the absurdity of any attempt at control, James Balog strides forward with confidence and certainty, using the technological tools available to bend glaciologic time to his will.

Balog’s mission is to re-insert a sense of concrete reality into the visualization of climate change by drawing on the indexical status of photography, to move away from abstraction and give his viewers something real and material, with the ultimate goal of provoking them to take action to stop climate change. Yet by highlighting all that goes lost in the removal of interstitial moments, the Ilulissat footage serves as a reminder that time-lapse itself is a form of abstraction. In their zoomed-out overview of the passage of time, these videos not only “bring normally unseen patterns and configurations into focus,” they also point toward an inevitable sense of glacial collapse and loss that seems to forestall the possibility of intervention. In working by erasing the particular and

⁶³ We can think here of the common trope of surveillance cameras that might have captured evidence of crime or injustice, but which turn out to have been erased to make room for the next day’s spying.

⁶⁴ Malkowski, 116.

the contingent, they also remove that which is understood of a central hallmark of history in the first place, namely the possibility that every moment could be something other than what it has turned out to be. For Kracauer and his contemporaries, who still draw a clear distinction between natural and human history, this technique for understanding glacial collapse might present no problem. Whereas Kracauer understood human affairs to “transcend the dimension of natural forces and causally determined patterns,” nature was in his eyes defined by “longitudinal laws” that supersede any historical intrusions on their behavior.⁶⁵ But anthropogenic climate change has changed this as well. Humans have become, in Chakrabarty’s term, “geological agents,” and this spells the “collapse of the age-old humanist distinction between human and natural history.”⁶⁶ As a public figure, Balog’s intent is to highlight these anthropogenic changes to climate: changes, that is, which are contingent on human decisions and actions, and thus fall into “the realm of contingencies, of new beginnings.”⁶⁷ With this effort in mind, the durational shots of Ilulissat’s calving point to a fatal flaw in the time-lapse project. As Kracauer warns, “macro histories overplaying their self-sufficiency are prone to go astray...They are scattered over time; they leave many gaps to be filled. We do not learn enough about the past if we concentrate on the macro units.”⁶⁸ In an ironic twist, in its attempt to demonstrate the way in which humanity has intervened in natural processes, rendering their narrative visibly historical through grasping and altering its pace, EIS re-naturalizes glacial loss by removing the very moments in which something different might occur.

⁶⁵ Kracauer, *History*, 29.

⁶⁶ Chakrabarty, 201.

⁶⁷ Kracauer, *History*, 31.

⁶⁸ *Ibid.*, 118.

The multiple tensions that haunt *Chasing Ice*—between tradition and innovation, indexicality and manipulation, stillness and motion, temporal elision and duration—thus culminate in an irreducible conflict between different modes of temporal address. In grappling with anthropogenic climate change, the film slips into a dual temporal mode that itself reflects the tensions between past and present that haunt its narrative. Time-lapse invites the viewer to consider an alternate understanding of the unfolding present, in which the movements and changes of yesteryear are no more remote than those of yesterday. The prospects of the distant future suddenly loom much closer, the removal of moments in between threatening to render our daily actions and choices invisible, irrelevant, and forgotten. This tension between these two historical modes—the macro and the micro—is also reflected by the complex temporal nature of the glacier itself. On the one hand, it is a register of the deep past, increasingly instrumentalized as an archive of climate history. We see this in time-lapse videos, which sample the historical record to make a coherent narrative, but also in how ice cores have been put to work to date the beginning of the much-discussed “Anthropocene Epoch,” by gathering air samples trapped in bubble form and analyzing their chemical composition. At the same time, the glacier is a beast of the present, its melting and refreezing, crackling and shifting a constant reminder that invisible forces are at work all around us, at every moment. As much as a storage medium of climate history, it is a visible (and audible) index of the warming of the earth, a reflection in duration of present conditions. And in the context of the slow-motion apocalypse of global warming, it gains a third temporal address, one which dramatically increases the stakes of its pronouncements: this archive of the past, and index of the present becomes a herald of the future—and sorting out its confounding historicity feels more necessary every day.

Chapter Five
A Future Without History:
The Glacier as Archive, Weathervane, and Catastrophic Oracle

At the National Science Foundation Ice Core Facility in Denver, Colorado, there is a room full of shelves stacked with aluminum tubes. In a photograph displayed on the institution's homepage, the camera looks down a long aisle extending between two rows, perspective lines converging on an empty cart that stands in front of a beige door with a red-lit EXIT sign, rendered by distance a tiny dot. Fluorescent lights track the photograph's center line, reflecting off the canisters to give the image a cold and somewhat sickly hue. On the flat ends of the tubes closest to the camera, which point toward the center aisle, arcane markings gesture toward a numerical cataloguing system indecipherable to the untrained eye. Arranged in their neat rows, these silver cylinders suggest a collection of ancient scrolls too fragile to be exposed to the open air, or canisters of film under protection from light and dust.

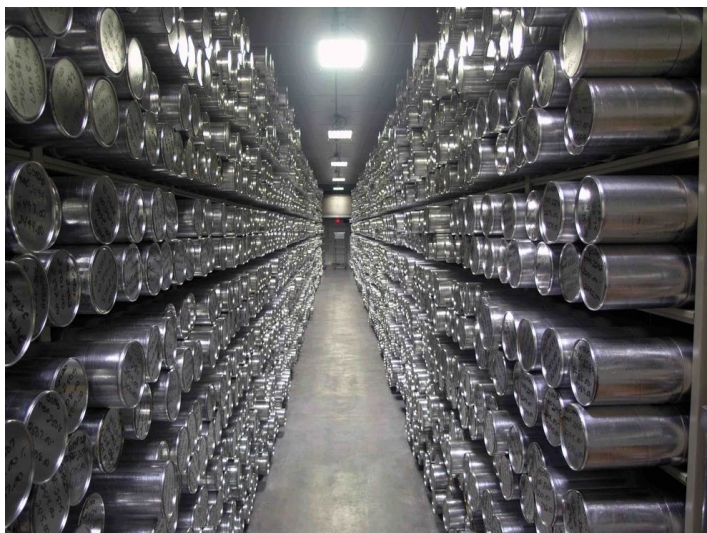


Fig. 1 Samples in the Archive Freezer at the National Ice Core Laboratory

In fact, the tubes do contain a precious historical document: sealed in each container is a meter-long section of a given ice core taken from one of the world's many glaciers. Upon being extracted, the cores are cut and shipped to the lab, where they land in this room, the "Archive Freezer." Here, they await sampling and analysis by glaciologists, meteorologists, chemists, physicists, and paleoclimatologists. The scientists who use this laboratory embrace this conceptualization of the cores as an archival medium: interviewed in the NOVA documentary "Extreme Ice," glaciologist Jim White explains, "it's the only medium that really collects the atmosphere itself." In describing the ice as a carrier of the historical record, White joins a chorus that goes back at least to the early 1960s, when the glaciologist James L. Dyson, who considered nature "a scribe who [keeps] the record," described Antarctica and Greenland as "great iceboxes of climatic history."¹ Raiding the icebox, the scientists who produce ice core records to fill the Archive Freezer are building a rich library of historical information, a resource for understanding the patterns of the present and predictions of the future.

Up to this point in this dissertation, I have been concerned primarily with how the glacier appears as an object of mediation, and the ways in which its representation contributes to the conceptualization of nature in the popular imaginary. In this final chapter, I turn to a theorization of how the ice itself participates in processes of mediation, helping to construct the very frames through which nature—and its history—are perceived and understood. I begin with a thorough examination of the glacier as an archive, one that stores and transmits historical information about climate that scientists hope will inform our understanding of impending climate change on a global level. Though glaciologists have long understood the glacier as a kind of historical medium,

¹ James L. Dyson, *The World of Ice* (New York: Alfred A. Knopf, 1962), 190; 100.

it has only relatively recently emerged into popular consciousness in this form. Most significant to contemporary discourse, in his foundational article “Geology of Mankind,” published in the journal *Nature* in 2002, Paul Crutzen uses the ice record to suggest a date for the beginning of the Anthropocene Epoch, a periodization he introduced in that same article.² Since then, advances in both transportation and information technologies (like those employed in the making of *Chasing Ice* and *Encounters at the End of the World*) have increased the volume and complexity of information that can be read from the ice, which becomes a “high resolution” image of the deep past.³ As a record whose antiquity “seem[s] to mock the timescales of our petty affairs,” the glacier is an essential part of a media environment that forces a reconceptualization of historical scale and human participation in epochal change.⁴

In recent years, it has become common practice in both artistic and scientific discourse to put the glacier to work as a kind of information database, a compilation of records that can be used to construct a coherent narrative of environmental history. Indeed, the glacier clearly fits the most basic definition of the archive offered by Paula Amad: “a space in which time is stored and retrieved.”⁵ From popular reporting to artistic interpretations, the NSF’s archive analogy is taken for granted, the ice core readily accepted as a “ledger,” a “story,” the “pages of a book.”⁶ Yet like any elegant analogy (and like the glacier itself), this one contains hidden depths: assumptions

² Paul J. Crutzen, “Geology of Mankind,” *Nature* Vol. 415 (January 2002), <http://nature.com>.

³ The term “high resolution,” likely most familiar to my readers as a media term—marking the fidelity of sound or images to an original—is also common parlance in glaciology, where it refers to the level of detail an ice core can provide about climatic history. This shared vocabulary indicates to me a conceptual relationship between the glacier and other audiovisual media.

⁴ Jussi Parikka, *A Geology of Media* (Minneapolis: University of Minnesota Press, 2015), vii.

⁵ Amad, *Counter Archive*, 17.

⁶ See Nicholas Wade, “An Ancient Ledger Trapped in Ice,” *New York Times* 22 May 2018, p. D4; “Ice Core Walk,” <http://icecorewalk.org>; Grrlscientist, “How do ice cores allow researchers to see climate change?” *The Guardian*, <http://theguardian.com>, 12 May 2011.

about the nature of time and history, truth and trace, and the malleability through abstraction of historical artifacts. Through an examination of data visualization and sonification projects that draw on the glacial archive to build a sense of historical narrative, I will seek to shed light on some of these assumptions and their implications for how we understand this peculiar medium. This approach to the glacier, as a repository of traces from the deep past, confronts tensions of stillness and motion, as well as temporal collisions, that recall studies of the cinematic archive. As both archive and archivist, the glacier serves a complex function, distilling constant motion into a catalogue of discrete moments, which themselves are re-combined to produce a sense of fluid mutation.

Yet the concept of the archive cannot fully encapsulate the mediating properties of the glacier. This shifting, dynamic formation is characterized by a fundamental tension between multiple different modes of communication, each of which has a distinctive temporal address. At the same time as it functions as an archival storage medium which preserves a record of the deep past by way of isolated impressions stacked on top of one another, the glacier's surface speaks in quite a different fashion. Melting, rupturing, and disintegrating, it is understood by scientists, reporters, and artists as an index of the warming of sea and air, rendering visible temperature changes that might otherwise remain imperceptible. In this mode of mediation, the glacier operates in the present, registering current conditions through reactions both violent and subtle. As in the case of the glacial archive, from which materials can be retrieved only through destruction, the glacier as a visualization of climate change bears a peculiar relationship to visibility: it is through loss and disappearance that metamorphosis becomes apparent. Like other indexical signs, the glacier's communications are reinforced by a sense of truth-value; they are

evidence of something much larger afoot, and frequently manifest as desperate appeals to convince viewers of the reality of warming. Yet in this medial address, rather than depositing a trace in the glacial record, it is the obliteration of the record that carries the message forward.

Taken together, the dynamics of these two modes of mediation point to a troubling future, one that multiplies the anxiety spurred by climate change. Established by the acceptance of ice core analysis as a deep and rich historical record, the glacier's subjection to gradual, persistent ruin and disintegration seems to promise the erasure of history itself. As both a representation of and present player in environmental change, the glacier is both messenger and message. If, as discussed in Chapter Three, every record points simultaneously (and symmetrically) to the past and the future, the glacier is addressing two futures that themselves tell very different stories. One, the immediate future of melting ice sheets, promises a devastating superabundance: rising sea levels, raging superstorms, catastrophic floods—all stories of the violent excesses of water released from its crystalline form. And the second, more distant, tells a tale of chilling desolation and loss: lack of freshwater, land submerged, barren earth uncovered by melt—and, perhaps most unsettling, total archival erasure. For to accept that the glacier is the repository of the record, and that it is rapidly melting away, is to face a future in which the realm of the unknowable extends not only forward into the future but also backward into the past.

In theorizing the glacier as a medium, I do not seek to elaborate a comprehensive definition of this infamously fuzzy term. Rather, I am drawn to the categories of analysis that are opened up by a consideration of how the glacier communicates. Most particularly, I set out to investigate the glacier's extraordinarily complex temporality, in an attempt to understand why and how it relates to our inability to grapple with the undeniably urgent problems and questions posed

by natural historicity. My central contention is that the glacier, appealed to as a media form by new technological constellations, operates simultaneously across multiple temporal registers: the past, the present, and the future. Each of these temporal modes contains tensions and contradictions within itself: between stillness and motion, information and sensorium, knowledge and the unknowable. Once thought of as an uncompromising void, a relentless refusal of the temporal logics that governed the world beyond, the heuristics of mediation reveal the glacier instead as an excess of temporalities, whose collisions and confrontations can only point the way forward to its own annihilation.

Sampling the Archive: The Ice Core as Media Technology

In the past three decades, glaciers have come to play a crucial historiographical role in both the scientific and the popular conversation about global climate change. In the broadest sense, the presence or absence of enormous glacial formations serves as a periodization technique in geologic history: periods of glaciation, or ice ages, are distinguished from “interglacial periods,” in which the earth’s glaciers recede or disappear entirely due to warming temperatures. The glacier is a way to mark the passage of time. But just as important as the glaciers’ existence is what lies beneath the surface: information to be gathered from an analysis of the ice itself. The glacial record, in the form of ice cores, has been available for scientific research since the 1950s, though the principles undergirding it emerged decades earlier.⁷ Specifically, the idea that annual layers of snow could be deciphered and used to determine a chronology of events (volcanic eruptions, wildfires, industrialization) that left a trace on the crystalline surface of glacial regions originated in the early

⁷ Chester C. Langway, “The History of Early Polar Ice Cores,” EDRC / CRREL TR-08-1, January 2008, 7.

1930s, with the glaciologist Ernst Sorge's research in Greenland.⁸ Though Sorge's discovery came from time spent examining the walls of a hand-dug pit in the ice sheet, rather than the smooth edges of a drilled ice core, his "path-breaking" work proved fundamental for the ice core science that has come to occupy center-stage in the reconstruction of climate history.⁹ The adoption of this concept was relatively quick: by 1962, just a few years after the first successful extraction of ice cores fit for stratigraphic analysis, the glaciologist James L. Dyson would write, "entombed within glaciers...are secrets of climatic changes which throughout the ages have guided the rise and fall of civilizations."¹⁰ One such secret—the sharp increase in carbon dioxide emission rates resulting from industrialization—has been central to a historiographical debate that currently occupies scholars across the humanities, social sciences, and physical sciences: namely, the dawn of the Anthropocene.

The "Anthropocene" is a proposed geological epoch that would formally recognize a relatively new historical phenomenon: namely, the fact that human activity is making a lasting and legible impact on the geologic record. Although the proposal has not been formally adopted by the International Commission on Stratigraphy—the body that determines the International Geologic Time Scale, according to which we are still living in the Holocene Epoch—its impact on the popular imaginary has been undeniable, giving rise to fervent discussions and debates in all arenas of the public sphere. From the academic sciences to popular literature, art biennials to climate summits, the notion of the Anthropocene, the idea of humans as "geological agents," has thrown into question some of our most basic assumptions about the nature of time, history, and the

⁸ The reader may recall Sorge from Chapter Two of this dissertation, where he plays an important role as a consulting glaciologist on the film *SOS Eisberg*.

⁹ Langway, 5.

¹⁰ Dyson, *The World of Ice*, 7.

environment.¹¹ And it is all based on the glacial archive: in the inaugural article naming this period, the geologists Paul Crutzen and Eugene Stoermer explicitly reference “data retrieved from glacial ice cores” in determining their suggested start date (the invention of James Watt’s steam engine, catalyst for the Industrial Revolution, in 1784).¹² In the research leading to the proposal of the Anthropocene, the glacier’s ability not only to store information, but to store it in a way that is chronologically indexed, lends it an archival function. It is a site of research for documentation on the climatological context of particular events, a storehouse of knowledge that can be extracted and put to work to make paradigm-shifting historical arguments.

An illustrative example of this interpretation of the glacier appears in a recent *New York Times* article about the use of ice cores for unusual historical purposes. Entitled “An Ancient Ledger Trapped in Ice,” the article describes how “a record...written not in Latin, but in lead” provides “something close to...a year-by-year economic history of the Roman Empire.”¹³ The author explains that a 1,400-foot section of the core, representing a period from 1235 BC-AD 1257, provides enough evidence to take what amount to monthly measurements of lead pollution during the Roman era. The lead record points to mining and production activity that economic historians interpret as signs of a strong economy. Findings from the core were cross-referenced, not only with tree rings and volcanic eruptions in the interest of synchronization, but also dates already known to be of historical significance, such as the Antonine and Cyprian Plagues, the Pax Romana, and the civil wars that preceded and followed the Pax. Although there is little resemblance to what most historians envision when they refer to “archival research” in either the

¹¹ The term “geological agents” comes from Chakrabarty, 207.

¹² Crutzen, “Geology of Mankind.”

¹³ Wade.

research process—melting of the ice core, measurement of lead by mass spectrometer, and the aforementioned cross-referencing—or the result thereby obtained—“a fluctuating line that corresponds to salient events in Roman history”—author Nicholas Wade still takes for granted his readers’ acceptance of the ice core as nature’s ledger. In doing so, he follows common popular scientific practice.¹⁴

This instrumentalization of the glacier recalls mid-twentieth-century idealizations of the archive. In particular, Robert-Henri Bautier, former director of the Archives Nationales in France, declared in the early 1960s that “documents are deposited in archives exactly in the manner in which the sediments of geological layers form, progressively, constantly.”¹⁵ The implication, as Amad notes, is that the archive possesses “the neutrality of original sources as inviolable depositories of ‘truth’ at the expense of admitting the political dimensions of cataloguing and sorting procedures through which historical documents are preserved.”¹⁶ This positivist approach was characteristic of a philosophy of history that aspired to a notion of scientific objectivity.¹⁷ The rhetoric of geologic sedimentation obscures the important role of human agency in the process of record-making. With the earth as its platonic ideal, the archive becomes a technology of impartial inscription, a disinterested machine whose omissions are products not of sinister intent, but of the constraints of physical laws. Through this lens, the glacial archive, in its autonomous preservation of the physical record, seems to encourage a mode of historical thought in which the historian simply gathers transparently legible facts laid down by an unbiased automaton, and builds from

¹⁴ Indeed, the name “archive freezer” itself suggests the extent to which the ice has been naturalized as a direct historical record comparable to the written word.

¹⁵ Quoted in Amad, 156.

¹⁶ Amad, 156.

¹⁷ Siegfried Kracauer mentions this trend in a critical tone in *History: The Last Things Before the Last*, which was composed in the 1960s when this was still common practice. See pp. 17-19.

them a logical narrative that fills in the gaps of our understanding of the past (and points toward a future made suddenly clear).

Of course, this kind of naive historiography is itself a thing of the past: after the far-reaching intervention of Michel Foucault into the philosophy of history and the theory of the archive, one would be hard pressed to find a humanist who would dare take a given historical narrative at face value. Foucault's most celebrated student, Jacques Derrida, reminds us that the temporality of the archive is never so straightforward as it seems, and that "the technical structure of the archiving archive also determines the structure of the archivable content even in its very coming into existence."¹⁸ That is, a clear understanding of the form and technological infrastructure of the archive is essential to any exploration of its holdings. This kind of attention to process also animates the science studies work of Bruno Latour, who in book after book carefully attends to the methods used in fields and labs in what he describes as an attempt to "renew empiricism," "to reconnect scientific objects with their aura, their crown, their web of associations."¹⁹ Latour resists the scientific claim to pure objectivity, instead situating the research process in its social, historical, and cultural context. In the wake of these crucial developments in the critical theory of knowledge formation, the notion of the glaciological record as a transparent and clearly legible chronology becomes untenable. Instead, the work lies in examining the many stages of mediation through which deposits of air, ash, and other trace elements in the compacted layers of snow are translated into digestible historical narratives.²⁰ Such a careful inspection reveals

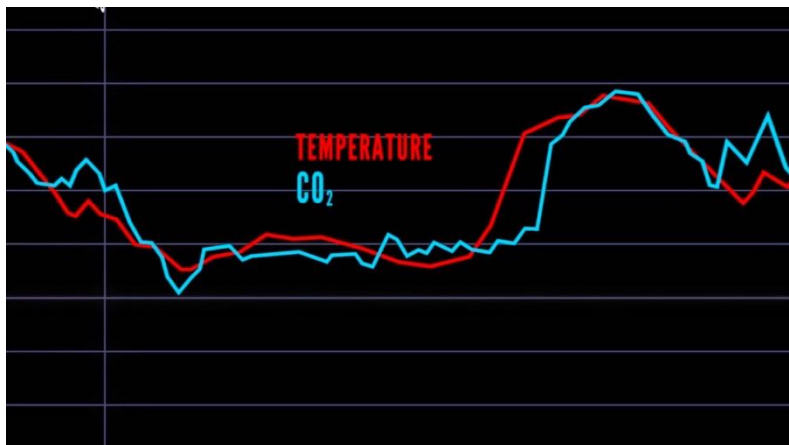
¹⁸ Jacques Derrida, *Archive Fever: A Freudian Impression*, Eric Prenowitz (trans.) (Chicago & London: University of Chicago Press, 1995), 17.

¹⁹ Bruno Latour, "Why has Critique Run out of Steam?" *Critical Inquiry* 30 (Winter 2004), 231; 237.

²⁰ My analysis in this chapter is very much in the spirit of "Why has Critique Run out of Steam?" I am not interested in destabilizing or challenging the "truth" of what is communicated from the glacial record, but rather in getting closer to that truth, and investigating the ways in which it is affected by the journey between the object and the communication.

hidden tensions at work in the ice archive, ones that must complicate our understanding of the operation of natural history: tensions between continuity and discontinuity, stillness and motion, recording and obliteration.

For lay audiences, the form in which the glacial archive most commonly gets mobilized into a cogent historical narrative is a simple line graph demonstrating the change in particular climate conditions, such as temperature, or carbon dioxide levels. See, for example, this graphic that appears in *Chasing Ice* as an illustration of how carbon dioxide levels and temperature levels have tended to rise and fall together over time:



Figs. 2-3 Line graphs demonstrating the rise and fall of CO2 levels and global temperature (*Chasing Ice*)

With its stark red and blue lines tracking and crossing each other over the grid of the graph, this image tells a clear story, one which borrows its authenticity from the materiality of the glacial record: the data come from ancient bubbles of air, we are frequently reminded, which are themselves direct emissaries from another time. Yet the clarity of this message—which is a large part of its power—relies on a series of interpretations and elisions, each of which puts more distance between the viewer of the image and the material substrate on which it ultimately is based. The graph is the end result of a process that begins with the laborious extraction, piece by piece, of ice core samples that reach over three kilometers deep into 800,000 year-old ice.²¹ Once extracted, cores are cut into meter-long sections and shipped to a lab for storage and analysis. Finally, scientists analyze the components of the cores, using spreadsheets and charts to organize and prepare data to be plotted onto graphs like this one.²² These graphs, in turn, are distributed to a broad audience in films such as *Chasing Ice* or *An Inconvenient Truth*, and climate reporting in venues like *National Geographic* or *The New York Times*.

Perhaps the most interesting element of this graph, and the many others like it that appear in popular reporting about climate change, is the continuity imposed by the parallel lines as they trace, left to right, the rise and fall of carbon dioxide and temperature levels over millennia. The unbroken lines smooth over (at least) two forms of discontinuity: first, the segmentation of the ice core for the purposes of transportation and storage (a further segmentation than that which occurs

²¹ In fact, as of 2017, ice as old as 2.7 million years has now been discovered and retrieved, but it is in formations that, due to the movement of the ice over time, prohibit the kind of high-resolution dating that is available for ice dating back 800,000 years, and which makes graphs like these possible. Paul Voosen, “Record-shattering 2.7-million-year-old ice core reveals start of the ice ages,” *Science*, 15 August 2017, <http://sciencemag.org>.

²² The process of analysis is different for different values. Carbon dioxide levels, taken from bubbles of air trapped in the ice, are measured directly; temperature, on the other hand, is a less direct process, reliant on analysis of oxygen isotopes found in the cores. See “How are past temperatures determined from an ice core?” *Scientific American*, 20 September 2004, <https://www.scientificamerican.com>.

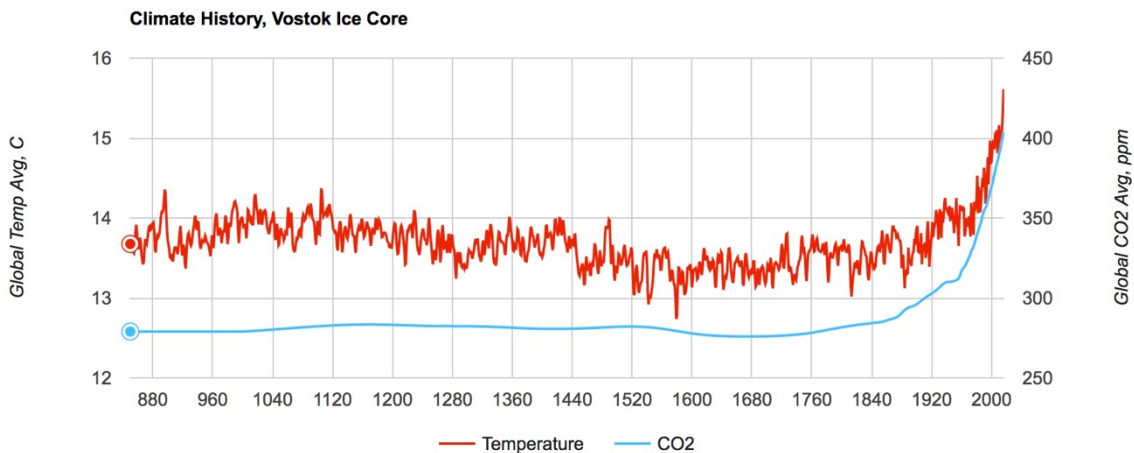
at the time of extraction). The three kilometers of ice represented by the 800,000 year-old graph are neither extracted nor stored in an unbroken piece, and the segments must be carefully labeled and their data reassembled to restore the sample's continuity. Second, the data itself is measured, recorded, and analyzed in discrete units: the very legibility of an ice core's chronology depends on the extent to which precise, and differing, dates can be assigned to the material traces (air, ash, dirt) within it. Indeed, the very idea of using ice cores for historical record keeping emerged from the observed striation of layers of snow year to year—a differentiation that made the passage of time visible, calculable, and correlatable to climate events.²³ Although such visibly separated layers only work for the purposes of dating at the upper levels of a deep ice core (down to about 55,000 years, after which the weight of the ice causes melting that muddles clean lines), deeper dating practices are still reliant on the ability to make distinctions, such as the difference between winter and summer temperatures revealed by isotopic testing. Thus the smooth and continuous lines showing the movement of carbon dioxide and temperature over time, while reliant on concrete data points, are a narrative device of sorts: a way to reintroduce motion and momentum that have been removed in the process of data extraction.

This work of re-creating a sense of motion from an archive of frozen elements is pushed a step further by a recent piece called “Ice Core Walk,” a data sonification that draws on ice core records to render the impossible: a phenomenological experience of the passage of 800,000 years. Available for free download at <http://icecorewalk.org>, “Ice Core Walk” is presented as an “audio tour” in which listeners are invited to “virtually walk down the data along the ice core.”²⁴ In the

²³ Langway, 5. This process emerged with Sorge, who spent the winter of 1930 on Greenland observing the walls of a hand-dug pit.

²⁴ <http://icecorewalk.org>

ideal scenario, a listener walks for three kilometers (representing the length of ice cores from which the data is drawn), taking in a 35-minute audio track with three layers: a tone tracking the amount of carbon dioxide in the atmosphere in a given year, a second tone tracking temperature in corresponding years, and a voiceover narration that periodically chimes in to give additional information and context. (If used with an iTunes app, GPS tracking enables an exact correspondence between the distance walked and the voiceover cues.) The two tones, somewhat resembling the cetacean wail of a theremin, rise and fall in tandem, dramatically spiking in the last few minutes of the walk, providing a sharp sensory experience of the drastic rise in CO2 that is also visible in the graph that heads the website:



This graph, with its red and blue lines that track each other, resembles the one displayed in *Chasing Ice*, though the scale is much different. Below the graph, the site provides a link to a climate data subsample from the Vostok Ice Core, one of only a few ice core samples in the world that provide such a long record. It comes in the form of a Google spreadsheet, which lists the values of individual data points used to construct both the graph and the data sonification that

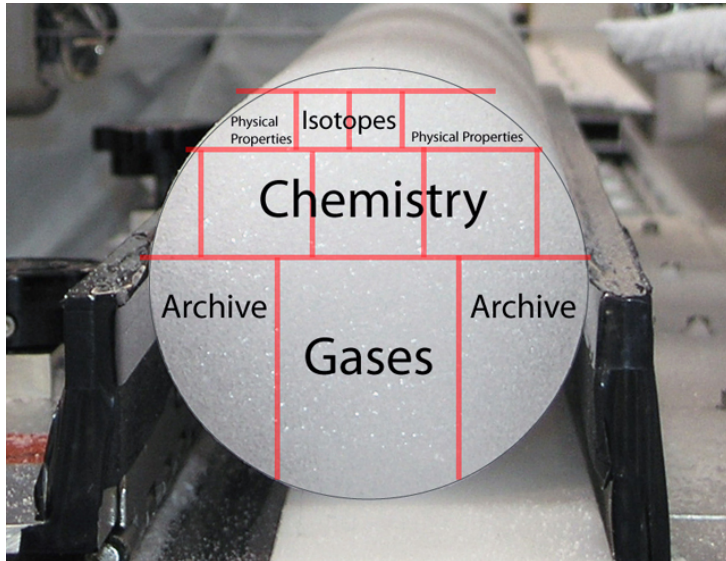
forms the centerpiece of the tour. These demonstrate clearly the extent to which the unbroken lines of the graph and tones of the audio rely on disparate measurements:

	A	B	C	D	E	F
1	Year		Year Markers	Temp Difference	Temp Absolute, (CO2	
2	-801301	1	-801301	-8.9183	5.0817	198.6836
3	-801107	2		-8.5456	5.4544	198.8203
4	-800407	3		-8.6815	5.3185	199.3151
5	-800307	4		-8.7033	5.2967	199.3857
6	-800207	5		-8.7252	5.2748	199.4564
7	-795187	6		-6.2768	7.7232	208.7894
8	-795122	7		-6.1982	7.8018	209.2796
9	-795022	8		-6.1197	7.8803	210.0359
10	-794922	9		-6.0412	7.9588	210.7923
11	-790639	10		-2.7981	11.2019	228.1463
12	-790539	11		-2.7139	11.2861	229.3275
13	-790439	12		-2.6297	11.3703	230.5088
14	-790339	13		-2.5669	11.4331	231.69
15	-788544	14		-0.5527	13.4473	257.1989
16	-787420	15		-1.0438	12.9562	269.356
17	-786254	16		-1.2639	12.7361	262.2298
18	-786254	17		-1.359	12.641	262.2298
19	-786223	18		-1.4541	12.5459	262.111
20	-782793	19		-2.3622	11.6378	257.4363
21	-782594	20		-2.1936	11.8064	256.0373
22	-781627	21		-2.1359	11.8641	257.2103

The tabular form highlights the fact that this graph is a representation of discrete data points, whose condensation into a flowing line is a product of the mathematical imagination.

Although Ice Core Walk does not provide any in-depth background information as to how the data filling this spreadsheet were produced, the curious listener will find the answer only a keyword search away, for instance at <http://icecores.org>, the website of the National Science Foundation Ice Core Facility (formerly National Ice Core Laboratory) in Denver, Colorado. The

site is rich in images: of the archive freezer, of the refrigerated trucks that deliver core samples to the facility, of scientists at work examining cores and distilling them into recorded information. Among the many images appears this one, demonstrating the way in which a given core is divided for use in a range of disciplines:



Here, again, we see the logic of division and categorization at work. Brought to NICL from Antarctica, Greenland, or any number of mountain glaciers around the world, the core has just begun its travels. Already cut into meter-long sections by the time it arrives at the NICL facility, it will be further reduced, its fragments distributed to labs around the world for analysis according to sub-specialization.²⁵ From the phenomenologically rich environment of the glacier itself, the ice passes through a multilayered process of extraction as core, sectioning for storage, subsectioning for differentiated analysis by discipline, and recording into data samples and subsamples that emerge as the spreadsheet displayed above. With each step the ice grows stiller, removed from the

²⁵ As mentioned earlier, these processes include multiple different methods for measuring carbon dioxide, another distinction flattened by the graph's single line tracing carbon levels.

slow flow and sudden ruptures that characterize its material existence, transformed into a set of static information that is frozen, still—more so than any glacial ice ever will be.

And yet that stillness lends itself to a new kind of mobility: the mobility of data transfer and the conceptual connections it enables. It would be simple to view this crystallization of glacial flows into data points simply as a loss, a distancing from the real that renders the historical narrative unreliable. Yet such a reading misses the crucial gains—for science, communication, and historical understanding—that accompany this codification of natural phenomena into numerical tables. The processing of the ice bears a striking resemblance in this regard to the winnowing of Amazon soil samples to a universally coded color chart, as eloquently detailed by Latour in *Pandora's Hope*. Such coding is, Latour notes, a process that transforms its object, but still retains some kind of indexical trace:

Across the variations of matters/forms, scientists forge a pathway. Reduction, compression, marking, continuity, reversibility, standardization, compatibility with text and numbers—all these count infinitely more than adequatio alone...when I read the field report, I am indeed holding in my hands the forest of Boa Vista. A text truly speaks of the world...

We forfeit resemblance, in this model, but there is compensation: by pointing with our index fingers to features of an entry printed in an atlas, we can, through a series of uniformly discontinuous transformations, link ourselves to Boa Vista.²⁶

For Latour, the step-by-step movement from material trace to abstract sign is in a dialectical relationship with meaning: what it loses in direct attachment to locality, it gains in facility of connection and circulation. The transformation of a series of soil samples—deposits of heavy earth arranged in accordance with a theory of knowledge—into a universal numerical code light enough to circumnavigate the world in the blink of an eye, enables the Amazon forest to enter a global discourse: “the threshold between local and global can now be crossed instantaneously.”²⁷ The

²⁶ Latour, “Circulating Reference,” 61; 79.

²⁷ *Ibid.*, 59.

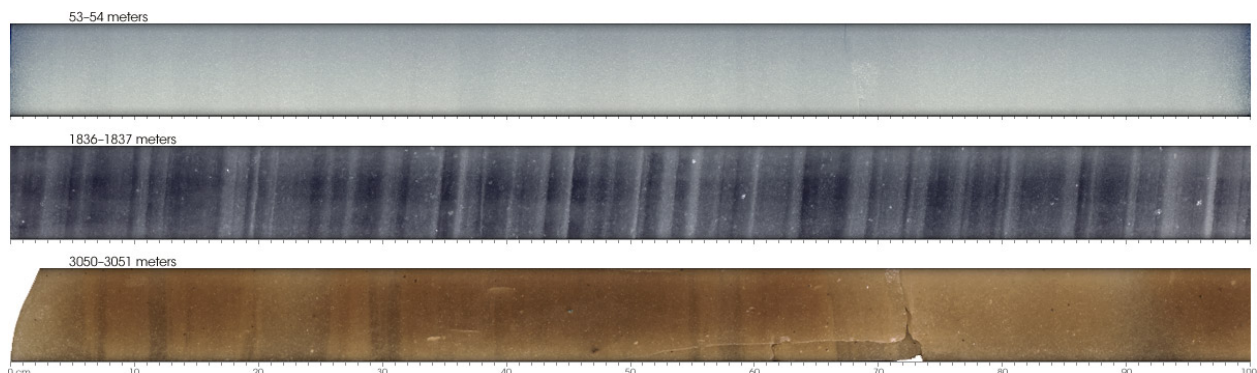
code is a manipulator of scale, an annihilation of space by significance, a mediator across distance that empowers patterns to emerge that reveal global ecosystems at work.

The work of the ice core is similar, though its primary axis of manipulation is not space but time. Extracted from miles beneath the ice, these epochal samples—rendered still by the vastnesses of time and the limits of perception—emerge into a different kind of dynamism. *Ice Core Walk*'s sonic waves re-introduce a sense of fluid motion, not only to data frozen by numeric precision, but to a temporality veiled by scalar alienation. The flow of sound along lines imagined between a plethora of points mobilizes the historical imagination of the glaciological, a Zeno's paradox for an age of catastrophic motion.²⁸ The process of excavation, identification, indexing, and coding of the glacial record lays bare the layers of history, enabling the direct juxtaposition of the present with epochs long past, the sensory apprehension of a period of time that exceeds the limits of unmediated human perception. In this way, it takes to a dizzying extreme the promise heralded by many enthusiastic theorists at the advent of cinema: the preservation of previous eras, their availability for examination, and the historical consciousness that this inspection inspires. Recall from the first chapter of this dissertation the rapture elicited by *With Byrd at the South Pole*, which led a newspaper reviewer to contemplate "the gloriously enlarged thing that the study of history is to become in the future, when all the high points in man's story of achievement are recorded in this fashion. What would it mean to us today had there been a motion picture photographer in the crew of the *Santa Maria*!"²⁹ The author revels in the idea of visiting historical moments that were once lost and which now are on the analytic itinerary due to the support of mediation. This

²⁸ Zeno's paradox, a classical text on the relationship between the senses and the nature of motion, is a common trope for philosophers of time and the cinema, not least Henri Bergson who famously rejected cinema's "spatialization of time." See, for example, the final chapter of Bergson, *Creative Evolution*, Arthur Mitchell (trans.) (Dover, 1998).

²⁹ "With Byrd at the South Pole," *Christian Science Monitor*, 3 July 1930, Box 326, Admiral Richard E. Byrd Papers. The ice core "enlarges" history, indeed—to the tune of 800,000 years!

is, of course, precisely the seduction of the archive: the promise of time travel, of impossible sequences, of the past brought to life. In transforming the spreadsheet into an electronic aria, Ice Core Walk re-animates the past in much the same way that the cinema does: by creating a sense of movement from a series of stilled moments, restoring to motion what has been captured and frozen.



The ice core (which, from certain angles, even resembles a film strip) is thus a media technology which, like the cinema, has the power to induce historical consciousness through temporal intervention and rearrangement. Projected through a digital-scientific apparatus of measurement, tabulation, and sensory presentation, it resurrects the long dead, inviting a sense of continuity with unreachable pasts and unimaginable futures. And yet, while resonant with the cinema in its capacity to reframe temporal consciousness, the ice core is of course crucially different, particularly in its material relationship to the past. Unlike film, which represents the moments to which it bears witness by means of trace and projection, the ice core, in a very real sense, is that which it narrates. The air bubbles and chemical elements, volcanic ash and ancient plant matter are not simple drawings made by the light; they are physically present. Indeed the ice itself, the vehicle for all these stored tidbits, is not just a record of the environment; it is a part of

it, a relic that is as much historic artifact as historiographical tool. What's more, the ice core can only be "read" through a process of destruction: the already disruptive act of slicing the core from the glacier is compounded by sectioning and analysis. The air bubbles that provide a record of past greenhouse gases, whose residency in the ice layers points the way most clearly to the archival conception of the ice, "are extracted by melting, crushing or grating the ice in a vacuum."³⁰ The reading of the leaden "ledger" of the Roman economy meant liquefying it and removing its component parts. Imagine a film that could only be watched by igniting the celluloid, or a book that required pages be shredded in order to be read. The ice core's archival specificity might be said to inhere in this tension between addition and reduction, in which the sum total of historical knowledge comes at the cost of negating the very object it seeks to understand.

Watching, Melting, Looming, Racing: The Glacier as Index of Climate Change

The peculiar dialectic between material loss and informational gain extends beyond the glacier's archival address to another mode in which it acts as a media form: namely, its role as a visual index of global warming. Here, too, the ice works most often in constellation with a host of computational technologies and digital effects, to produce a visceral sense of climatic changes that hover just outside the range of the human sensory apparatus. We have seen this effect already in the time-lapse videos deployed by *Chasing Ice*, treated as "forensic evidence" of hidden changes in climatic conditions. One function of time-lapse in these videos is to drag the temporality of glacial disintegration forcibly into the present, to give the sense, as stated by James Balog, that "geology is happening now." The time-lapse video sets the ice to flowing, its movement a persistently present

³⁰ Bethan Davies, "Ice core basics," *AntarcticGlaciers.org*, 1 September 2015.

address, a concern with the immediacy of loss and change. With the collapse of the ice suddenly pressing down on every moment, the barely perceptible change of one or two degrees of air temperature becomes dramatically visible, an addition-by-subtraction of a sense of meteorologic flux.

The videos of the *Extreme Ice Survey* are in good company; across contemporary visual culture, and particularly in popular climate reporting in venues like *The National Geographic* and *The New York Times*, glacial melt has become the primary visual signifier of global warming. The flow of water and rupture of the calving face act as a material measure of rising temperatures whose effects register much more sensibly on glacial firn than human skin. Of course, that sensibility relies on processes of mediation that can intervene in the scalar challenges of glacial space and time, optimizing them for human vision and cognition. In a striking example from May 2017, a team of reporters, scientists and data visualization specialists collaborated on a three-part series of “Antarctic Dispatches,” which make clear not only the role of glacial ice as a bellwether for climate change, but also the markedly present-tense address of this mode of glacial mediation.³¹ The headline of the first dispatch, entitled “Miles of Ice Collapsing into the Sea,” signals with its gerund the contemporaneousness, and also continuity, of what it describes. The collapse of the ice is an ongoing process, one that is as immediate as it is immense. The centerpiece of the article is a data visualization that operates similarly to the gerund on a visual level: on an image of the Antarctic continent presumably produced by way of satellite photography, fine lines in shades varying from seafoam green to periwinkle blue appear to flow from the center of the map to the slate blue background that represents the ocean and seas surrounding Antarctica. (The image

³¹ Justin Gillis, “Antarctic Dispatches,” *The New York Times*, 18 May 2017, <https://www.nytimes.com/interactive/2017/05/18/climate/antarctica-ice-melt-climate-change.html>.

included below does not reproduce this motion; to see the lines in action, visit

<https://www.nytimes.com/interactive/2017/05/18/climate/antarctica-ice-melt-climate-change.html>

(. Drawing on a data set that shows the velocity of ice in different locations on the continent, the lines are animated by way of color cycling, a process in which individual pixels shift in color over the course of a given time. In this case, the timing of the shift bears a direct relationship to the relative velocity of the ice in a given location. To the careful viewer, the lines present a visualization of the differentiated speed of ice across the Antarctic continent; but it is unmistakable that all of it is moving.



In this article, the visualization itself is an important mediator between the apparent stillness of the ice and the relatively rapid motion that makes it newsworthy. As explained by the data visualizations editor for the *New York Times*, “we tend to think of the continent [Antarctica] as static and unchanging, but most of its ice is in constant motion, crawling downhill towards the sea.”³² Indeed, the three-article series itself makes explicit reference to the disjuncture between the dynamic reality of the ice shelf and its apparent motionlessness, celebrating how measurement can rupture “the illusion that the ice [is] just a flat, boring pancake.”³³ The visualization shown above, with its writhing lines layered on the “pancake” of white ice, smearing its surface with a sense of almost cataclysmic change, exemplifies how data can be put to work to reveal hidden truths. Here, the data-driven animation is a medium that reveals the hidden motion of the ice. But there is also another layer of mediation at work, one that is crucial for the stakes of the article’s argument: that, of course, is the story being told by the ice itself. These “dispatches”—an elegant term for instant messages—are not interested in the melting of the ice *per se*. They are interested in what it says about the even harder-to-access elements surrounding it: the warming air and seas, vehicles for the catastrophes of climate change. The “miles of ice collapsing into the sea” are an ongoing measurement of atmospheric and oceanic temperatures—and, when correlated with further data sets, of human culpability in these changes. They are also a material threat in and of themselves, as made clear by the title of the second dispatch: “Looming Floods, Threatened Cities.”³⁴ Another ground, another sense of immediacy, presentness—both spatial and temporal—of the activity of

³² Derek Watkins, “How We Animated Trillions of Tons of Flowing Ice,” *Derek Watkins*, <http://dwtkns.com/posts/flowing-ice.html>, 13 June 2017.

³³ Gillis, “Antarctic Dispatches.”

³⁴ *Ibid.* This juxtaposition, of the city held in thrall by the unstoppable motion of nature, turns the modernist conception of the dynamic city and eternal landscape entirely on its head (see Chapter Two of this dissertation especially).

nature, set against the passivity of civilization, frozen here into a helpless past participle. In the face of this impending doom, we are, the third dispatch announces, “Racing to Find Answers in the Ice.” The series throws us into a struggle against time, checking our progress against the clock as each second ticks by. As a mediator of climate conditions, the melting glacier provokes a rhetoric of simultaneity and urgency that seems a far cry from the meditative musings of historians who rely on it as a source of archival wisdom.

This communicative capacity of the ice itself, unfiltered through any digital or cinematic device, has been put prominently to work in recent years. The conceptual artist Olafur Eliasson—a familiar name on the biennial circuit for his large-scale installations that reconfigure sensory experience—drew on glacial ice for a piece that accompanied the COP 21 UN Climate Summit of 2015.³⁵ Entitled “Ice Watch,” Eliasson’s artwork consisted of twelve icebergs calved from the Greenland ice sheet, retrieved from the north Atlantic and arranged in a circle 20 meters in diameter in the Place Panthéon in Paris. Over the course of eleven days, the fragments, up to nearly ten tons in weight, gradually melted to puddles while people looked on, touched, danced, listened, or simply passed by. The dodecagonal form of Ice Watch serves as a nod to the dual meaning of “watch”: the installation is both spectacle and timepiece, an index of rising temperatures and of fleeting seconds. Observers are invited to watch the ice, which itself watches time—the increasingly urgent time of climate change. By bringing the ice to Paris, Eliasson sought to “make something that may have previously seemed quite abstract into reality...Ice Watch makes

³⁵ See <http://icewatchparis.com>. In fact, the Paris installation was the second appearance of this piece (though for reasons that will become obvious, the materials shifted); it debuted in Copenhagen the year before, during the writing of the IPCC climate report in that city. See Cynthia Zarin, “The Artist who is Bringing Icebergs to Paris,” *The New Yorker*, 5 December 2015, <https://www.newyorker.com/culture/culture-desk/the-artist-who-is-bringing-icebergs-to-paris>.

the climate challenges we are facing tangible.”³⁶ In this sense, the piece also plays on multiple meanings of the term “present”: sharing space with the people who use their eyes, ears, and skin to take it in, and continuously reflecting the temporal present, melting away in immediate reaction to its new surroundings. Of course, the piece relies for its effect on the situational context of those surroundings: a climate summit aimed at coming to an international accord to prevent the menace to civilization represented by climate change (the “threatened cities” of the Antarctic dispatches). It assumes knowledge on the part of the observer, their ability to understand these remnants of the ice sheet as a synecdoche for all the ice, and most of the freshwater, on the entire planet. In this way, it too is part of a much larger media constellation dedicated to grappling with the complexities of climate change, including the challenge of incommensurate time scales.³⁷



At first blush, *Ice Watch* seems quite different from data visualizations like the “Antarctic dispatches” that circulate in the popular press. And from the perspective of materials, it is: rather than a data-based representation of the ice’s activity that relies on a series of abstractions, it presents that activity itself in concrete form for direct sensory apprehension. It does not

³⁶ *Ice Watch*, <http://icewatchparis.com>.

³⁷ Although it doesn’t involve any mathematical calculations, there is scalar manipulation at work in Eliasson’s piece, as well: the smaller an iceberg, the faster it will melt, due to the increased ratio of surface area to mass. The hour markers of *Ice Watch*, therefore, are adjusted to accommodate the scale of human senses of time and space alike.

manipulate the speed of the ice for visual effect (unless, of course, one counts transporting the bergs to a relatively warmer, and landlocked, location where they would never have made it on their own). The piece does not deal in information or knowledge, but, as explained in an accompanying essay co-authored by Eliasson and geologist Minik Rosing, in “emotional and physical experience.”³⁸ Yet belying these differences in approach are several commonalities that can begin to clarify a broader understanding of how glacial ice mediates climate change. First, both *Ice Watch* and the *Antarctic Dispatches* are deeply invested in the evidentiary status of the ice.³⁹ Like the body of a victim of organized crime, glaciers are both materially affected by climate change, and serve as signifiers, embodying a record that points beyond themselves to much larger forces at work. This understanding preoccupies both the *New York Times* reporting team and Eliasson, who rely on the evidence of glacial collapse to signal broader and more complex conditions. Yet both projects are haunted by a tension at the heart of this signifying operation: this is a presentation that functions by way of disappearance. The presence (and present) of climate change becomes visible through the erosion (the becoming-absent) of the ice. To put it in semiotic terms, the glacier is possessed of a confounding indexicality: it traces shifting temperatures by vanishing without a trace. Data visualizations and *Ice Watch* alike offer supplements to address this problem: recorded measurements, flowing lines on the page in the first case, and human sense memory in the second. Yet both seem caught in a dangerous trap: if the truth of climate change inheres in vanishing glaciers, how can the message come across while any ice remains?

³⁸ Minik Rosing and Olafur Eliasson, “Ice, Art, and Being Human,” http://olafureliasson.net.s3.amazonaws.com/subpages/icewatchparis/press/Ice_Watch_Essay_OE_MR.pdf, n.d.

³⁹ Here, we might again recall James Balog’s appeals to EIS time-lapse videos as “forensic evidence” of climate change.

This question points to a third set of similarities that characterize these two deployments of glacial melt as a form of mediation, namely their temporal address. As described above, both deal in a persistent present tense: the ice *is melting*, the shelf *is collapsing*, floods *are looming*, scientists *are racing*, lines *are flowing*. The constantly changing ice—whether presented in material form or represented as flowing lines of animated data—shores up this sense of insistent motion, and the risks of looking away. To ignore the melting ice is to lose it forever, to miss the chance to inscribe it in machine or human memory before it disappears completely. Embedded in this impulse to inscribe, and raising the stakes of capturing the elusive present, is an orientation toward the future, a future that seems increasingly immediate. For all the glacier’s embodiment of the living present, it haunts the observer with another implied time: “act now,” the pieces say, “before it is too late.” Now is defined in contrast to the “too late” future where we are precipitously headed (though of course the confusing temporality of climate change causality produces the nagging concern that we may already have arrived there). Ice Watch is a countdown clock to the moment of too late, when all the glaciers, and the freshwater within them, will have flowed into the saline sea. The competitor going up against the scientists dispatched to Antarctica in their race for data is the melting ice itself. And in a race, while the present moment is surely quite exciting, meaning is derived from an expectant sense of the imminent future, the question of who will cross the finish line first, and when.

A Future without History: The Glacier as Doomed Oracle

Such an intimate relationship with futurity is a central property of the glacier as a medium. Whether being read as an archive of past climate information, or an up-to-date report on current

conditions, the glacier signifies not only in terms of what it says about yesterday or today, but also as a tale of tomorrow. Certainly, as discussed in Chapter Three, every archive is haunted by the future, to the extent that its value obtains in its usefulness to future researchers who come back to retrieve what is stored, and to understand the path taken to any given moment in time.⁴⁰ But in the context of global climate change, appeals to the glacial past bear a disproportionately heavy burden of curiosity about what is to come. Accessed through the ice core, the glacial archive serves the future imaginary in two ways: first, it is put to work to build trajectories, like those traced by the graphs described in the first section of this chapter, that might indicate what is next for the global climate. Second, and more intriguingly, it is used to confirm the validity of global climate models that draw on comprehensive input sources—from air, earth, water, and even reanalysis of data itself.⁴¹ This situation arises from a historical peculiarity, namely the ongoing move from an era of remarkable climate equilibrium to one that is significantly less stable. The period of detailed meteorological record keeping—roughly the last 150 years, give or take a few—provides no examples of the kinds of conditions most scientists expect to arise in the coming centuries; but the glacial archive does.⁴² Records from periods of elevated temperatures and carbon dioxide levels can be

⁴⁰ Paula Amad phrases this elegantly when she writes, “The archive bets on its indispensability not only to the present, (so-to-be-past), but, more importantly, to the future, in the hope that its salvaged documents will be remembered, consulted, and studied.” Amad, *Counter-Archive*, 1.

⁴¹ For a comprehensive explanation of how climate modelling works, especially the process of reanalysis, in which datasets from different inputs are combined to create a more comprehensive picture of the global climate, see Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge: MIT Press, 2010).

⁴² There are limits. At least as far as current research goes, at no point in the glacial record are there periods to be found in which carbon dioxide has exceeded roughly 300 parts per million until after the beginning of industrialization (currently, global carbon dioxide levels measure around 408ppm). Additionally, for obvious reasons, the ice holds no information about a completely ice-free world.

used to confirm the validity of projections for the next several hundred years, transforming the past into a sort of funhouse mirror of the future.⁴³

Although the projections developed from and tested against this icebound information are themselves often deeply unsettling, there is a certain comfort derived from the ability to project and predict at all. To know is to control, in the good Western tradition, and it is an oft-repeated notion that knowing about climate change can help us to prepare for it, or even to forestall its very arrival.⁴⁴ This common refrain greets us everywhere, despite a distinct lack of evidence to back it up. But not every instance of glacial futurity offers similar solace. Present-tense accounts focused on ongoing melt, like the “Antarctic dispatches” and “Ice Watch,” are fraught with the anxiety of uncertainty. “To predict how quickly this vulnerable ice could raise sea levels,” the *New York Times* frets, “scientists need better data than they have now.”⁴⁵ The article offers a few possibilities—a 160-foot sea-level rise accompanying the collapse of the Antarctic ice sheet being the most alarming—but very little conclusive information about precisely how or when this might occur. The only thing that is presented as clear is the risk (itself a category of such epistemological complexity that an entire industry has been built around calculating it). Similarly, “Ice Watch” offers little beyond the sense experience of cryospheric loss: all that is solid melting into a puddle at your feet—or an ocean that is quite suddenly at your front door, as Eliasson hopes the viewer will infer. In the urgency of witnessing change, any sense of certainty over what is being changed *to* goes by the wayside. Instead of just dangerous, the future seems both perilous and ultimately unknowable. It also seems immediate, waiting for us at the end of the finish line in the race scientists run for

⁴³ See, for example, “Ice Core Studies Confirm Accuracy of Climate Models,” *Science Daily*, <https://www.sciencedaily.com/releases/2008/09/080911150048.htm>, 15 September 2008.

⁴⁴ Indeed, this is the central premise of the Extreme Ice Survey, which seeks to provoke action through communication.

⁴⁵ Gillis, “Looming Floods.”

information—information, it bears noting, that may well prove unable to save us. In the chaos of constant motion, a stable endpoint, no matter how terrible, becomes difficult to grasp.

But the true terror lies, I think, in the synthesis of these competing perspectives on the future. The polyvalent nature of the glacier—signifier and signified, medium and material, archive and index—refracts and multiplies the historical significance of its disintegration. Even as scientists, journalists, artists and historians draw on the glacial archive to project and understand a future world, the storehouse of knowledge itself is crumbling. The very record that helps us to predict extreme warming will be erased should these predictions prove true; indeed, its erasure is one of the primary ways we assure ourselves that these forecasts are correct. Thus the future world an increasing number of experts predict—one perched between the overwhelming fullness of flooding seas and the austere desolation of barren mountaintops—will also lack the resources to explain how we (if any we remains) arrived at this abject place.⁴⁶ For it turns out that nature’s perfect record-keeper has a sinister secret: creeping across the land, carving out valleys and smoothing peaks, the glacial surface clears the geologic record nearly as efficiently as its depths store one.⁴⁷ Like a library whose building requires the clearing of an ancestral burial ground, the glacier holds a history of nearly unfathomable complexity that comes at the cost of legible remnants that lie beyond its walls. Aided by gravity, the glacier clears a path for frozen chronicles; but when the ice melts, the past melts with it. This is the glacier’s last laugh: the story it tells ends in the erasure of its own mode of storytelling. With its prophecy of archival loss, it proclaims a future without history, in which all the infrastructures of knowledge on which we now rely have gone the way of the burning sun.

⁴⁶ A widely-reported 2018 study, published in *Nature Geoscience*, predicts even worse climate change effects than expected. See Hubertus Fleischer, Katrin J. Meissner, and Liping Zhou, “Paleoclimate constraints on the impact of 2° C anthropogenic warming and beyond,” *Nature Geoscience* Vol. 11 (2018), 474-485.

⁴⁷ See Sharp, *Living Ice*, 177: “An ice sheet destroys its own growth record as it expands and advances.”

What a treatment of the glacier as a process of mediation thus makes clear is that the ongoing crisis of climate is also a crisis of epistemology.⁴⁸ As we begin to run up against the material limits of this planet, we are faced with the prospect that knowledge itself—conceived as we in the West have understood it—may be a resource just as finite as oil, water, or lithium.⁴⁹ For what undergirds each of the primary conceptual frameworks I have examined in this chapter, the glacier as both archive and weathervane, are logics of extraction and accumulation, storage and exchange, that are also essential to the political economy that has driven the world to the brink of ecological collapse. The same impulse toward stockpiling that makes more knowledge feel more powerful causes panic at the thought—or sight—of measurable loss. As a medium, the glacier provides a graphic demonstration of how material reality cleaves to quantitative representation, resisting alienation and mocking the aloofness of abstraction. But it should not therefore be understood as some kind of mystical exception; rather, the glacier is exemplary. It serves as a symbol of the persistence of environmental consequence, a reminder that there is no outside to the global ecosystem. In highlighting the imbrication of accumulation with obliteration, it also makes a clear case for the danger of believing that hoarding more knowledge can save us, that circulating answers equals finding solutions, that energy spent on perfecting information extraction will power anything other than, at best, a heightened awareness of our inevitable demise. Ultimately, the

⁴⁸ Epistemological crisis is central to many touchstones of academic literature on the Anthropocene, including Chakrabarty of course, but also Jamie Lorimer's *Wildlife in the Anthropocene: Conservation after Nature* (Minneapolis: University of Minnesota Press, 2015); Anna Tsing's *The Mushroom at the end of the World* (Princeton: Princeton UP, 2017); and Christophe Bonneuil and Jean-Baptiste Fressoz's *The Shock of the Anthropocene* (New York: Verso, 2017), to name a few.

⁴⁹ Certainly, the energy resources devoted to running the server farms that store all that data derived from environmental analysis, and to running the supercomputers that produce climate models, are enough to suggest that information comes at a hard-won price.

truth most clearly indexed by the glacial medium is that the same path that led us into danger will not prove a suitable way back out. And as it grows increasingly easy to imagine the end of the world, the work of establishing alternative bases—for living, apprehending, knowing—seems the only conceivable way forward.

Bibliography

Archival Holdings

Admiral Richard E. Byrd Papers, SPEC.PA.56.0001. Byrd Polar and Climate Research Center, The Ohio State University, Columbus, Ohio.

Books, Articles, and Artworks

Anderson, Benedict. *Imagined Communities*. New York: Verso Books, 1983.

Andrejevic, Mark. *Infoglut: How Too Much Information Is Changing the Way We Think and Know*. New York and London: Routledge, 2013.

Anon. "Filmkritik: SOS Iceberg." *Der Film-Kurier*, August 31, 1933.

Amad, Paula. "From God's-eye to Camera-eye: Aerial Photography's Post-humanist and Neo-humanist Visions of the World," *History of Photography* 36, no.1 (2012): 66-86.

Ames, Eric. *Ferocious Reality: Documentary According to Werner Herzog*. Minneapolis: University of Minnesota Press, 2012.

Baer, Nicholas. "Natural History: Rethinking the *Bergfilm*." In "*Der Wunderliche Realist*" – *Studien zu Siegfried Kracauer*, edited by Jörn Ahrens et al. Berlin: Springer Verlag, 2016, 279-305.

Balázs, Béla. "Reel Consciousness." Translated by Christopher M. Geissler. In Kaes, Baer, and Cowan, 58-60. Oakland: University of California Press 2016.

Balázs, Béla. "The Case of Dr. Fanck." Translated by Alex H. Bush. In Kaes, Baer, and Cowan, 68-70.

Bäumer, Eduard. "Cinematograph and Epistemology." Translated by Sara Hall. In *The Promise of Cinema*, 78-81.

Bazin, André. *What Is Cinema? Volume I*. Translated and edited by Hugh Gray. Berkeley: University of California Press, 1967.

Becker, Andreas. *Perspektiven einer anderen Natur: Zur Geschichte und Theorie der filmischen Zeitraffung und Zeitdehnung*. Bielefeld: Transcript Verlag, 2004.

Benjamin, Walter. "The Work of Art in the Age of its Technological Reproducibility: Second Version." In *The Work of Art in the Age of its Technological Reproducibility and Other Writings on Media*. Translated by Edmund Jephcott et. al. Cambridge, MA: Belknap Press of Harvard UP, 2008.

Bergson, Henri. *Creative Evolution*. Translated by Arthur Mitchell. Mineola, NY: Dover, 1998.

- Bloom, Lisa. *Gender on Ice: American Ideologies of Polar Expeditions*. Minneapolis: University of Minnesota Press, 1993.
- Bloom, Lisa and Elena Glasberg. "Disappearing Ice and Missing Data: Climate Change in the Visual Culture of the Polar Regions." In *Far Field: Digital Culture, Climate Change, and the Poles*, edited by Jane D. Marsching and Andrea Polli. Bristol: Intellect Press, 2012.
- Bonneuil, Christophe and Jean-Baptiste Fressoz. *The Shock of the Anthropocene*. New York: Verso, 2017.
- Borges, Jorge Luis. *The Total Library: Non-Fiction 1922–1986*. Translated by Eliot Weinberger. London: The Penguin Press, 2000.
- Brauner, Ludwig. "Cinematographic Archives" [1908]. Translated by Alex H. Bush. In *The Promise of Cinema: German Film Theory 1907-1933*, edited by Anton Kaes, Nicholas Baer, and Michael Cowan, 74-77. Oakland: University of California Press, 2016.
- Breuer, Robert. "The Film of Factuality." Translated by Tara Hottman. In *The Promise of Cinema*, 444-447.
- Byrd, Richard. *Little America*. New York and London: G. P. Putnam's Sons, 1930.
- Cartwright, Lisa. *Screening the Body: Tracing Medicine's Visual Culture*. Minneapolis: University of Minnesota Press, 1995.
- Chakrabarty, Dipesh. "The Climate of History: Four Theses." *Critical Inquiry* 35.2 (Winter 2009), pp. 197-222.
- Cosgrove, Denis. *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination*. Baltimore: Johns Hopkins University Press, 2003.
- Craig, Douglas B. *Fireside Politics: Radio and Political Culture in the United States, 1920-1940*. Baltimore: Johns Hopkins UP, 2005.
- Crary, Jonathan. *Techniques of the Observer*. Cambridge, MA: MIT Press, 1992.
- Paul J. Crutzen, "Geology of Mankind," *Nature* Vol. 415 (January 2002), <http://nature.com>.
- Cubitt, Sean. "Everybody knows this is Data Visualisation and Ecocriticism." In *The Ecocinema Reader: Theory and Practice*, edited by Stephen Rust, Salma Monani and Sean Cubitt, 277-296. New York: Routledge/American Film Institute, 2012.
- Davies, Bethan. "Ice core basics." *AntarcticGlaciers.org*. 1 September 2015.

- Derrida, Jacques. *Archive Fever: A Freudian Impression*. Translated by Eric Prenowitz. Chicago & London: University of Chicago Press, 1995.
- Doane, Mary Ann. *The Emergence of Cinematic Time: Modernity, Contingency, the Archive*. Cambridge, MA: Harvard UP, 2002.
- Dyson, James L. *The World of Ice*. New York: Alfred A. Knopf, 1962.
- Edwards, Paul N. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. Cambridge, Mass.: MIT Press, 2010.
- Eliasson, Olafur. *Ice Watch*. <http://icewatchparis.com>.
- Ernst, Wolfgang. "From Media History to Zeitkritik." *Theory Culture & Society*, vol. 30 no. 6 (November 2013): 132-146.
- Fanck, Arnold. *Der Kampf mit dem Berge*. Berlin: Verlag von Reimar Hobbing, 1931.
- Fanck, Arnold. *SOS Eisberg: Mit Dr. Fanck und Ernst Udet in Grönland*. Munich: Verlag F. Bruckmann AG, 1933.
- Feld, Hans. "Filmkritik: Der Fanck-Film der Aafa. Stürme über dem Monblanc," *Der Film-Kurier*, February 3, 1931.
- Fleischer, Hubertus, Katrin J. Meissner, and Liping Zhou. "Paleoclimate constraints on the impact of 2° C anthropogenic warming and beyond." *Nature Geoscience* Vol. 11 (2018): 474-485.
- Freud, Sigmund. *Beyond the Pleasure Principle*. Translated by James Strachey. New York: W. W. Norton & Co., 1961.
- Gaycken, Oliver. *Devices of Curiosity: Early Cinema and Popular Science*. Oxford: Oxford UP, 2015.
- Gillis, Justin. "Antarctic Dispatches." *The New York Times*. 18 May 2017. <https://www.nytimes.com/interactive/2017/05/18/climate/antarctica-ice-melt-climate-change.html>.
- Glasberg, Elena. *Antarctica as Cultural Critique: The Gendered Politics of Scientific Exploration and Climate Change*. New York: Palgrave MacMillan, 2012.
- Grrls scientist, "How do ice cores allow researchers to see climate change?" *The Guardian*, <http://theguardian.com>, 12 May 2011.
- Gunning, Tom. "The Cinema of Attractions: Early Film, its Spectator and the Avant-Garde." *Wide Angle*, vol. 8, nos. 3 & 4 (1986).

- Gunning, Tom. "Moving Away from the Index." *differences*, Vol. 18, No. 1 (2007): 29-52.
- "How are past temperatures determined from an ice core?" *Scientific American*. 20 September 2004. <https://www.scientificamerican.com>.
- Häfker, Hermann. "Cinema and Geography: Introduction" [1914]. Translated by Nicholas Baer. In Kaes, Baer, and Cowan, 51-52.
- Hillis, Ken. "Modes of Digital Identification." In *New Media, Old Media*, edited by Wendy Hui Kyung Chun and Thomas Keenan. New York: Routledge, 2005.
- "Ice Core Studies Confirm Accuracy of Climate Models." *Science Daily*. 15 September 2008. <https://www.sciencedaily.com/releases/2008/09/080911150048.htm>.
- Kaes, Anton, Nicholas Baer, and Michael Cowan, eds. *The Promise of Cinema: German Film Theory 1907-1933*. Oakland: University of California Press, 2016.
- Kern, Stephen. *The Culture of Time and Space*. Cambridge, MA: Harvard UP, 2003.
- Kittler, Friedrich. *Gramophone, Film, Typewriter*. Translated by Geoffrey Winthrop-Young. Palo Alto: Stanford University Press, 1999.
- Koerber, Lili-Anne. "'See the Crashing Masses of White Death': Greenland, Germany, and the Sublime in the 'Bergfilm' SOS Eisberg." In *Films on Ice: Cinemas of the Arctic*, edited by Anna Westerdahl Stenport and Scott MacKenzie. Edinburgh: Edinburgh UP, 2016.
- Koerner, Joseph. *Caspar David Friedrich and the Subject of Landscape* [1990], 2nd. Ed. London: Reaktion Books, 2009.
- Kracauer, Siegfried. *From Caligari to Hitler*. Princeton: Princeton UP, 1947.
- Kracauer, Siegfried. *History: The Last Things Before the Last*. Edited by. Princeton: Markus Wiener Publishers, 1969.
- Kracauer, Siegfried. "Mountains, Clouds, People," trans. Nicholas Baer. In Kaes, Baer, and Cowan, 97-98.
- Kracauer, Siegfried, "Photography." Translated by Thomas Y. Levin. *Critical Inquiry* vol. 19, no. 3 (Spring 1993): 421-436.
- Kracauer, Siegfried. *Theory of Film: The Redemption of Physical Reality*. Princeton: Princeton University Press, 1997.

- Kurgan, Laura. *Close Up at a Distance: Mapping, Technology and Politics*. Cambridge, MA: MIT Press, 2013.
- Levenson, Thomas. *Ice Time: Climate, Science, and Life on Earth*. New York: Harper & Row, 1989.
- Langway, Chester C. "The History of Early Polar Ice Cores." EDRC / CRREL TR-08-1, January 2008.
- Latour, Bruno. "Why has Critique Run out of Steam?" *Critical Inquiry* 30 (Winter 2004): 225-248.
- Lorimer, Jamie. *Wildlife in the Anthropocene: Conservation after Nature*. Minneapolis: University of Minnesota Press, 2015.
- Lundemo, Trond. "In the Kingdom of Shadows." In *The YouTube Reader*, edited by Pelle Snickars and Patrick Vonderau. Stockholm: The National Library of Sweden, 2010.
- MacDonald, Scott. *The Garden in the Machine*. Berkeley: University of California Press, 2001.
- Malkowski, Jennifer. *Dying in Full Detail: Mortality and Digital Documentary*. Durham: Duke UP, 2017.
- Masco, Joseph. "The Six Extinctions: Visualizing Planetary Ecological Crisis Today." In *After Extinction*, edited by Richard Grusin, 71-105. Minneapolis: University of Minnesota Press, 2018.
- Melcher, Gustav. "On Living Photography and the Film Drama." Translated by Alex H. Bush and Jon Cho-Polizzi. In Kaes, Baer, Cowan, 17-20.
- Mirzeoff, Nicholas. "Visualizing the Anthropocene." *Public Culture* 26, no. 2 (2014): 213-232.
- Moltke, Johannes von. "Evergreens: The *Heimat* Genre." In *The German Cinema Book*, edited by Erica Carter, Tim Bergfelder, and Deniz Göktürk. London: BFI, 2002.
- Morris, Christopher. *Modernism and the Cult of Mountains: Music, Opera Cinema*. Oxon and New York: Routledge, 2016.
- Mulvey, Laura. *Death 24x a Second: Stillness and the Moving Image*. London: Reaktion Books, 2006.
- Nenno, Nancy. "'Postcards from the Edge': Education and Tourism in the German Mountain Film." In *Light Motives: German Popular Film in Perspective*, edited by Randall Halle and Margaret McCarthy, 61-84. Detroit: Wayne State UP, 2003.
- Newhall, Beaumont. *The Airborne Camera: The World from the Air and Outer Space*. New York: Hastings House, 1969.

- Nuttall, Mark. *Arctic Homeland: Kinship, Community and Development in Northwest Greenland*. Toronto: University of Toronto Press, 1992.
- Orr, Christopher. "The Movie Review: 'Grizzly Man.'" *The Atlantic*, January 10, 2006. <https://www.theatlantic.com/entertainment/archive/2006/01/the-movie-review-grizzly-man/69418/>.
- Parikka, Jussi. *A Geology of Media*. Minneapolis: University of Minnesota Press, 2015.
- Parks, Lisa. *Cultures in Orbit*. Durham: Duke University Press, 2005.
- Parks, Lisa. "Satellite Views of Srebrenica: Tele-visibility and the Politics of Witnessing." *Social Identities*, vol. 7, no. 4 (2001): 585-611.
- Peirce, Charles Sanders. *The Essential Peirce: Volume 2*. Edited by Nathan Houser and Christian Kloesel. Bloomington: Indiana University Press, 1998.
- Peters, John Durham. "Proliferation and Obsolescence." In *Cultures of Obsolescence: History, Materiality, and the Digital Age*, edited by Babette B. Tischleder and Sarah Wasserman, 79-96. New York: Palgrave MacMillan, 2015.
- Peters, John Durham. "Recording Beyond the Grave: Joseph Smith's Celestial Bookkeeping." *Critical Inquiry* no. 42 (2016): 842-864.
- Rapp, Christian. *Höhenrausch: Der deutsche Bergfilm*. Vienna: Sonderzahl Verlagsgesellschaft, 2007.
- Rentschler, Eric. "The Mountains and Modernity," *New German Critique* 51 (1990): 137-161.
- Richter, Hans. "New Means of Filmmaking." Translated by Nicholas Baer. In *The Promise of Cinema*, 472-474.
- Riefenstahl, Leni. *Kampf in Schnee und Eis*. Leipzig: Hesse & Becker Verlag, 1933.
- Rony, Fatimah Tobing. *The Third Eye: Race, Cinema, and Ethnographic Spectacle*. Durham: Duke UP, 1996.
- Rosen, Philip. *Change Mummified*. Minneapolis: University of Minnesota Press, 2001.
- Rosing, Minik and Olafur Eliasson, "Ice, Art, and Being Human," http://olafureliasson.net.s3.amazonaws.com/subpages/icewatchparis/press/Ice_Watch_Essay_OE_MR.pdf, n.d.
- Schivelbusch, Wolfgang. *The Railway Journey*. Berkeley: University of California Press, 1986.

Sconce, Jeffrey. *Haunted Media: Electronic Presence from Telegraphy to Television*. Durham, NC: Duke UP, 2000.

Shabecoff, Philip. "Global Warming Has Begun, Expert Tells Senate." *New York Times*, June 24, 1988. A14.

Shackleton, Ernest. *South: The ENDURANCE Expedition [1921]*. New York: Signet Books, 1999.

Sharp, Robert P. *Living Ice: Understanding Glaciers and Glaciation*. Cambridge, UK: Cambridge University Press, 1988.

Simmel, Georg. "Die Alpen." In *Philosophische Kultur: Gesammelte Essays von Georg Simmel*. Leipzig: Alfred Körner Verlag, 1919.

Simmel, Georg. "Metropolis and Mental Life" [1903]. In *The Blackwell City Reader*, edited by Gary Bridge and Sophie Watson, 11-19. Oxford and Malden, MA: Wiley-Blackwell, 2002.

Sontag, Susan. "Fascinating Fascism." *The New York Review of Books*. February 6, 1975.

Sorge, Ernst. *With 'Plane, Boat and Camera in Greenland: An Account of the Universal Dr. Fanck Greenland Expedition*. London: Hurst & Blackett, 1935.

Steingröver, Reinhild. "Encountering Werner Herzog at the End of the World." In *A Companion to Werner Herzog*, edited by Brad Prager, 466-484. West Sussex: Wiley-Blackwell, 2012.

Taut, Bruno. "Artistic Film Program." Translated by Alex H. Bush. In *The Promise of Cinema*, 532-534.

"The Geography of Transport Systems,"
<https://people.hofstra.edu/geotrans/eng/ch1en/conc1en/telecom%20diffusionUS.html>.

"The Tragedy of the Titanic," *The New York Times*, 28 April 1912, p. S1.

Tsing, Anna. *The Mushroom at the end of the World*. Princeton: Princeton University Press, 2017.

Turner, Fred. *From Counterculture to Cyberculture*. Chicago and London: The University of Chicago Press, 2006.

Uricchio, William. "The Future of a Medium Once Known as Television." In *The YouTube Reader*, edited by Pelle Snickars and Patrick Vonderau. Stockholm: The National Library of Sweden, 2010.

Voosen, Paul. "Record-shattering 2.7-million-year-old ice core reveals start of the ice ages." *Science*. 15 August 2017. <http://sciencemag.org>.

Wade, Nicholas. "An Ancient Ledger Trapped in Ice." *New York Times* 22 May 2018. p. D4.

Watkins, Derek. "How We Animated Trillions of Tons of Flowing Ice." *Derek Watkins*.
<http://dwtkns.com/posts/flowing-ice.html>. 13 June 2017.

Wilkins, Alasdair. "What Happened to the Iceberg that Sank the *Titanic*?" *WIRED*. 16 April 2012. <http://www.wired.com>.

Williams, Linda. "Film Bodies: Gender, Genre, and Excess." In *Film Theory and Criticism*, 7th Ed., edited by Leo Braudy and Marshall Cohen, pp. 602-616. Oxford: Oxford UP, 2009.

Zarin, Cynthia. "The Artist who is Bringing Icebergs to Paris." *The New Yorker*. 5 December 2015.
<https://www.newyorker.com/culture/culture-desk/the-artist-who-is-bringing-icebergs-to-paris>.