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Polar Futurism and the Labors of Knowledge Production

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Polar Futurism and the Labors of Knowledge Production

by

Spencer Adams

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Abstract

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Doctor of Philosophy in Rhetoric

Designated Emphases in Critical Theory and Science & Technology Studies

Professor Nasser Zakariya, Chair

Over nearly the last century, Antarctic research stations have been central to the production of knowledge of the "global environment." Below the "global environment" however, inhabitants of these stations, including scientists, technicians, and operational laborers, have had to negotiate their own relations to the Antarctic's extreme, hostile, and unforgiving environment, as part of the ongoing reproduction of their everyday life and labors. This dissertation asks how these inhabitants have done so, what ad hoc, low-level, and contingent environmental knowledges have been produced therefrom, and what features of Antarctic inhabitance have emerged as key determinants of the conditions of living and working there beyond the sheer climatic and geophysical extremity of the continent. In doing so, I focus in on Antarctica as an acute site of "knowledge work," thought broadly to encompass the wide range of labors—scientific, technical, logistical, operational, service-oriented—that underwrite the ongoing production of scientific knowledge on the continent. Looking in particular at the history of UK and US Antarctic research stations from their early institutional founding to the present, I argue that this history sees "knowledge work," once a relatively autonomous and exceptional enterprise in Antarctica, increasingly subsumed under the normative conditions of contemporary professional work in the capitalist world. I argue moreover that this has been facilitated through socio-technical interventions that work to "exteriorize" collective wisdom, knowledge, habit, and practice cultivated as part of the integrated life of the base onto new technical and institutional forms that project an image of the Antarctic outward to the wider world. This image has become the basis for a widespread discursive linkage, termed *polar futurism* in the dissertation, between Antarctic inhabitance and the forthcoming conditions of the Anthropocene.

The four chapters of the dissertation take up this polar futurism, seeing in speculative projections of future life in the Anthropocene a starting point for critically uncovering obscured and underlying lines of open discourse, debate, and contestation over the myriad conditions and forms of collective life and "knowledge work" in the Antarctic. The chapters look respectively at novel interventions in Antarctic architecture over the last decade; the history of psychological discourse in the Antarctic up to an including the growing body of institutional psychological literature on Antarctic inhabitance; literary narratives produced by Antarctic inhabitants from early in-station magazines through to more recent products of writer and artists residency programs; and climate modelling as a knowledge base that both implicitly projects visions of future life and labor and that, in Antarctica, entails an often hidden myriad of laboring activities. Across these chapters, I unravel ways in which Antarctic inhabitants have historically and do now think, live, and work "below" and aside from the so-called Anthropocene, even as the products of their work have been so crucial to the global knowledge

frameworks out of which the Anthropocene as a periodizing concept emerged. Ultimately, in doing so, the dissertation offers a contribution to Science and Technology studies scholars and others examining the production of climate and environmental knowledge and the stakes of present and future climate change. It does so by arguing for an attention to scientific knowledge as grounded in a social labor process and to knowledge workers of various stripes, facing crises and structural transformations of their working conditions, as holding agency in rethinking and reconfiguring the institutions and orientations of their work and therefrom re-thinking the forms of knowledge suited to the crisis conditions to which that knowledge is addressed.

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Acknowledgments

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I've been routinely inspired by the wider community of graduate students in and beyond the Rhetoric department and have been shaped and supported by more people that I can name here. pê feijó has been variably a wonderful friend, host, co-teacher, and critic of my unreformed Marxism, and I have learned so much from being with her in the classroom, in autonomous neighborhoods on the outskirts of Lisbon, on picket lines, and elsewhere. Throughout my time as a graduate student, Kyra Sutton has provided a consistent dose of caring encouragement around my work (and life more generally), while never shying away from the kind of necessary, incisive commentary that has pushed me towards new and more rigorous ways of thinking. I have gained so much from the feedback of other Rhetoric dissertation group members, including Tim Wyman-McCarthy, Devin Choudhury, Camila Yadeau, Anooj Kansara, Bruno Anaya, and Linda Kinstler, all of whom have moreover provided consistent kindness and friendship along the way. I am likewise very appreciative of all those I've had the chance to work with on *Qui Parle*, in particular Zach Hicks, who is a remarkable and seemingly unflagging comrade, and Mehak Khan, who has doubled moreover as an excellent bridge partner over the last 5+ years. While I am certainly forgetting many, I would also like to thank Keoni Correa, Thom Sliwowski, Chris Geary, Patrick Lyons, Pedro Hurtado Ortiz, Angela Yu, Joel Auerbach, Robin Manley, Tara Philips, Kevin Stone, Abrar Abidi, Deimy Chavez, and Kathleen Powers. Beyond Berkeley, I am grateful to Owen Marshall and the other participants in the cross-institutional Marx and STS working group, which has been a gift to my thinking, knowledge base, and scholarship since I first discovered it at 4s in 2020. And I would be remiss to not recognize all those others who have put in hours and hours of work over the time I've been at Berkeley to organize their peers, develop the militancy of graduate workers on campus, and carry out bold and sustained strikes in 2019-2020 and 2022. Grad worker organizing has been its own education and has done much to sustain me over the last seven years.

In many ways, the thinking in this project and my way of looking at the world more generally draws heavily on experiences and conversations I've had beyond the university setting. Almost exactly halfway through my time in graduate school, I had the good fortune of stumbling into a uniquely warm, committed, and ambitious political organization. I am eternally grateful for what that

has opened up for me over the years since and for the wider world of friends, comrades, and organizers I've encountered therefrom. In particular, I want to thank Justin Gilmore and Rane Stark for their initial warm welcoming into the group and inspiring capacity to bring people together in struggle wherever they go; Dani Tutt, who is among the most brilliant people I've ever met and provided me so many insights for thinking about science, energy, infrastructure, climate, and Go, all from a radical perspective; Diego Arrocha and Cece Shaw, who, along with being great neighbors, never fail to be fun, thoughtful, and inspiring to be in conversation with; the various participants in the three-volume *Capital* reading group that carried me through the duration of the pandemic every Sunday morning, including Nick Thacker, Jimmy Wu, Shimmy Li, Sara Wexler, Hasan, and Julian Park; and all the other members and friends of the caucus. Being part of this wider group has both honed the critical instruments I bring to my research and modelled the kinds of knowledge transmission and production I have looked in this project to recover and theorize.

I would like moreover to thank my parents, my brother Brian and sister Laura, my siblings-in-law, and Shirley, Nuri, and Graham, all of whom have been loving and supportive throughout my time in graduate school. And I would like to thank Ly – it feels like a stroke of luck that you took my offer to come out to Berlin last Spring and it's now pretty much unthinkable to imagine having done this last stretch of grad school without you there by my side. Here's to our imminent return to Germany!

Introduction

"Whatever lies most remotely in the earth—its shadow is extended in the human being. The same holds true for what lies in the deepest depths of the seas—[it] imprints upon the human being. And whatever lies sub *Polo Antarctico*—it casts its reflection beneath the *Polus Arcticus*. And what [is] under the *Arcticus Polus* lends its reflection to the human being and to the *Polus Antarcticus*."

- Paracelsus, *Das Buch Paragranum*[1]

"So they lived in Antarctica for over a year together, familiarizing themselves with the shelters and equipment that were already landing on Mars in robot vehicles; familiarizing themselves with a landscape that was almost as cold and harsh as Mars itself, familiarizing themselves with each other."

- Kim Stanley Robinson, *Red Mars*[2]

Even before it was first ever literally seen in recorded history, Antarctica has long appeared in ranging imaginaries as a door into the unknown, a shadow, an abyss, or a stepping-stone into the future. It's only in recent years that this quality of the southern continent and the imaginaries surrounding it has taken the shape it holds today. At present, Antarctica, in global imaginaries, stands in for future life in the Anthropocene, a sandbox or laboratory for encountering, thinking with, and experimenting around the yet-unknown but forthcoming pressures of ecological extremity and Anthropocenic life. In many ways, there's a certain self-evidence to this particular speculative character of polar spaces as Anthropocenic conditions take widespread hold around the planet. The Arctic and the Antarctic are seeing their geophysical and climatic environments aggressively change earlier and more rapidly than other parts of the world, in a basic sense then standing as a kind of omen of what's to come elsewhere. In projective models of future global climate, Antarctic ice sheets have for decades stood as one of the core contingencies, the extent to which they're prone or not to melting under feasible global warming conditions indexing dramatic differences in the makeup of coastlines and coastal cities on every other continent by the end of the century.[3] As diminishing ice in the polar north newly opens up potential arenas for shipping and extraction, mainstream press outlets and governmental bodies have come to look at the Arctic with a speculative eye, asking after possible futures of reconfigured trade routes and resource jostling.[4] While analogous envisioning has yet to take as dramatic a hold for Antarctica, the continent is suspected of housing substantial reservoirs of gas, oil, and other extractable materials. And the current make-up of the Antarctic Treaties, officially blocking Antarctic resource extraction while also

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[1] Paracelsus, *Paracelsus (Theophrastus Bombastus von Hohenheim, 1493–1541): Essential Theoretical Writings*, ed./trans. Andrew Weeks (London and Boston: Brill, 2008), 133.
[2] Kim Stanley Robinson, *Red Mars* (New York: Del Rey, 2017), 26.
[3] Edmond A. Mathez and Jason E. Smerdon, *Climate Change: The Science of Global Warming and Our Energy Future*, *2nd. Ed* (New York: Columbia University Press, 2018), 318-321.
[4] Richard Milne, "Arctic Shipping Set for Record as Sea Ice Melts," *The Financial Times*, July 21, 2013, https://www.ft.com/content/c947b810-f06a-11e2-929c-00144feabdc0; Jugal K. Patel and Henry Fountain, "As Arctic Ice Vanishes, New Shipping Routes Open," *The New York Times*, May 3, 2017, https://www.nytimes.com/interactive/2017/05/03/science/earth/arctic-shipping.html; "Melting Arctic Ice Opens New Route from Europe to East Asia," *The Guardian*, September 28, 2018, https://www.theguardian.com/world/2018/sep/28/melting-arctic-ice-opens-new-route-from-europe-to-east-asia.

due to expire in 2048, force those involved and interested in Antarctic governance to set their eyes toward negotiation over the continent's middle-term future.[5]

Previous scholars have warned of making the leap in too overdetermined a way from the character or spectacle of polar spaces to tidily dystopic or catastrophic pictures of the future. The geographer, Kathryn Yusoff, argued in the mid-2000s that NASA's satellite-mediated RADARSAT map images of the Larsen B ice sheet collapse, commonly deployed as markers of forthcoming ecological destruction in the early popularization of climate change awareness, enacted both a spatial and temporal alienation. Said images placed Antarctica for spectators in a space dislocated and thus at a remove from the rest of the globe. "Within this conceit," Yusoff suggests, "Antarctica is imagined as *a place in time* as much as a geographic place: a temporal bridge into the future and onto the past."[6] An ecologically catastrophic future (along with the deep geological and climatic past) is presented to the viewer from the comfortable, even aesthetically pleasing, vantage point of temporal distance, sublimating the viewer's fear and anxiety, while allowing the viewer of such images a temporal relocation, situating them prior to the true catastrophic event of advanced climate change. For the environmental historians, Mark Carey and Allesandro Antonello, ice cores have a similar effect, engendering a "global rhetoric" structured around specific temporalities, including a "future time" sensibility that casts the future as singularly, determinately, and inexorably catastrophic, foreclosed then and unavailable to ongoing contestation.[7] Either of these cautions register ways of perceiving Antarctica and its geophysical realities from a distance, within what we might think of as the wider world. Antarctica is brought into relation with the fears we might ultimately project onto it through the circulation of images, data-mediated renderings, or even physical objects preserved and transported back to hubs of laboratory research. In that way, Antarctica can both signal future-oriented anxiety about the threats presented by advanced and catastrophic climate change and signal the otherness of those threats, held at a distance or made the kind of catastrophic scenario against which any given present appears reasonably normal.

For all its dislocation and remoteness though, Antarctica and its various conditions (with climatic, geophysical, legal, geopolitical, and social dimensions) exists as the immediate, proximate space of life and work for small populations of those who are very often most acutely involved in rendering the global environment perceptible in such a way that a notion like the Anthropocene can even become possible. This has been the case since the immediate post-war era and was codified, to a degree, by the Antarctic Treaty System's designation of the continent as an international space of science. Infrastructures of atmospheric, oceanic, glaciological, geophysical, and zoological observation have been sustained on the continent, in some cases enabling ongoing streams of data dating back at least as far as the 1950s (this was famously the case for the Ozone observations carried out at the British Antarctic Survey's Halley station which became the basis for the highly publicized "discovery" of the Ozone hole in the 1980s and the observation of its relative to recovery to ecologically healthy conditions throughout the 1990s).[8]

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[5] Renegotiation of the Antarctic Treaty system is among the core recurring topics that has come up in my research, when I've asked British Antarctic Survey staff about the politics that manifest in everyday conversation in Antarctica. For a brief overview of the topic from one of the foremost scholars of Antarctic geopolitics, see Klaus Dodds, "In 30 Years, the Antarctic Treaty Becomes Modifiable, and the Fate of a Continent Could Hang in the Balance," *Phys.org*, July 12, 2018, https://phys.org/news/2018-07-years-antarctic-treaty-fate-continent.html.

[6] Kathryn Yusoff, "Visualizing Antarctica as a Place in Time: From the Geological Sublime to 'Real Time,'" *Space and Culture* 8, no. 4 (November 2005): 390.

[7] Allesandro Antonello and Mark Carey, "Ice Cores and the Temporalities of the Global Environment," *Environmental Humanities* 9, no. 2 (November 2017): 190, 194-198.

[8] Jonathan Shanklin, "Reflections on the Ozone Hole," *Nature* 465 (2010): 34-35.

Science and Technology Studies scholars have built out tools for recognizing the particular material contexts out of which global knowledge frameworks arise. Perhaps most comprehensively in the context of global climate science, Paul Edwards has laid out the many-sided "knowledge infrastructure," social, political, and physical in scope, that came to be amassed and entangled in the construction of the global climate as an object of knowledge.[9] STS scholars have also shown how speculative aspirations come to be embedded in built and material environments, in the course of private investment and state-building projects big and small. Most notably, such research has rested on Sheila Jasanoff and Sang-Hyun Kim's notion of "socio-technical imaginaries."[10] Both "knowledge infrastructures" and "socio-technical imaginaries" inform the thinking of this project, as I examine the ways the spectacle of Anthropocenic futures is mobilized in the ongoing production of Antarctic space, a space infrastructurally central to the present and historical observation of global climate change.

I aim though in this dissertation to bring forward what either concept implicates as a subsidiary piece, namely the social labor that underwrites the construction and maintenance of technoscientific infrastructure, knowledge, and the imaginaries folded into or drawn out of either. Insofar as Antarctica has sustained institutional scientific research going back to the immediate postwar era, it has existed as an arena of "knowledge work." While "knowledge work" as a category might conjure forth images of intellectual labor of various stripes being carried out—scientists performing experiments in labs; mathematicians at the chalkboard; humanists amidst piles of books and sheets of notes typing away at a keyboard; and the various talks, panels, seminars, and classrooms that classically conceived knowledge workers take part in as a routine part of their job—anyone who has been employed by a university for any period of time can recognize how the work of the university implicates a wider array of workers, from technicians keeping things operational to logistics handlers making sure materials for research reach where they're supposed to go to service and custodial staff making the space of the institution itself habitable, not to mention the array of banal, not expressly intellectual, and frequently bureaucratic work that gets pushed into the days of those more traditionally thought of as "knowledge workers." Antarctica as a historical site of "knowledge work" is interesting on that front, as the close quarters, remoteness, and relatively small scale of many research stations served to dissolve much of what exists elsewhere as the implicit or explicit boundaries and divisions between these various forms of labor. Antarctic research stations have had recognized scientists, engineers, operations specialists, station managers, cooks, cleaning crew, and the like throughout their history, but across such divisions of labor, people have lived, slept, eaten, relaxed, recreated, and worked together in the same shared spaces in ways that are relatively unique. The continent then has made acute something I want to forward as a vantage point for analyzing technoscientific activity more generally, a vantage point that sees sites of technoscientific activity and intellectual production in their whole being, with knowledge of various kinds as the explicit product of a socialized and entangled labor process.

Published in the *Socialist Review* in 1985, Donna Haraway's now-iconic "A Cyborg Manifesto" spoke in what I would claim are resonant terms about the "social relations of science and technology." Read in a certain way, the piece served to forward an intervention into Marxist feminist thought rooted in the mid-1980s moment of its writing. In North America, social and political economic transformations were dissolving the post-war family wage and the normative structures of gender, race, and labor said family wage enabled. These transformations were, in turn, bringing more

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

[10] Sheila Jasanoff and Sang-Hyun Kim, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea," *Minerva* 47, no. 2 (June 2009): 119-146.

and more women and racial minorities into previously exclusive (and in some cases novel) arenas of work, work which was integrated more and more closely with novel developments in technoscience. Whether as scientists, engineers, secretarial workers, manufacturing laborers in semi-conductor factories, or otherwise, racialized and gendered subjects were coming into close proximity with the advances in technosciences that sat behind the new legibility of a figure like the "cyborg" to an extent that for Haraway marked the possibility of novel affinities and solidarities that critical scholars and activists of technoscience could and should engage with. Such engagement with and leveraging of these reconfigurations of race, gender, labor, and technology might serve, per Haraway, as the foundation for a more fundamental institutional/political economic, and in turn epistemological, re-founding of technoscience away from its uses by US militaristic and capitalist powers.[11]

What I'm after is something similar to Haraway's intervention, a sense of the agency of knowledge workers across various roles and labors, as they face new folds in crises of and reconfigurations of knowledge work. Over the course of the dissertation's chapters, I examine inhabitants of and interactants with UK and US Antarctic research stations over the course of their history from the early postwar era to the present. As scientists, technicians, operations specialists, and service staff, these inhabitants have participated in a social labor process that has helped produce the "global environment" and "global climate" as objects of scientific knowledge. As knowledge workers in a relatively exceptional setting, they have negotiated how to sustain viable practices of work and life in the face of extreme environmental hostility. They have also articulated distinct and varying ideas of what the environmental conditions that encroach on or threaten their well-being consist of, pointing in distinct moments to both the climatic and geophysical environment of the Antarctic, but also to the social, cultural, institutional, and technical environments that inform their everyday experiences. Whether they have recognized it or not, they have formed their own minor, shifting, and contingent environmental discourses and knowledge frameworks below the picture of "global climate" that more readily implicates them as world-historical actors in the era of the Anthropocene. And they have done so over several decades in which their conditions of life and work amidst the continent's research stations have been brought into an increasing proximity to the wider, networked world and to the normative and disciplined standards, rhythms, and habits of capitalist workplaces.

In the remainder of the introduction, I elaborate on these claims. I do so first by looking more closely at Antarctica's temporalization in terms of the future-Anthropocene, the "polar futurism" evoked in the dissertation's title. I suggest, in parallel to the claim that Antarctic knowledge workers have observed environments "below" that of the "global environment" that their work serves to articulate, that these knowledge workers likewise live both amidst the material vestiges of future-Anthropocene imaginaries and below these imaginaries and the temporal framework they hinge on. Namely, knowledge workers live amidst the temporalities of knowledge work itself, including the day-to-day rhythms and habits that organize the time of said workers and the historical temporalities of crisis and restructuring that have impacted the working experience and conditions of those positioned in arenas of natural scientific activity across the world. In the second section of the introduction of the introduction, I frame this historical transformation as a process of what, from the Marxian lexicon, I call "subsumption." What I argue is that glimpsed across the chapters of the dissertation is an exceptional labor process increasingly subsumed under the normative conditions of capitalist work and brought thereby into closer proximity with ongoing

[11] Donna J. Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 149-181. See, in particular, the sections on the "The 'Homework Economy' Outside 'the Home'" and "Women in the Integrated Circuit."

global trends in the composition of "knowledge work" specifically and, to a degree, of work itself more generally. This process of subsumption has been enabled by socio-technical and institutional interventions into the living and working practices of Antarctic inhabitants. These interventions, between the early, postwar institutionalization of sustained scientific research on the continent and the present have functioned to weaken or even dissolve integrated forms of life and labor situated in relation to the built, social, cultural, and institutional environments of Antarctic inhabitance. In turn, such interventions have, as I demonstrate in the chapters of the dissertation, distilled ad hoc, contingent, and contested wisdoms and practices and folded them into various forms of what I frame as, drawing on the work of Bernard Stiegler in particular, the exteriorization of these prior forms of life. Though part of a long history of mediations and re-mediations of the continent, this process of exteriorization in the context of late 20th and early 20th-century knowledge work in Antarctica has conditioned the living and working practices of Antarctic knowledge workers to fit the disciplinary prescriptions entailed in knowledge work's subsumption. It's for this reason that the third part of this introduction lays out Stiegler's arguments around exteriorization and their stakes for thinking the dissertation project as a whole. Having moved through these three sections—on the Anthropocene-based temporalization of Antarctica; on the subsumption of Antarctic knowledge work; and on the mechanisms of exteriorization that have facilitated that subsumption—I move then into a summary of the dissertation's four chapters, before concluding with a brief outro on the wider stakes of the project.

Antarctica and the "Anthropocene": What Happens Below "Anthropocene Time?"

A *polar futurism* that thinks with polar spaces as offering a glimpse at Anthropocenic futures is mobilized across discourses on Antarctica.[12] An array of aesthetic and architectural interventions, among the most prominent of which I discuss in the first chapter of this dissertation, mark out this symbolic linkage for a global audience.[13] Among the most recent and most pointed in making this link, the cultural critic and art historian Lisa E. Bloom, in a 2022 monograph titled *Climate Change and the New Polar Aesthetics: Artists Reimagine the Arctic and Antarctic*, goes so far as to proclaim the emergence of a "new polar aesthetics" responding to the present and forthcoming impacts of climate change. As she argues, "The present feels dangerous and volatile, but just how quickly the world will become permanently unrecognizable is not yet clear. The ongoing degradation caused by extreme climate change as it unfolds in the Arctic and Antarctic remains important to the representational politics of the accelerating climate crisis as we grapple with this strange breadth of futures."[14] Tying the geographic poles to an Anthropocenic future, as suggested here, happens in a number of ways: polar spaces, undergoing rapid and visible environmental changes, temporally un-distance climate change, bring its consequences into the present, and at the same time, in doing so, they offer acute glimpses to the wider world of a future soon to come.

Among scholars of polar spaces, anthropologists of the Antarctic have echoed, in recent years, this notion of the southern continent as speculatively gesturing towards future modes of inhabitance in the Anthropocene. Juan Francisco Salazar, for instance, points to Antarctica as a

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[12] For perhaps the most direct and explicit consolidation of these discourses, see Leane, Elizabeth, and Jeffrey McGee, eds., *Anthropocene Antarctica: Perspectives from the Humanities, Law and Social Sciences* (London and New York: Routledge, 2020).

[13] See Chapter 1 of the dissertation in particular for a deeper discussion of futurist architecture in Antarctica. For more on like interventions in the visual arts, see the conclusion of Chapter 3.

[14] Lisa E. Bloom, *Climate Change and the New Polar Aesthetics: Artists Reimagine the Arctic and Antarctic* (Durham, NC: Duke University Press, 2022), 3.

"laboratory for thinking alternative way of living in the Anthropocene,"[15] a basis for a methodological emphasis on speculative practices outlined as such: "my concern has been to explore how futures are imagined and hoped for in relation to how novel forms of sociality emerge in extreme environments."[16] Futurity here is figured in relation to matters of sociality, part of an intervention into conceptual and methodological explorations of Antarctica's historico-geographies over the last two decades. Salazar, alongside Jessica O'Reilly, argue for the significance of Antarctic inhabitance, understood by way of ethnographic approaches to the continent, to contemporary Antarctic place-making. As they note, "In Antarctica … inhabitation is something lived and intentional, built by humans both from top-down governmental practices and bottom-up improvisations of everyday Antarctic life… As Antarctic people inhabit their polar places, their place work becomes attuned to the top-down governmental postures of Antarctic geopolitics. But more importantly, the everyday lives of everyday Antarctic people also resist this, creating other more quotidian, intimate places in research stations: this forms the core of inhabiting Antarctica."[17] For them, recognizing distinct forms of social interaction and subject formation wrests totalizing pictures of Antarctic geographies away from sheer attention to symbolic, representational, legal, and governance structures which have all been crucial to critical scholarly characterizations of the Antarctic. Salazar's own work then, which includes a speculative ethnographic film titled *Nightfall on Gaia* which leans into aesthetic projections of Anthropocenic futures through footage of the Antarctic, establishes particularly strong connections between Antarctica and future Anthropocenic inhabitance, drawing from the basic, ordinary sociality of contemporary Antarctic life a picture that's made to gesture temporally forward.

This symbolic mapping of Antarctica through its potency for thinking Anthropocenic futures is contingent, preceded by a much longer tradition of peering into the unknown through Antarctica. The continent has had projected onto it seafaring myths beyond the recorded world;[18] symbols of Blackness and whiteness emerging out of the North American racial imagination;[19] elements of gothic horror;[20] utopias of de-atomized and disalienated human sociality;[21] and plans for treating Antarctic human life as a stepping stone into futures of long-term space travel,[22] all of which projections remain latent in imaginaries of the continent, having come into and out of focus repeatedly at various points and from various perspectives. Recognizing this history of Antarctica's symbolic mapping alongside the cautions noted above against granting too much conscious weight to a distanced, catastrophic "future time" gives pause to the project of thinking with the Anthropocenic Antarctic.

Rather than simply dismissing an Anthropocene-tinged polar futurism at play in imaginaries of the Antarctic, this dissertation stays with it. Part of this has to do with where I started, namely thinking with what appeared to me as socio-technical imaginaries at play in Antarctica that were

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[15] Juan Francisco Salazar, "Speculative Fabulation: Researching Worlds to Come in Antarctica," in *Anthropologies and Futures: Researching Emerging and Uncertain Worlds*, eds. Juan Francisco Salazar, et al. (London: Bloomsbury, 2017), 152.
[16] Salazar, "Speculative Fabulation," 153.
[17] Jessica O'Reilly and Juan Francisco Salazar, "Inhabiting the Antarctic," *The Polar Journal* 7, is. 1 (2017), 11.
[18] Elizabeth Leane, *Antarctica in Fiction: Imaginative Narratives of the Far South* (Cambridge, UK: Cambridge University, 2012), 24-25.
[19] Toni Morrison, *Playing in the Dark: Whiteness and the Literary Imagination* (New York: Vintage Books, 1992), 31-33
[20] Leane, 53-83.
[21] As I'll note across the dissertation, one can glimpse traces of this kind of thinking across the ad hoc and informal writings of certain Antarctic inhabitants, the architectural interventions into the built space of the continent over the last roughly decade, documentary examinations of Antarctic inhabitance, and speculative fictions, with the works of Kim Stanley Robinson, one of which is read extensively in Chapter 3, acting as exemplary examples (particularly the closing sections of his *Antarctica*).
[22] This is treated more extensively in Chapter 2 in particular.

informed by recent and contemporary practices of speculation. Speculative and science fiction, even at points where they aren't directly invoked in the research objects I examine, exert a significant influence over my lines of thinking and choices of objects across the dissertation. When I started out, I imagined more expressly that this was a dissertation in some ways about the category of "speculation" and its capacity to respond to the crises of the present. I imagined moreover that I was saying something about the generative, material force of speculation in articulating novel futures at a moment of seeming futureless-ness. At some point though, I feel as though I lost faith in that vantage point and found myself doing almost precisely the opposite of what I initially intended, deconstructing the speculative and projective claims of interventions into Antarctic space, inhabitant research, culture, and science and re-centering the agency of groups of people living and working among, and in certain cases either indifferent or actively critical of, those claims.

In its own way though, the dissertation attempts to stay with a speculative reading practice though one that's fixated as much on the myriad and at times collective activities and discourses of the knowledge workers living and working in Antarctica as on the more apparently speculative and futurist objects that act in the contemporary discursive construction of Antarctica as a place indexed to the future. This serves perhaps in restoring something of the intent of an early influence on the project, the "speculative materialist" philosopher, Ernst Bloch, who identifies a speculative temporal orientation to self-conscious, material activity acting at the edge of the "new" and coupled with an eye for the real-possible.[23] The "futurism" invoked in the dissertation's title, in this way, is itself not just about the "polar futurism" of a set of oddities and objects present in the contemporary Antarctic but a methodological approach: one characterized by thinking between the poles of the prefigurative and projective dimensions of eye-catching speculative objects and the human activity that has happened and continues to happen at something of a distance from those speculative objects, and thinking between the poles of seeing in either tools of speculative-projective possibility and tools of critique.

In attending to this vacillation, what the dissertation suggests is that a polar futurism tethered to anxieties over the emerging and forthcoming conditions of the Anthropocene stands as a particularly powerful instance for exploring the temporal structures engendered (and obscured) by thinking in terms of the Anthropocene. That term, in its initial formulation, marks an epoch, one characterized by a socially-induced, global environmental precarity.[24] This threading together of the

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[23] Ernst Bloch, *The Principle of Hope, Vol. 1*, trans. Neville Plaice, Stephen Plaice, and Paul Knight (Cambridge, MA: The MIT Press, 1986), 195-223. For a more in-depth reading of Bloch's "speculative materialism," see Cat Moir, "Beyond the Turn: Ernst Bloch and the Future of Speculative Materialism," *Poetics Today* 37, no. 2 (June 2016): 327-351.

[24] As is widely established in literature on the subject, the term "Anthropocene" was originally popularized in a 2000 article by earth scientists, Paul Crutzen and Eugene Stoermer, a proposal to mark off our current geological epoch as one characterized by human influence on the earth system and separated off from the prior "Holocene" epoch understood to have covered the period of human history up until recent centuries. See Paul J. Crutzen and Eugene F. Stoermer, "The 'Anthropocene,'" *Global Change Newsletter* 41 (May 2000): 17-18. The "Anthropocene," widely used now across the arts, humanities, and social sciences, has become a hotly discussed and contested term, with alternative formulations, perhaps most popularly the "Capitalocene," coming into use as well. What's at stake in these debates, usually, involves the "Anthropos" named in the "Anthropocene," recognized as standing in for a universal human subject bearing a universal responsibility for the harmful consequences of human impacts on the global environment. As these debates point out in rejoinder to this implicit naming of "man" or the "human" as the core geological agent of this present epoch, both the causes and the consequences of global climate change are highly uneven, with much of the historical fossil fuel use that's at the root of climate change concentrated in the Euro-American sphere and tied to the history of industrial capitalism, even as regions of the Global South face some of the starkest and quickest environmental effects of climate change. For more on contestation over the use of the term "Anthropocene," see Jason W. Moore, "The Capitalocene, Part I: On the Nature and Origins of Our Ecological Crisis," *The Journal of Peasant Studies* 44, is. 17 (2017): 594-630; Donna J. Haraway, "Making Kin: Anthropocene, Capitalocene, Plantationocene,

temporalities of human lives and societies and those of ostensibly long-term Earth-wide geophysical processes has been vexing for many commentators on the Anthropocene. As the historian Dipesh Chakrabarty asks in his appeal to an "Anthropocene Time" that folds in at once human-historical and geological time scales, "Anthropocene time puts pressure on another question: What does it mean to dwell, to be political, to pursue justice when we live out the everyday with the awareness that what seems "slow" in human and world-historical terms may indeed be "instantaneous" on the scale of Earth history, that living in the Anthropocene means inhabiting these two presents at the same time?"[25] Chakrabarty wonders then about the prospects of thinking history from the vantage point of the geological as much as or even rather than the world-historical.

The Anthropocene marks a crisis in global climatic processes felt in the degradation and collapse of geophysical environments and redounding back on basic frameworks and categories of social and historical analysis. As a temporal category then, the Anthropocene organizes how we give shape to experiences and images of climatic and environmental phenomena. In thinking through this, the historian Reinhart Koselleck offers a helpful critical framework. Throughout his writings, Koselleck advances the claim that certain categories of modern European thought—history, revolution, crisis, progress—came to be temporalized in the 18th-century. That is to say, per Koselleck on the category of "history" for instance, that prior to a particular shift in modern thought, figured the past as a kind of storehouse within a static continuum of human experience. You could look at "history" in the sense of examining past events and drawing lessons from them. But only upon an 18th-century shift in how the concept came to be deployed did "history" begin to figure an ongoing process, one with a distinct pace and texture, and one that made possible notions of historicity as differentiation between past, present, and future or philosophies of history that saw the world moving in particular directions as a function of particular agential forces.[26]

This new conception of "history" redounds upon or enlists an array of other concepts that likewise come to have a new temporal character, among the most well-explored of which is that of "crisis." Against the uncertainty of the future conjured forth by a bourgeoisie increasingly at irreconcilable odds with the political as it inhered in an absolutist state, Koselleck argues, figures of the Enlightenment called upon history as a system of moral laws (transposed eventually onto the rational laws of the Hegelian philosophy of history) that would enact a judgment on the unfolding present of continental Europe charging towards the 18th-century's end.[27] Crisis, a term derived from the Greek as one that designated "a definitive irrevocable, decision,"[28] held force within a newly temporalized concept of history as a kind of heuristic for perceiving the terms of historical judgment in conditions of uncertainty.[29] The future, specifically, then could be imagined as a realm that would both work out the critical resolution of unfolding crisis and would acutely act as such on the present, "an escape hatch, the pledge of tomorrow in whose good name today could be allowed to perish."[30] In this formulation, the future acts as escape hatch, as that realm upon which hope for eventual

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Chthulucene," in *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016), 99-103; and Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2019).

[25] Dipesh Chakrabarty, "Anthropocene Time," *History & Theory: Studies in the Philosophy of History* 57, is. 1 (March 2018), 30.

[26] Reinhart Koselleck, "Historical Magistra Vitae: The Dissolution of the Topos into the Perspective of a Modernized Historical Process," in *Futures Past: On the Semantics of Historical Time*, trans. Keith Tribe (New York: Columbia University Press, 2004), 27-28, 33-37.

[27] Reinhart Koselleck, *Critique and Crisis: Enlightenment and the Pathogenesis of Modern Society* (Cambridge, MA: The MIT Press, 1988), 9-12, 185.

[28] Reinhart Koselleck, "Some Questions Regarding the Conceptual History of 'Crisis,'" in *The Practice of Conceptual History: Timing History, Spacing Concepts*, trans. Todd Samuel Presner, et al. (Stanford, CA: Stanford University Press, 2002), 237.

[29] Koselleck, "Some Questions," 238.

[30] Koselleck, *Critique and Crisis*, 107.

reconciliation between the political sphere and bourgeois morality could be projected, insofar as a set of historical laws and movements were understood to be operative as the means for history's moral and political judgment on the present that was "allowed to perish." For Koselleck, an emergent philosophy of history that saw in historical unfolding the dynamics of a set of moral and rational laws acted as a kind of assurance amidst the uncertainty for the future at play in Enlightenment thought.

This claim serves in marking out a kind of critical ontology of "history" as laid out by certain of that category's foundational philosophers, a critical ontology[31] that allows us to step back from concepts such as "history," "crisis," and "progress" and ask how they come to organize thought and experience, as well as interpretations of and responses to situations that evoke these terms. The "Anthropocene" is such a temporalized category in the present that we might fold into the kind of critical ontology Koselleck offers. His own response to that critical ontology comes in the form of an exploration of multiple or what he calls "sedimented" temporalities that serve to analytically problematize the kinds of overarching metahistorical temporalities imposed by categories such as "progress" or the "Anthropocene." The image of temporal sediments is something Koselleck draws as a metaphor from geology, elaborating that, "'sediments or layers of time' refers to geological formations that differ in age and depth and that changed and set themselves apart from each other at differing speeds over the course of the so-called history of the earth." For Koselleck, this metaphor, broadly speaking, aims to consider historical movement across "different temporal levels upon which people move and events unfold, and thus ask about the longer-term preconditions for such events."[32] Rather than reconciling events and phenomena to a singular shape or philosophy of history, sedimented temporalities speak to the various registers of time and rhythms of experience that course through events and phenomena. One could certainly imagine re-literalizing this metaphor of sedimentation in thinking through the question that Chakrabarty frames as one of "Anthropocene Time." How do we embed the layers of the geological, seen from the vantage point of slow (but accelerating), non-uniform movement, into the human-historical (including the different layers of change and movement embedded within the human-historical) and vice versa?

But here it might also be worth preserving something of the metaphoricity of Koselleck's appeal to sedimentation. Of course, human epochs, periods characterized by dominant forms or institutions, presiding relations of geopolitical forces or modes of production, etc., happen at a register aside from that of the Anthropocene. Even if we do wish to take for granted that we live in the Anthropocene now, we don't only, or at any given time primarily, live in the Anthropocene. And below the register of human-historical epochs are temporalities aligned with personal and localized dramas, individual memories and anticipations, day-to-day habits of life, and an array of other ways of stitching together discrete units and experiences of time. These sedimented temporalities echo, in

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[31] Here, I take this term "critical ontology" from Johanna Oksala's excavation of Michel Foucault's late writings. Foucault wrote, in "What Is Enlightenment?," "The critical ontology of ourselves must be considered not, certainly, as a theory, a doctrine, nor even as a permanent body of knowledge that is accumulating; it must be conceived as an attitude, an ethos, a philosophical life in which the critique of what we are is at one and the same time the historical analysis of the limits imposed on us and an experiment with the possibility of going beyond them." Oksala argues that this notion of "critical ontology" as a "historical analysis of the limits imposed on us" characterizes Foucault's disposition toward neoliberal governmentality in his widely debated later writings and lectures. See, Michel Foucault, "What Is Enlightenment?," in *Ethics, Subjectivity and Truth*, trans. Robert Hurley, et al. (New York: The New York Press, 1997), 319; Johanna Oksala, "Beyond Neoliberal Realism: Foucault's Late Politics," *South Atlantic Quarterly* 121, is. 4 (October 2022), 657-665. I see Koselleck operating in a similar mode here, critically exposing the "limits imposed upon us" by "history," "crisis," "progress," "revolution," and other like terms in how they structure our ways of thinking about time and human activity and set the conditions of possibility for ordering and relating human events in time.

[32] Reinhart Koselleck, "Sediments of Time," in *Sediments of Time: On Possible Histories*, trans/ed. Sean Franzel and Stefan-Ludwig Hoffman (Stanford, CA: Stanford University Press, 2018), 3.

instances, through one another, habitual practices, for example, interrupted in turn by sudden environmental or political ruptures, world-historical epochs consolidating around particular regimes of everyday life, etc. A view toward "sedimented temporalities" also asks us to consider how an analytic focus on a particular layer of temporality, as opposed to others, coursing through a given event or phenomenon, might shift how we make sense of that event or phenomenon in relation to others.

A contention of this dissertation is that the polar futurism that characterizes a kind of overdetermined temporal understanding of polar spaces (with Antarctica being the dissertation's core focus) offers, despite (or precisely because of) the particular shape it wishes to give to the unfolding of history, an acute starting point for beginning to critically examine a set of sedimented temporalities at play in these spaces. And this serves as a powerful case for developing tools to grasp environmental crisis not as a singular, discrete phenomenon but as a relational event, entangled and interacting with other crises and conflicts. This grasp of environmental crisis, volatility, and extremity is what emerges out of a closer look at the history and present of scientific research in Antarctica. As expressed in manifestations of a contemporary polar futurism in Antarctica, it would seem obvious that the geophysical extremity of the continent, its brutally harsh, dry, cold, and windy environment brought into a state of growing precarity and volatility by the impacts of climate change, is the core, characteristic feature of life in Antarctica. But what I demonstrate in this dissertation is that Antarctica's extreme and changing environment, rather than acting as the primary, acute pressure point for sustaining life, labor, and knowledge production on the southern continent, exists as one facet of a multi-dimensional ecology, that includes as well the social, cultural, institutional, and technical environment of Antarctic inhabitance.

If this argument in part appears to downplay the particularities of the Antarctic environment, this is not to suggest that said environment (understood climatically and geophysically) is a non-entity. But rather that it's not obvious to Antarctic inhabitants always and at all times that it's the only or defining aspect of the "environment" seen in a more capacious sense. With this in mind, this dissertation takes an interest, which I'll explore in the better part of the remainder of the introduction, in other structuring features of Antarctic life and scientific research. As well as being a site that, because of its environmental extremity is frequently indexed to the emerging and forthcoming conditions of the Anthropocene, Antarctica, across its human outposts, is seen most expressly as a place where science is done. The continent is designated by its now more than half-century old treaty system as a space to be inhabited and explored for the purposes of science. And, alongside being a kind of laboratory for experimenting with future Anthropocenic life and sociality, the continent is seen widely as perhaps the core laboratory environment for pursuing global climate research, taking advantage of the uniquely pristine atmospheric conditions and the global climatic significance of the continent's ice sheets and the Southern Ocean to make key facets of the continent and its immediate surroundings into a measuring rod of sorts for the state of the Earth System as a whole.

Given the centrality of scientific research to the forms of inhabitance that have taken hold in Antarctica, the continent serves, for the purposes of this dissertation, as a privileged site (a measuring rod of sorts) to examine the social and infrastructural organization of knowledge work and the shifts, crises, and contestations that have shaped and restructured this social and infrastructural organization. In that vein, Antarctica exposes one banal but often obscured aspect of knowledge work as a composite of labors: it infrastructurally hinges on a wide variety of laboring activity implicating operational, logistical, technical, and service workers alongside scientists themselves. As noted again in Chapter 3 of the dissertation, at any given time at McMurdo station, the largest American research base on the continent, the non-scientific staff far outnumbers the scientists, though the most clear and visible product of the collective labor produced at McMurdo is

scientific knowledge. Aiming to treat knowledge work in its composite character, a subsidiary claim in this dissertation to the one I highlight above regarding the relational quality of the Antarctic environment is that the composition of contemporary knowledge work in Antarctica has been undergoing substantial forms of restructuring that at once interact with concerns over the continent's extreme geophysical environment and echo wider trends in the constitution of knowledge work, especially across and implicating Anglophone institutions (which, within Antarctica, are the core institutions I focus on). The next few sections of the introduction aim to theoretically characterize the organization and restructuration of Antarctic knowledge work, drawing on the categories of subsumption and exteriorization in particular, and with the ambition to see how Antarctica itself can speak back to an understanding of these categories, especially as they come to be inflected through novel conditions imposed by advancing climate change.

Knowledge Work and Subsumption

"Subsumption," in the sense I employ it, emerges as a critical category in the indices to volume 1 of Marx's *Capital*. For Marx, subsumption [Subsumtion] describes the act of redirecting a hitherto non-capitalist labor process toward the production of market commodities. He breaks the category down further, separating the overarching act of bringing labor processes into the capitalist mode of production into two differentiated moments. The first is that of "formal subsumption" [formelle Subsumtion] which Marx describes as follows: "The labour process becomes the instrument of the valorization process, the process of the self-valorization of capital – the manufacture of surplus-value…All this notwithstanding, this change does not in itself imply a fundamental modification in the real nature of the labour process, the actual process of production. On the contrary, the fact is that capital subsumes the labour process as it finds it, that is to say, it takes over an *existing labour process*, developed by different and more archaic modes of production."[33] Formal subsumption alters the ends of a given labor process, expropriating its products to make them market commodities. Marx gives a number of paradigmatic examples of this, including "When a peasant…becomes a day labourer working for a farmer; when the hierarchic order of guild production vanishes making way for the straight-forward distinction between capitalist and wage-labourers he employs; when the former slave-owner engages his formers slaves as paid workers."[34] What distinguishes these moments are that the actual character of the labor process itself, including, in some cases, a certain autonomy of laborers themselves over when and how they labor, is maintained more or less as it would be for subsistence production, production for personal use, production for a feudal lord, production for a slave owner, etc. It's in the case of "real subsumption" [reelle Subsumtion], that, as Marx puts it, "…the entire real form of production is altered and a *specifically capitalist form of production* comes into being (at the technological level too)."[35] That is to say, the very character of the labor process itself has been subsumed under capital, altered in its appearance, content, organization, and the like by the fact that the purpose of the labor process is the production of surplus value on an expanding and competitive world market.

Insofar as *Capital* appears, to a degree, as a kind of historical exposition, "formal" and "real" subsumption seem to describe subsequent historical moments, an idea deployed by a range of theorists to periodize distinct moments in the history of capitalist development.[36] Though the sub-

[33] Karl Marx, *Capital Volume 1*, trans. Ben Fowkes (London and New York: Penguin Books, 1976), 1019-1021
[34] Marx, *Capital Volume 1*, 1020.
[35] Marx, *Capital Volume 1*, 1024.
[36] For an overview of these periodizations, see Endnotes Collective, "The History of Subsumption," *Endnotes* 2 (April 2010), https://endnotes.org.uk/articles/the-history-of-subsumption.

categories might be more ideal types than exact historical demarcations, one might reasonably fold early modern handicraft and artisan labor, agricultural labor expropriated by commercial capital (particularly in colonial contexts), and proto-industrial manufacture, along with the lifeways associated with these forms of production, into a kind of historical epoch of formal subsumption, whereas the onset of factory production, along with the industrialization of agriculture, commerce, and logistics, mark the epoch of real subsumption in industrial capitalism. Contemporary engagements with *Capital* however have had a more vexed relationship to any clear-cut historical exposition one might try to read out of Marx's critical analysis of political economy, exemplified in particular by value-theoretical approaches that, in their strongest articulation, see in *Capital* an "*abstract-theoretical depiction of the mode of operation* of capitalism,"[37] or in other words, an exposition addressed to the capitalist mode of production as a fully developed totality and not so easily mapped onto the historical development of capitalist social relations. Like certain other seemingly historically-limned Marxian categories – the "factory," primitive accumulation, proletarianization, etc. – subsumption has been extended readings as a category that would in various ways bring it into a more ongoing, complex, and/or cyclical relationship with the evolution of capitalism, especially from the vantage point of capitalism enduring into a post- or de-industrialized form. For Endnotes, recent economic histories call into question clean periodizations of the history of capitalism in terms of stages of subsumption, the distinctions holding strict import as facets of an ontological category addressed to "the immediate process of production" under capital in its various transformations.[38] For a set of Italian thinkers, on the other hand, emerging out of the autonomist traditions, the category of "real subsumption" has been useful for thinking about the ways capital acts more diffusely across society, either, as with Antonio Negri and strands of autonomist theory, in "transpos[ing] onto the terrain of exploitation…all social relations," such that "*life is subsumed to capital*,"[39] or in a similar vein with post-Autonomist thinkers, in "real subsumption" coming to describe a point when subjectivity itself across both processes of immaterial labor and of consumption becomes central to the accumulation of capital.[40]

My own intention in the dissertation is to treat subsumption as both an historical and extra-historical category, one that meaningfully characterizes a particular transition that's taken place over a particular period of time in how knowledge work is thought and performed, but also one that's both more vexed and has more to say as a critical category than any simple characterization of stages of labor could properly capture. What's particularly interesting for me about the category of subsumption, perhaps what you could say it uniquely describes among Marxian critical categories is the relative autonomy individuals or groups involved in a production process have over their time, not just in an absolute sense but at the level of time's rhythms and ways of being organized and parceled out. A production process formally subsumed under capitalism might begin to be subjected to mechanisms for extending the extraction of absolute surplus value, demands from those expropriating the products of labor toward commodity exchange for greater quantities of labor. But a really subsumed production process is subjected to the extraction of relative surplus value, involving a whole range of interventions in the very makeup of the labor process, described throughout Part IV of *Capital*, starting with coerced cooperation and extensive divisioning of labor and evolving through the cyclical introduction, obsolescence, and updating of increasingly sophisticated machinery and techniques for supervising and surveilling the integration of individual

[37] Micheal Heinrich*, An Introduction to the Three Volumes of Karl Marx's Capital*, trans. Alexander Locascio (New York: Monthly Review Press, 2012), 29.
[38] Endnotes Collective, "The History of Subsumption."
[39] Antonio Negri, *Marx and Foucault*, trans. Ed Emery (Cambridge, UK: Polity Press, 2017), 45.
[40] For a further overview of these discussions, see Jason Read, "The Real Subsumption of Subjectivity," in *The Micro-Politics of Capital: Marx and the Prehistory of the Present* (Albany, NY: State University of New York Press, 2003), 103-152.

laborers into an overarching, technologically-mediated apparatus of production. When Marx describes the "factory," the apotheosis of industrial production, he, uncharacteristically for *Capital*, dwells in the embodied and sensual realities of the capitalist mode of production: "Every sense organ is injured by the artificially high temperatures, by the dust-laden atmosphere, by the deafening noise, not to mention the danger to life and limb among machines which are so closely crowded together."[41] That's because, what's at stake here, along with and implicating the particular cruelties and dangers of factory work, is a dramatic shift in the phenomenology of labor, wedged further and further into production processes as a function of the demand for relative surplus value.

If what subsumption ultimately entails then is an intervention into the phenomenology of labor, it's for this reason it serves in this dissertation as a useful category for considering the transformations of knowledge work that have taken hold in Antarctica since the earlier institutionalization of Antarctic research and inhabitance. For the first generations of durable British Antarctic research stations dating back to the 1950s and 1960s, for instance, station inhabitants led a relatively freewheeling, unruly life over the course of a contracted, year-long stay, resembling a fairly autonomous cell, with a generally shared investment in the work of the station but also a certain distance from structures of management and command. These inhabitants spent substantial time constructing the arena in which sustained scientific observation might come to take place, but also taking part in games of bridge and Mahjong, throwing late-night parties followed by mornings taken off for long hungover lie-ins, and playing practical jokes on one another.[42] Inhabitants at American stations during this time faced stricter order and disciplining, the stations overseen by military command structures, though the first and largest American station, McMurdo, primarily acted as a kind of base camp for field research, which itself was carried out acutely amidst the exigencies of the geophysical environment, and in the kind of ad hoc and relatively independent fashion of much of the era's extreme fieldwork.[43] The late 1980s saw a refurbishment of McMurdo by the NSF, shifting the feel of the station away from that of a military barracks.[44] By the mid-2000s, one could speak at McMurdo of relatively standardized, if, for operational and service workers, frustrating employment conditions and on-site HR.[45] In a like sense, by 2022 the watchword for much British Antarctic research is automation. Efforts abound to maintain regular streams of scientific data with shrinking human presence. A research trip might entail a summer season's worth of intensive, tightly disciplined, 6 day-a-week labor, servicing equipment and preparing stations for a long winter season of limited human interaction.[46] In drawing a distinction between US and British Antarctic research station, it becomes clear that the research programs started out under differing conditions, different versions of a labor process and its attendant command structures that were to a significant degree heterogenous to postwar Fordist enterprises. Their parallel subsumption under normative conditions of capitalist work occurs as more of a historical convergence under variable conditions than a singular, determinate historical process.

Antarctic work has been subsumed under both the standards and the crises of contemporary professional work, looking far more like regular university labor – whether scientific, operational, or service-oriented – than 70 or 80 years ago. Treating knowledge work in Antarctica through the category of subsumption, though, begs certain questions. What precisely is driving this subsumption

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[41] Marx, *Capital Volume 1*, 552.

[42] These aspects of Antarctic social life are discussed in further depth in Chapter 2 of the dissertation.

[43] Christy Collis and Quentin Stevens, "Cold Colonies: Antarctic Spatialities at Mawson and McMurdo Stations," *cultural geographies* 14, is. 2 (April 2007), 239, 245-246. For more on mid-20th century fieldwork, see Etienne Benson, "The Post-Heroic Field," *Isis* 113, is. 1 (March 2022): 114-120.

[44] Collis and Stevens, "Cold Colonies," 246-248.

[45] For more details on the working conditions at McMurdo in the late 1990s and 2000s, see chapter 3 of the dissertation.

[46] See Chapters 1 and 4 of the dissertation in particular.

for researchers who aren't obviously producing commodities to be wrested away by employers for the sake of relative surplus value? Insofar as what I'm concerned with is as much the phenomenology of subsumed labor in the context of extreme environments as it is something like the political economy of knowledge work, I will largely bracket this question, but can venture here a few tentative answers. Like much of the work of the contemporary sciences, knowledge work and its attendant infrastructures in Antarctica, even where largely publicly-funded, follows trends in the character of research more generally that have been documented and analyzed by a number of scholars of what's been called "academic capitalism," and taken up within the lower ranks of scientific labor through organized collective action,[47] entailing discernible if at times indirect relationships between the aims and ways of organizing private enterprise and the direction of academic research.[48] That is to say, the subsumption of Antarctic work, at least in the Anglophone sphere, is part of a wider subsumption, commented upon by a number of contemporary critics, of arenas of production (alongside the cultural, aesthetic, literary, religious, and the like) which had at some point existed with a relative or supposed autonomy from capital, however oblique the actual function of a particular sphere of production (such as scientific knowledge production) might be in relation to what might be thought of as a perfuse "social factory" of capital extending across the contemporary world. To a degree and particular as oriented toward climate and environmental management, climate science's own function within a global "social factory," as I suggest in the first chapter of the dissertation, is to help facilitate capital's aims to preserve the durability of logistical and infrastructural networks in the face of climatic threats.[49] Alongside these trends are the observations of a range of sociologists of science, going back to Bruno Latour and Pierre Bourdieu, on the growing organization of the sciences around a kind of competitive entrepreneurial logic,[50] a logic exerted both within the university and the sphere of publicly-funded research but also on that sphere by privatized science.[51]

Outside of these questions, what I focus on in the dissertation, in examining transformations in Antarctic work through the lens of subsumption is the pressure that Antarctic conditions put on the possibilities for straightforwardly subsuming a labor process under standard patterns of temporal organization and rhythms of experience. As noted above, "real subsumption" centrally involves a disciplined re-organization of the time and activity of a labor process, situating individuals in a tightly structured and highly-managed way in relation to the machinic apparatuses of production to increase their efficiency. When Foucault begins to set out his own theorization of a "an idea of a technology of power" involved in the discipling of subjects in not simply a repressive sense, he

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[47] Science for the People, ed. *Organize the Lab: Theory and Practice* (2022), https://magazine.scienceforthepeople.org/organize-the-lab/.

[48] Daniel Lee Kleinmann and Steven P. Vallas, "Science, Capitalism, and the Rise of the 'Knowledge Worker': The Changing Structure of Knowledge Production in the United States," *Theory and Society* 30 (August 2001): 451-492; Edward J. Hackett, "Academic Capitalism," *Science, Technology, & Human Values* 39, is. 5 (September 2014): 635-638; You-Na Lee and John P. Walsh, "Rethinking Science as a Vocation: One Hundred Years of Bureaucratization of Academic Science," *Science, Technology, & Human Values* 47, is. 5 (September 2022): 1057-1085.

[49] For echoes of the reading of climate science I offer in chapter 1 of the dissertation, as well as a brief overview of the wider STS and history of science engagements with Earth system, environmental, and climate science, see Etienne Benson, "Review: Duncan Kelly's *Politics and the Anthropocene*," *H-Diplo*, July 5, 2021, https://networks.h-net.org/node/28443/discussions/7893123/h-diplo-roundtable-xxii-48-kelly%C2%A0-politics-and-anthropocene#_Toc76135182.

[50] Pierre Bourdieu, "The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason," *Social Science Information* 14, is. 6 (December 1975): 19-47; Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, NJ: Princeton University Press, 1986), 189-208, 214-216;

[51] This exertion of pressure on university research by science done in the private realm was an oft-recurring talking point of a number of post-doctoral researchers I spoke to as part of a standalone project examining the relationship of scientific knowledge production to labor militancy during the 2022 UC strikes.

turns, in his 1976 lecture, "The Mesh of Power," to Marx's writing on the extraction of relative surplus value. As he draws out of Marx, "The original, essential and permanent function of these local and regional powers is, in reality, being producers of the efficiency and skill of the producers of a product."[52] What Foucault is describing here under the category of a "technology of power" that acts on individuals in situating them productively in relation to certain spatial and institutional orders is equivalent to that which, for Marx, characterizes the mechanisms for newly arranging production processes as a function of the logic of capital accumulation. And this, alongside spatial and institutional orders, demands the imposition of normative time on individual habits in their relation to a wider production apparatus.

Are there certain kinds of environmental limits to the expropriation and re-organization of time involved in this process though? An examination of Antarctic knowledge work puts this question to the test, and in doing so considers the limits of subsumption more generally, particularly where labor processes are put under pressure by the prospects of volatile climatic conditions and environmental crises. Certain unique elements of the working conditions in Antarctica do seem to stretch the limits of time discipline. The seasonal textures of an Antarctic year follow the unique polar pattern of night-less summers and extended sunless winters. In the earliest instances of long-term stays within the Antarctic, either side of this seasonal combination tested (and in certain cases broke) the sanity and endurance of inhabitants in extraordinary ways, a topic I explore more in chapter 2 of the dissertation in particular. This meant early Antarctic inhabitants faced prolonged periods of work and prolonged periods of essentially obligatory rest and recovery, odd patterns of life further exacerbated as inhabitants engaged in field exploration and research that implicated the brutal dry, windy cold of the continent. On what's famously been termed Antarctica's "worst" prolonged field research endeavor, participants needed recourse to several hours of time in the morning and evening to take on the simplest tasks – escaping or settling oneself back in a sleeping bag; dressing and undressing; entering feet into shoes on one end of the day and removing those shoes on the other.[53] The labors of basic personal and social reproduction acutely dominated the day in ways that required reworking the temporal patterns of the supposed primary labor (of field reconnaissance) that justified the endeavor itself. These were extreme moments and much of the social, scientific, infrastructural, and technological mediation on the continent since has gone into enabling increasingly standardized patterns of work and life in both field and station across the continent.

To this day though, overwintering puts certain seemingly hard, fixed, psycho-physiological pressures on inhabitants: in ways that compare to and, to a degree, extend beyond the experiences of only the most far-north inhabitants of the Arctic, overwintering Antarcticans will face seasonal depressions, lolls in activity, sleep abnormalities, and the like, symptoms that have become steadier (almost like clockwork among contemporary stations) as stations themselves have stabilized their own internal conditions and infrastructure. These are the issues that technological mediation over the last several decades, from the crass (literal dozens of daily cups of coffee) to the cutting edge (artificial sunrises and sunsets built into the living spaces of newly- and highly-designed Antarctic stations), have sought to bring into line with hopes for maintaining a standard work week throughout the Antarctic year, though the most recent design interventions and psychological literatures point to an enduring recognition that winter months of inhabitance will continue to be characterized by the need to promote greater amounts of rest, less-intensely disciplined work habits,

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[52] Michel Foucault, "The Mesh of Power," trans. Christopher Chitty, *Viewpoint*, September 12, 2012, https://viewpointmag.com/2012/09/12/the-mesh-of-power/.

[53] This journey, documented in Apsley Cherry-Garrard's first-hand account, *The Worst Journey in the World*, is discussed in greater depth in chapter 2 of the dissertation.

and a mix of recreational/self-reproducing solitude and the corralling of inhabitants around regular outlets for sociality to break against the inertial impulse toward prolonged isolation (overwintering depression is associated with increasing social withdrawal).[54]

As the effects of climate change advance rapidly in the polar regions, Antarctic work and life have also taken on textures that don't straightforwardly align, even as they interact in a sense, with capitalist patterns of work. Facing compounding conditions of climatic and extra-climatic volatility (exacerbated by the COVID-19 pandemic), ostensibly year-long Antarctic research stations have gone through re-locations, re-organizations, and staff cuts. The British Antarctic Halley station holds a privileged place in this dissertation for a number of reasons – its role as a kind of reproducible model for certain now-common, technologically-minded architectural interventions on the continent; the unique availability of textual access to the station's cultural traditions; its exceptionally odd, remote, and volatile location on the Antarctic ice shelf – but one of the most important ones is how acutely and rapidly it has faced intense social, organizational, and climatic/geophysical volatility, leading to sustained winter closures and uncertain prospects for year-long re-opening over the last five years. There then, the time of inhabitance at Halley appears especially disciplined precisely because it's constrained to a shortened three-month summer season, the phenomenological reorganization of Antarctic labor in turn folding in the textures of intensified on-site work seasons and distanced periods of off-site office work requiring a certain faith in networked access to the station's data infrastructure.

While the most obvious and pressing explanation given for this re-organization of Halley work/life over the last roughly half-decade involves the pressure exerted on the station by its locational precarity and the increasingly rapid shifts and fractures of the Antarctic ice sheet, a range of other factors contribute to what now appears to most Halley staff as a permanent shift in how the station runs that speak to a continuity between the apparently unique conditions of Antarctic knowledge work and the social and economic pressures put on contemporary knowledge work and labor more broadly at the most general level. The acute risks of ice sheet breakaway that closed down the station initially accelerated moves within the station toward advanced automation of on-site data infrastructure, a logic furthered under the COVID-19 pandemic and seen by those at Halley as exemplary of what's to come more broadly as Antarctic research stations face increased climate volatility and organizational imperatives toward more efficient data extraction at less cost.

Obscured then by a narrowed focus on the geophysical volatility of the continent, a view toward the subsumption of labor processes under patterns of work that, however unique in their own right, align Antarctic research with diffuse capitalist imperatives, helps shed light on a range of important features of climate knowledge work there, particularly around questions of automation, precaritization, logistics labor, and logics of extraction. In closing out this section, I'll take a short detour through a set of interlocutors that speak to what can be viewed as logics at play in the context of Antarctica as an acute site of climate data extraction.[55] For Brett Neilson and Ned Rossiter, "precarity" can be seen as a normative condition of work, Fordist regimes of temporal regularity and job security an exception distinct to particular periods and varieties of labor.[56] Much of the labor cycling through Halley and other Antarctic station, especially mechanical and technician's labor, is already organized around relatively short-term, seasonally-structured contracts,

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[54] For more details on what's briefly outlined in this paragraph, see chapter 2 of the dissertation.

[55] The remainder of this section is reproduced in a journal article based primarily on the first chapter of the dissertation. See Spencer Adams, "Imaginaries of Planetary Inhabitance: Polar Futurism and the Labors of Climate Science," *Environment and Planning E: Nature and Space*, OnlineFirst Publication (October 11, 2022): https://doi.org/10.1177/25148486221129124.

[56] Brett Neilson and Ned Rossiter, "Precarity as a Political Concept, or, Fordism as Exception," *Theory, Culture & Society* 25, is. 7–8 (December 2008), 54-57.

even as scientific labor is edged out of the base. Neilson and Sandro Mezzadra point as well to common logics of logistical labor regimes, logics geared toward the overcoming of human subjectivity. They draw on the work of Fred Moten and Stefano Harney who, in commentary on logistical subjectivity tying contemporary regimes of work and logistics back to roots in the Transatlantic slave trade, claim of logistics that it "wants to dispense with the subject altogether."[57] As Neilson and Mezzadra put it, "contemporary logistical systems … striv[e] for resilience, or fault tolerance, for an ability to go on operating despite breakdowns or interruptions, for the accommodation or avoidance of hindrances, whether they result from natural disasters or labor stoppages."[58]

In this sense, a station like Halley VI appears as a logistical system, a piece of infrastructure on the ice oriented toward ongoing accumulation and circulation of information, despite the geophysical precarity in which its situated, but also enabling a growing evacuation of the physical presence of human subjects via that very geophysical precarity. Automation is the watchword presented as a key fix for facilitating the ongoing functioning of this logistical system. Martín Arboleda's work on the centrality of extractive logics to contemporary capitalism offers a framework for making sense of this if we recognize this framework as extending beyond primary commodity production and implicating an extractive relation to data accumulation. Arboleda shows trends toward an increasing incorporation within extractive endeavors of a remote technical workforce and automated technological means of extraction, that at once squeeze and evacuate laborers present at sites of extraction.[59] Moreover, the image the comments of the scientist quoted above paint suggests dynamics not unlike what Aaron Benanav theorizes in his critical commentary on full automation discourse. Benanav's analysis takes stock of a world driven by the automation of particular tasks and labors toward ever further underemployment. He argues that full automation ought not to be seen as any kind of "technological fix" to social problems, including that of widespread subjugation to the wage relation, but rather as a facet of an ongoing restructuring of the category of "employment" itself. As opposed to a large-scale liberation from waged work, automation and technological development more generally have long been part of an ongoing and ever-renewing social abjection of different kinds of labor.[60] A subsumed labor process subjects those who carry it out to the effects of these structural trends in ways that exert a pressure on Antarctic work and life as profound as the environment itself.

Knowledge Work and Exteriorization

If subsumption here names an effort to restructure a labor process in line with and in response to the structural trends that bear on the constitution of contemporary knowledge work more generally, what subsumption demands acutely in relation to the distinct environmental pressures of Antarctic work are especially obvious, visible forms of social, cultural, and technical mediation. These forms of mediation involve flashy technological oddities, institutionalized venues for reflection and observation, rapid and dramatic extensions of the kind of industrial mediation (digitalization, networking, logisticization, and automation of sites of knowledge production) that appears continuous with transformations of contemporary work the world over, etc. What I go on to demonstrate throughout the chapters of this dissertation are that these interventions into the

[57] Fred Moten and Stefano Harney, *The Undercommons: Fugitive Planning & Black Study*, (Wivenhoe, UK: Minor Compositions, 2013), 87.
[58] Sandro Mezzadra and Brett Neilson, *The Politics of Operations: Excavating Contemporary Capitalism* (Durham, NC: Duke University Press, 2019), 153.
[59] Martín Arboleda, *Planetary Mine: Territories of Extraction Under Late Capitalism* (London and New York: Verso, 2020), 91.
[60] Aaron Benanav, "Automation and the Future of Work-2," *New Left Review* 120 (Nov/Dec 2019), 117-130.

socio-technical environment of Antarctic research are re-mediations that work to absorb generations worth of wisdom, knowledges (tacit and explicit), anxieties, habits, practices, and realizations that have in their own arising been folded previously into Antarctic forms of life. In doing so, these re-mediations project back onto the socio-technical environment of Antarctica a particular vision of Antarctic life, work, and sociality, helping to facilitate an ongoing reconstitution of the experience of Antarctic work/life in the process.

As a way of addressing these processes of socio-technical (re-)mediation, I want to follow now a line of thinking that the French philosopher Bernard Stiegler develops in *Technics and Time* around what he calls "exteriorization" or a "pursuit of life by means other than life."[61] Stiegler's account of technics within the terms of this pursuit rests substantially on an interest in both adopting and complicating certain Heideggerian categories—of authentic and inauthentic temporal modes and of temporalization, thought in a primordial sense, as the fundamental conditioning feature of Dasein's ontological being. Heidegger's account of temporalization as a "movement…which opens [past, present, and future] up to one another,"[62] then lays out said past, present, and future as corresponding to three "ecstases" folded into the unity of time, which, drawing from Ancient Greek origins of the term "ecstasy," is his way of referring to the three ways (past, present, and future) in which time leaps outside of itself in its primordial ongoingness for Dasein.[63] The future—Dasein's always anticipative stance of being "ahead-of-itself"—is especially important among these ecstases as the condition of possibility for temporalization as an ongoing openness.[64] At the same time that Dasein's being is always projected forward, it also always holds the character of "having been," that is to say having been thrown into a world with particular possibilities, in which Dasein is, as understood by Heidegger, for the most part fleeing into the legible, public, inauthentic modes of existence in which it can be absorbed, and thus turn away from an authentic facing down of ecstatic anticipation's ownmost possibility, namely the ontological finitude of Dasein's being.[65] It's then in terms of these inauthentic modes of existence that Heidegger comes to define, against primordial time as temporalization, a secondary form of time, the calculative clock time that likewise comes to condition a socially shared understanding of historical time.[66]

Stiegler's intervention against Heidegger retains an ontological account of Dasein's being as a being conditioned by temporalization, as well as an understanding of temporalization as comprised of an ecstatic unity. Yet he structures into this account technics, including a technics as embodied in the time of the clock, as part of the ontological being of Dasein. Following a set of anthropological accounts of the early human being, particularly that of André Leroi-Gourhan,[67] Stiegler rethinks Heidegger through an understanding of Dasein as fundamentally conditioned, not just by its being

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[61] Bernard Stiegler, *Technics and Time 1: The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Stanford, CA: Stanford University Press, 1998), 17.

[62] Pheng Cheah, *What Is a World?: On Postcolonial Literature as World Literature (Durham, NC: Duke University Press, 2016)*, 110.

[63] Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (New York: Harper & Row, 1962), 376.

[64] Heidegger, *Being and Time*, 364-380.

[65] Heidegger, *Being and Time*, 219-224.

[66] Heidegger, *Being and Time*, 464-472.

[67] The French paleoanthropologist, André Leroi-Gourhan, developed an account of the human as founded in the invention of tools. From this initial moment, where the human is co-constituted together with the emergence of a technical world, Leroi-Gourhan traces developments in human history as a kind of history of evolution emerging out of the biological realm and taking hold in the social and technical realm, as humans increasingly externalize their gestures, ideas, and habits onto a shared socio-technical environment. See André Leroi-Gourhan, *Gesture and Speech*, trans. Anna Bostock Berger (Cambridge, MA: The MIT Press, 1993).

already in a world, but by its relationship within that world to tools of various kinds. Importantly, these tools, as conditioning features of Dasein's ontological being, are essential to any possible understanding of a relationship of Dasein to time. Tools—encompassing everything from early human hand tools to complexly organized technical objects—are the means, in Stiegler's account, of producing time ecstatically, of creating the conditions for any possible anticipation of future possibilities or retention of a world in which Dasein is thrown. As he puts it, "There is no anticipation, no time outside of this passage outside, of this putting-outside-of-self and of this alienation of the human and its memory that 'exteriorization' is."[68] Exteriorization—the "pursuit of life by means other than life"—consists in an alienation of human being, an alienation that reproduces facets of conscious processes in the external, material world. This alienation spans across basic prosthetic extensions of the human, like early human tools which reproduce the motion of limbs or the slicing capacity of teeth, as well as contemporary technical reproductions of human thought and consciousness.[69] What's important for Stiegler is that it's in this very moment of alienation and interaction with the exteriorized world of alienated human being that time, in any sense, is produced and reproduced. To project one's movement or thought onto an external object is likewise to anticipate the use of that object outside of the singular moment of the present, and then subsequently to recognize in that object the memory of that projection and the processes of movement or consciousness held therein.

Stiegler's move then is to literalize (and materialize) the ecstatic structure of Heideggerian time, such that the temporal ecstases entail actual leaps, projections, and extensions outside of an individual Dasein. If Dasein is always a being in the world qua temporalization, this temporalization is always already what inheres in a shared socio-technical world, a shared socio-technical world that then at once conditions Dasein's being and has an evolutionary life in constant interaction with but also disjuncture from Dasein. In these terms, it no longer makes sense to speak of a primordial time sited within the "who" of Dasein and a secondary time sited within the "what" of a clock,[70] as either of these terms continuously evolve with, condition, and re-organize one another. This co-evolutionary process moreover demands a rethinking of temporal finitude. As Stiegler says, "Time is each time the singularity of a relation to the end that is woven technologically. Every epoch is characterized by the technical conditions of actual access to the already-there that constitute it as an epoch, as both suspension and continuation, and that harbor its particular possibilities of 'differ*a*ntiation' and individuation."[71] If temporalization is no longer the primordial time of an individual Dasein but rather the shared, exteriored time of the social and technical world in interaction with the people that inhabit that world, temporal finitude is then no longer the ownmost possibility of Dasein, Dasein's being-towards-death. Rather, shared social and technical epochs condition certain modes of relating to time and to possibilities of anticipation, including the anticipation of shared finitude. "Time is each time the singularity of a relation to the end…" in so far as exteriorized time calls forth certain modes of relating to the finitude of a shared world, and to the anticipation of disjunctural technical and social evolution away from that shared world.

In the differ*a*ntial gap Stiegler points out between the "what" of exteriorized time and the "who" of humans embedded in a world conditioning a relation to time, a slippage emerges that allows either term to exceed the other. For Stiegler, the modern technological condition is one of that slippage taking a kind of supercharged form in the acceleration of technical evolution well past the capacity for human social evolution to maintain a temporal grip, to recognize in its own

[68] Stiegler, *Technics and Time 1*, 152.
[69] Leroi-Gourhan, *Gesture and Speech*, 237-251; Stiegler, *Technics and Time 1*, 146.
[70] Stiegler, *Technics and Time 1*, 141-142, 212-214.
[71] Stiegler, *Technics and Time 1*, 237.

anticipations the ongoing development of the exteriorized and projected world.[72] It's as if then an ever widening gap separates or "skews"[73] away the projections inherent in exteriorized temporal modalities from the forms of human being these projections ostensibly conjure forth. This, for Steigler, marks a shift from ongoing re-mediations of a given socio-technical world that hold the "who" and the "what" of that world in suspension with one another. All such re-mediations entail potentially violent dissolutions of existing lifeways, ones that may happen almost imperceptibly over long stretches of time, and re-integrations of a socio-technical world and the individuals who inhabit it in turn, and in that sense all are points of opening, contingency, and potential struggle over the precise modes of re-mediation (the texts of Plato manifest a kind of active struggle over the re-mediation involved in the introduction of writing into the world, while the classical era of industrial worker sabotage, strikes, worksite occupations, and even socialist revolutions manifested the active struggle over the introduction of machines, techniques, and social relations specific to industrial capitalist production).[74] What Stiegler argues though, most pointedly in volume 3 of *Technics and Time*, is that the contemporary technological moment is one distinctly marked by a kind of resolution of the suspension between the "who" of the human being and the "what" of the human's socio-technical world in favor of the later.[75]

As highlighted particularly in Chapter 2 of the dissertation, the most up-to-date results of an ongoing re-mediation of Antarctic psychic being are now folded into a kind of technological shell pitched as intervening against the continent's harsh environmental conditions. What's at stake in this though, even as it offers novel ways to accommodate Antarctic inhabitants to their environment, is a shift to said technological shell capturing and integrating not simply the regularly contested and re-worked memories, wisdoms, and knowledges of past and present Antarcticans but projections and anticipations around human expectations, desires, and possibilities on the ice. Antarctic psychic being seems no longer to be an object of discourse and contestation amidst those integrated into a collective form of life but a set of positive claims codified into the technological apparatuses of sustaining life on the continent. Something analogous is happening in Chapter 3, as cultural and literary production *of* the Antarctic, long part of the larger understanding of how to sustain long-term research stays in Antarctica, comes to shift from an exteriorization of lay thoughts and discourses onto practices, habits, festivities, and ephemerally shared cultural objects as part of an integrated form of life to an institutional exteriorization of these practices and the themes and concerns arising out of them onto a separate professional sphere of Antarctic cultural production understood as mediating globally-available representations of the continent.

For Stiegler, ultimately, the issue of a technological capture of past, present, and future rupturally beyond the ongoing suspension and re-mediation of technics and time as co-constitutive plays out at the level of a consumer society plugged into a global world of novel technological

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[72] Bernard Stiegler, *Technics and Time, 2: Disorientation*, trans. Stephen Barker (Stanford: Stanford University Press, 2009), 3.
[73] I am adapting this term "skew" here from Donald Mackenzie's work on the performative agency of economic models in the era of financialization. Mackenzie, drawing on prior work in STS, argues that economic theory, including the Black-Scholes model used for describing the pricing dynamics of financial derivatives, was crucial in constructing the conditions of possibility for its own success as a mathematical model. It was, in that sense, what STS scholars call a "performative" theory, namely one that doesn't so much describe a pre-existing material reality as it does work to construct the material realities to which it points. Mackenzie argues further that this theory performativity didn't work perfectly in the case of Black-Scholes but rather helped construct a situation that ultimately skewed away from the reality that the original model claimed to describe. See Donald Mackenzie and Yuval Millo, "Constructing a Market, Performing Theory: The Historical Sociology of a Financial Derivatives Exchange," *American Journal of Sociology* 109, no. 1 (July 2003): 107-145.
[74] Stiegler, *Technics and Time 2*, 34-37, 75-81.
[75] Bernard Stiegler, *Technics and Time, 3: Cinematic Time and the Question of Malaise*, trans. Stephen Barker (Stanford: Stanford University Press, 2011), 172-177, 199-204.

objects. He uses the term "proletarianization" but carries it chronologically past the classical proletarianization of individuals as workers folded into industrial production processes, seeing proletarianization happening at the level of thought and subjectivity and bearing on individuals as consumers and participants in the social and political world.[76] In treating the scientific research stations I look at in Antarctica through the lens of "knowledge work," part of what I want to suggest though is that the problems of a shift from technics to technology that Stiegler diagnoses remain problems that are perceived by those integrated into process of knowledge production as problems hovering around the conditions of their labor. As practices of scientific activity, in-base routines and cultural habits, and collective wisdom as to how to negotiate the psychic and physiological effects of Antarctic inhabitance are re-mediated through forms of automation, institutional restructuring, and socio-technical intervention, the resulting shift in know-how and subjectivity is not just a matter of consumer passivity but a proletarianization of "knowledge work" as a site of myriad and socialized labor. And what I aim to demonstrate across the chapters I'm looking at are glimpses of sustained and possible contestation held at a kind of distance from visible and rapid technological advance. If the conditions of learning, teaching, and research during the pandemic signal the prospects of a kind of anthropocenic technics that strives to fixedly accommodate knowledge workers to volatile conditions that appear as the result of external and uncontrollable realities, technics that accelerate existing social and economic trends in the restructuration of knowledge production and transmission more broadly, it remains valuable to develop tools for reading the conditions of environmentally precarious knowledge work as open and re-workable.

Chapter Outlines

As laid out in the beginning of this introduction, this dissertation will explore discursive linkages between Antarctica and the Anthropocene, making the case that these discursive linkages overly fixes the continent and the human activities within it as a space that in its environmental harshness and precarity projects and anticipates Anthropocenic futures. This tendency sees an acute expression of the Anthropocene in Antarctica presently but holds prospects for the organization of human life, work, and knowledge at a global scale. What this in turn risks facilitating are fixed socio-technical interventions that capture the future as a problem of environmental management, while obscuring lines of open discourse, debate, and contestation over the myriad conditions and forms of collective life. Wrestling with these concerns, the chapters of this dissertation each explore a particular component of Antarctic life where this link is, in the present, prominently made: architectural design, in-station psychological research, speculative fiction, and scientific research pertinent to the production of global climate models.

Chapter 1 examines the site of polar futurism's most explicit invocation, the contemporary architecture of Antarctic research. Amidst a set of design developments that have now taken hold across a range of national research programs, penetrated the polar north, and sparked planning on prototypes for globally replicable short-term and makeshift research hubs, the chapter focuses on the paradigmatic futurist architectural object of the Antarctic, the Halley VI research base located on the Ross Ice Shelf atop the Weddell Sea. Designed in the 2000s and erected in 2013, the novel Halley station design, drawing on a range of sci-fi tropes and imaginaries, emphasizes a set of anticipations about the prospects for durable communal and balanced lives in Antarctica and has conjured forth hopes for sustainable living through the volatile conditions of advanced climate change. In starting the chapter, I draw on a mixed archive of base designs, media objects promoting

[76] Bernard Stiegler, "The Proletarianization of Sensibility," trans. Arne De Boever, *boundary 2* 44, no. 1 (2017). See also see Benoît Dillet, "Proletarianization, Deproletarianization, and the Rise of the Amateur," *boundary 2* 44, no. 1 (2017).

the base, and informational material provided by the architectural firm that designed the base, to demonstrate the significance of science fictional imaginaries on the architectural vision behind the base and to develop a reading of the projected image of base life embedded in its architectural design. Reading the base design and its actual contemporary use from within, I then complicate this image, drawing on interviews carried out with numerous long-time and former inhabitants of the base to portend the marginalization of human labor to key arenas of scientific knowledge production and the subsumption of climate research under capital's broader aims to facilitate stable logistical movements and infrastructural durability amidst extreme conditions. In the latter part of the chapter, I move to a reading of the base from without, highlighting what I term a "deconstructable nationalism" operative in the marketing and repurposing of the base design both in the UK and more widely and situating this "deconstructable nationalism" within the base's contemporary scientific and extra-scientific functions as a logistical node within British post-imperial space.

Chapter 2 shifts to an examination of the history of meta-scientific knowledge reflecting on the Antarctic inhabitant, specifically focusing on efforts to characterize and facilitate the relative stability of a distinctly Antarctic "psyche." For several decades, Antarctic research stations have been seen as laboratories of a sort for studying human isolation, alongside psychological and physiological responses to prolonged darkness. While these studies have been most closely linked to a different terrain of futural projection, tying the Antarctic to prospects for long-term space travel, they've increasingly constituted an institutional body of research that presently is articulated around a wider set of environmental factors that have relevance to human psychological reactions to Anthropocenic conditions. What I show in this chapter is that this more recent institutional body of psychological research reflects a re-mediation of a much longer set of discourses around the human psyche and its relation to the Antarctic environment. The chapter starts with an examination of the earliest efforts to consolidate a set of theories and knowledges around the volatile psyche of Antarctic explorers, reading in particular a set of famed travel narratives from the "Heroic Age of Antarctic Exploration" with especial focus on Apsley Cherry-Garrard's canonical book, *The Worst Journey in the World*. I shift in the second part of the chapter to a largely obscured archive of reflection on the psychological and behavioral conditions of Antarctic inhabitance: the often joke-y and informal writings of early FIDS/BAS-employed inhabitants of 1950s/60s era Antarctic research stations, held in on-site produced magazines presently available through the BAS archives. The latter part of the chapter focuses on research papers from efforts starting in the 1970s and carrying through into the contemporary era to begin consolidating sporadic studies on Antarctic psychology into an institutional body of scientific knowledge, before highlighting the fixing of the lessons from this body of scientific knowledge into technoscientific apparatuses aimed at facilitating clean, durable psychological stabilization in the Antarctic present. While certain symptoms are carried through each stage in this historical evolution of Antarctic psychology, what the chapter demonstrates are dramatic shifts in how people at various points came to understand the existence of a uniquely Antarctic "psyche" and the particular pressures that bore on that psyche, whether matters of yearly temporal patterns, environmental hostility and volatility, remoteness and isolation, or institutional disfunction and social disorganization. The "psyche" in and of itself and in its relationship to the environment was held open across this trajectory of discourses as an arena of ongoing contestation, linked acutely to struggles over the laboring conditions of various generations of Antarctic inhabitants. After showing this, the chapter then ends by expressing concern over the fixing of a technoscientifically-mediated Antarctic "psyche" in the technological apparatuses sustaining contemporary Antarctic life, seeing in this a risk of ignoring and closing down currents of contestation in the fixing of contemporary Antarctic social life and conditions.

The third chapter of the dissertation considers Antarctic literary production, specifically in the context of different modalities of Antarctic inhabitance and taken as an important strain of the wider sphere of cultural production both located in and concerning Antarctica. As noted above, Bloom's recent art historical monograph, *Climate Change and the New Polar Aesthetics*, is explicit in characterizing the last few decades of art work in and of the Antarctic as a site of Anthropocenic speculation, seeing in Antarctica a way of re-imagining the future beyond both the fatalist catastrophism of disaster movies like *The Day After Tomorrow*, as well as beyond the histories of the Antarctic dominated by tropes of predominantly white, masculinist imperial exploration. Such work both echoes and complements speculative fictional treatments of the continent over the last few decades, from Ursula K. Le Guin's short story "Sur" to Kim Stanley Robinson's *The Ministry for the Future*. And such work, in the case of the artists Bloom considers, along with Robinson's work and a now substantial array of other cultural and aesthetic interventions, has been made vastly more possible by expanded artist and writer residency programs that hold as their explicit aim the representation of Antarctica and the scientific activities pursued on the continent for a global audience, a representational project increasingly tied to Antarctica's significance to global climate modelling and understandings of climate change. Relative to this modality of cultural production in the Antarctic, much of what this chapter shifts focus to is an earlier, less-commented on, and to a certain degree unknown history of Antarctic literary production. For both the earliest generation of Antarctic explorers and for the earliest institutional inhabitants of Antarctic research stations, literary and cultural production, from the writing of newspapers and magazines to one-off stage productions, always taken on with a consciously amateurish levity, was folded into the ongoing production of a disciplined form of life amidst the pressures of environmentally and seasonally harsh and remote living. This chapter starts by situating this aspect of early Antarctic literary production as a kind of intervention into materialist sociologies of literature and culture, before returning to the 1950s/60s era on-site magazines explored in Chapter 2, though this time with a particular focus on the fictions and imaginaries that emerge in these magazines. I highlight two short stories in particular, either one of which plays at a kind of mimicry of popular and speculative genres, highlighting the seemingly exceptional and sublime character of subterranean Antarctic bases, before collapsing this generic play into jokes leveled at the fundamental tedium of Antarctic everyday life. The latter part of the chapter then sees this tension between the sublime/exceptional and the tedious/banal return, though this time as a conscious thematic in what's perhaps the exemplary work emerging out of the US Antarctic Artists and Writers residency program, Kim Stanley Robinson's *Antarctica*. Across this archive of literary material, what this chapter traces is at once a thematic continuity that sees Antarctic labor as wrestling routinely with the interplay of the tedious and the sublime and a dramatic shift in the locus of Antarctic literary production, from serving as a functional, disciplining feature of a distinctly Antarctic form of life to an institutionally-sponsored representational project, concerned with Antarctica's place within global imaginaries of a climatically threatened world.

Each of these first three chapters think in some ways about the conditions of Antarctic knowledge work, about the cultural, social, technical, and meta-scientific aspects of producing and sustaining Antarctic forms of life. Each then also wrestles with an arena of the Antarctic where the subsumption and exteriorization of Antarctic space and knowledge work towards something networked, global, and relatively routine and familiar is visible alongside histories of contestation over that subsumption and exteriorization. In the dissertation's final chapter, I turn consciously to an examination of the products of Antarctic knowledge work. Specifically the chapter is concerned with the making of climate data, observation, and models in Antarctica in the present. Climate modelling in and of the Antarctic, as noted above, has been central to the production of the "global climate" as an object of knowledge and to the contingency with which the future of global climate

has come to be invested. Acknowledging this, while carrying through the dissertation's larger concerns with trends in the structure and status of knowledge work, this chapter considers the labor infrastructures of climate modelling in Antarctica, both building off of and showing the prospects of contingency and contestation embedded in efforts in STS and the history of science to root climate science in a growing global infrastructure, with Paul Edwards's *A Vast Machine* serving as the most obvious touchstone. The first two parts of the chapter situate the contemporary labor infrastructures of Antarctic climate science in two ways: first, in relation to global climate modelling, for which I carry out a reading of the most recent IPCC report to highlight implicit and speculative gestures within the report toward the necessary labors for upholding and sustaining climate knowledge with increasing global coverage and resolution, a task that immanently within climate science itself is positioned as necessary to the work of forthcoming adaptation efforts. Secondly, I situate Antarctic knowledge work theoretically in relation to critical theoretical accounts of scientific knowledge and their echoes in more contemporary critiques of climate science. The final part of the chapter then aims to tell the stories of the labors of Antarctic climate science, drawing on extended interviews with a number of climate scientists studying in and through the Antarctic by ice, by sea, by air, and virtually. Together, these parts of the chapter aim to offer a detailed account of the contemporary social relations and laboring activity that underlie global climate models emanating from Antarctic research. Putting in conversation a composite image of the labors of climate science at a global scale, on one hand, and the social relations of work distinct to contemporary Antarctic research, on the other, affords an opportunity to reflect on the underlying labors of contemporary and future global climate research at a more general level.

Outro: On Worker Agency and Environmental Knowledge

What I see the dissertation doing is drawing out and elaborating the agency of laborers in a site predicated on the production of scientific knowledge to articulate the problems and concerns of the environment – understood geophysical and climatically, but also socio-technically and institutionally – in which they live and work. And in doing so, I hope to speculatively elaborate the potential historical agency of laborers in crucial sites of environmental and climate knowledge production to generatively contest and re-think the forms and frameworks of knowledge suited to an environment (again thought multiply) under crisis. This is part of why I aim to tell the story of the transformations of knowledge work in the Antarctic over the last 70 or so years as a story of subsumption, taking relatively collective and autonomous artisan work and living practices and re-fashioning them through growing socio-technological mediation and correspondent efforts at disciplining and normalization.

In his 2018 book, *Old Gods, New Enigmas*, Mike Davis aims to articulate a theory of worker agency across a wide range of historical contexts and struggles. The throughline that holds these varying contexts together, Davis suggests, is a distinct transformation of artisan labor processes that carry with them a degree of autonomy into fully socialized labor, a transition from formal to real subsumption and the disciplining strictures this carries with it.[77] Contemporary accounts of research privatization and "academic capitalism," alongside a growing precariat within universities and other centers of knowledge production and the nascent rebooting of projects like Science for the People, articulated around an express eye towards organization among those in the sciences who most overwhelmingly experience their work through its determination by the wage-relation, attest to the kind of transition that Davis speaks of being ever more characteristic of the present for knowledge workers, at least in the Anglophone sphere. If there's an enduring speculative horizon for this

[77] Mike Davis, *Old Gods, New Enigmas: Marx's Lost Theory* (London and New York: Verso, 2020), 35, 95.

project, it exists in the hope that this transformation of knowledge work, for all it harmfully carries with it, points to a budding agency of knowledge workers to rethink and reconfigure the institutions and orientations of their work and in doing so re-think the forms of knowledge suited to the crisis conditions to which that knowledge is addressed. This dissertation aims to offer something like a speculative pre-history to knowledge work in the present, glimpsed at the outer edge of the livable world, read out of the ambivalences, oddities, and unruliness of ways of living and working that have long negotiated a hostile environment.

Chapter One
Staging the Present and Future of Science: Imaginaries of Planetary Inhabitance in the Built Space of Halley VI[1]

Halley, the British Antarctic Survey's (BAS) longest-running research station on the southern continent, sits atop the Brunt Ice Shelf, a floating ice sheet on the Weddell Sea. Alongside exceptionally cold, dry, and windy conditions, both continuous and ruptural shedding of ice from the Brunt Ice Shelf lend the area a volatility and inhospitality extreme even for a continent that saw no direct human contact prior to the 19th century. It's not surprising then that though Halley facilities have been in operation continually since the late 1950s, the actual physical space of the station is currently on its sixth iteration. The first four iterations, lasting each between six and twelve years, succumbed to the Ice Shelf's ongoing accumulation of snow, upwards of 1.5 meters per year, and now lie abandoned below the snow's surface, while Halley V was demolished in 2012 to make way for the Halley VI station that opened in early 2013.

Uniquely conceived and built as a mobile research base, Halley VI (see Figure 1) was designed to withstand the harsh and at times unpredictable conditions that left prior stations inaccessible. The station is made up of modular wings attached to a large central living space and sits atop hydraulic legs that allow it to shift location. Alongside slow yearly movement, the station has, in its now seven year lifetime, gone through one major location shift, moving significantly inland due to threats of cracks in the Brunt Ice Shelf causing a major calving event.[2][3] A testament to the recognized difficulties of building a physical space that could withstand the Brunt Ice Shelf's conditions over the long run, even the cutting-edge new Halley VI station was initially given a shelf life of 20 years, longer than prior iterations, but seemingly short relative to the futurist buzz of the station design. And though ostensibly operable year-round, the station has closed during the Antarctic winter season every year since 2017 over fears of becoming separated from the larger Brunt Ice Shelf while otherwise inaccessible.[4]

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[1] Portions of this chapter were revised into the journal article, "Imaginaries of Planetary Inhabitance: Polar Futurism and the Labors of Climate Science," forthcoming in print in *Environment and Planning E: Nature and Space* and published online on October 11, 2022 at: https://doi.org/10.1177/25148486221129124.

[2] "Calving" refers to the creation of an iceberg separated out from the larger shelf, in this case one projected to "cover nearly 700 square miles." The Oxford English Dictionary traces this usage of "calve" back to the 19th century. Prior usages of the term largely refer to the birthing and/or breeding of cows and other items (i.e. to engender a calf), though the word was also seen in specific local contexts used similarly to "caved," as in a geological body "caved in." Across these usages, the word may share a root in the Dutch *af-kalven*, which means "to fall or break away." See "Calve, v. 1," *Oxford English Dictionary*, https://www-oed-com/view/Entry/26563; and "Calve, v. 2," *Oxford English Dictionary*, https://www-oed-com/view/Entry/26564.

[3] A significant Brunt Ice Shelf calving event occurred in late February 2021. This event, which shed off a major portion of the North Brunt, occurred after the rapid onset and progression of a rift in the ice starting in November of 2020. This rift was separate from the slowly converging Halloween Crack and Chasm 1, from which a massive calving event is expected to happen sometime in the future. See "Brunt Ice Shelf in Antarctica Calves," British Antarctic Survey, February 26, 2021, https://www.bas.ac.uk/media-post/brunt-ice-shelf-in-antarctica-calves/.

[4] O. Marsh (glaciologist) in discussion with the author, July 2020.

Figure 1. Full view of Halley VI from the outside. Source: Source: Hugh Broughton Architects[5]

As a national research base, Halley's spatial dimensions, to a significant degree, can be situated within the wider the history of British Antarctic exploration and the legal and geopolitical constitution of Antarctic space more generally. This history has roots in the earliest Antarctic bases, makeshift structures set up during what's now referred to as the "Heroic Age of Antarctic Exploration," a period covering the end of the 19th and the beginning of the 20th century, characterized by a significant number of expeditions to the continent.[6] These early expeditions, inextricable from the era's imperialism more generally, became the basis around which certain competing legal claims to Antarctic territory were made, claims that the Antarctic Treaty System (ATS), signed in 1959, sought to manage. While early iterations of Halley, dating back to 1956, retained, to a degree, the ethos of the imperial era's masculine frontiersman mentality towards the Antarctic,[7] Halley VI, in its design and the rhetorics surrounding it, explicitly sheds any trace of that particular ethos, emphasizing the base instead as a site of inviting home-y comfort. In doing so, Halley VI wishes to present itself as pointing forward towards how we live in a future of peril and possibility, rather than back at the imperial legacy of British Antarctic exploration and research.

Noting, though of course not taking for granted, how Halley VI situates itself temporally, I will treat the base, in what follows, as a kind of speculative spatial form, making claims on the quotidian future of Antarctic scientists, as well as on Antarctic science itself. This speculative character of Halley VI takes on multiple dimensions. At an immediate level, the design pictured above calls to mind popular science fiction, a reserve of imagined possibilities consciously called upon by the architects involved in conceiving of the base. What I demonstrate going forward is that

[5] "Halley VI British Antarctic Research Station," Hugh Broughton Architects, accessed September 22, 2022, https://hbarchitects.co.uk/halley-vi-british-antarctic-research-station/.

[6] The expeditions were generally led by famed explorers and are generally recognized as having occurred prior to technological developments emerging in the 1920s that allowed for greater levels of communication between expeditions and home nations. Among such famed explorers were the Norwegian, Roald Admundsen, credited with first reaching the South Pole, Robert Scott of the UK, whose death shortly after reaching the South Pole (just after Admundsen) became the subject of substantial lore, and Ernest Shackleton.

[7] Klaus Dodds directly traces the links between early scientific endeavors in Antarctica and the effort by Britain to consolidate a South Atlantic Empire against territorial claims by South American nations, Argentina and Chile in particular. See Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London: I.B. Taurus, 2002).

this conscious invocation of science fiction in the design and construction of Halley VI is not simply a matter of kitsch or novelty for its own sake. It rather reflects a larger inclination among those involved in the base's design to imagine science as salvaging the future from operative historical processes, processes that threaten a threaded-together social and environmental degradation. This soteriological expectation figures climate as a site of infrastructural management and situates climate science within a broader logistical landscape working to effect that management.

These speculative conjurations immediately at play in Halley VI's science fictional appearance are facets of the temporalities of scientific life on the Brunt Ice Shelf. At the same time, built space itself—beyond the more sweeping images of futurity Halley VI calls forth—exists, of course, in time. Calling, as I do in my Introductory chapter, upon Stieglerian arguments as to the interventions of technical projections into the perception of time, I would point to further dimensions of the base's speculative character than that of its immediate science fictional appearance. The base projects specific modes of sense experience, patterns of movement, ways of relating residents within to the labors of climate science, and an anticipated sociality, in composite forming a quotidian picture of a salvaged future and its attendant rhythms of everyday life. Techniques for managing climate and the possibilities of environmental calamity merge with techniques for accommodating subjects within this salvaged future to distinct social and environmental conditions, characterized temporally by everything from the possible imminent cataclysmic event to the unique and often-punishing seasonal rhythms of the Antarctic year[8] to a displacement from familiar historico-geographies onto what's frequently perceived as, even for Antarctica, a remote white emptiness.[9]

Among the core questions that emerge in what I present below as a reading of Halley VI from within is as follows: how specifically are life, work, and knowledge among Halley VI's inhabitants shaped and facilitated amidst the base's techno-temporal interventions? Another way of posing this question would ask after the spatial arrangements of life, work, and knowledge at Halley, recognizing that such spatial arrangements involve projections as to the motions of the base's inhabitants, the relations between the base's activities, the flow of knowledge and information at the base, and an array of other concerns for imagining a space of scientific research. In thinking through such a question, one could draw on a significant tradition of research that has sought to articulate the links between architectural imaginaries and knowledge production, links developed in 20th-century scientific spaces not just as architectural metaphors for knowledge but as concrete efforts to spatially configure and facilitate disciplinary distinctions and cross-disciplinary conversations.[10]

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[8] For more on the distinct spatio-temporal disorientation that characterizes experiences of and attempts to consolidate Antarctic space-time, see Alexandra H. Bush, "Cold Storage: A Media History of the Glacier" (PhD diss., University of California, Berkeley, 2019), 4.

[9] Thinking across the imaginaries drawn upon in the design of Halley VI and the specific projections of forms of life instantiated in the base's built space, I recognize a substantial affinity in my claims with Sheila Jasanoff and Sang-Hyun Kim's concept of "socio-technical imaginaries," which they define as "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation specific scientific and/or technological projects." See Sheila Jasanoff and Sang-Hyun Kim, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Regulation in the U.S. and South Korea." *Minerva* 47, no. 2 (2009): 119 -146; and Sheila Jasanoff, "Future Imperfect: Science, Technology, and the Imaginations of Modernity," in *Dreamscapes of Modernity: Socio-technical Imaginaries and the Fabrication of Power*, ed. Sheila Jasanoff and Sang-Hyun Kim (Chicago: The University of Chicago Press: 2015), 4-5. At the same time, I invest my own arguments in this chapter with a specific generic attention to science fiction as it informs such imaginaries, while also looking to draw particular attention in reading Halley VI to dynamics that make Halley's embedded spaces and infrastructures manifest both more and otherwise than the imaginaries they conjure forth.

[10] Architectural metaphors, as Daniel Purdy points out, abound in the tradition of Western philosophical thought. Descartes, in his *Discourse on Method*, imagined knowledge as advancing most purely and resolutely from an individual vantage point, favorably comparing the work of a "single architect" to collaboratively constructed buildings. See René Descartes, *Discourse on the Method of Rightly Conducting one's Reason and Seeking*

But Halley VI is not architecturally figured as a laboratory in the conventional sense. The predominant logics spatially organizing Halley VI hover not around the distribution and flow of knowledge but rather of life more generally. And here I would mark a distinction between the laboratory, a space consolidating the means of knowledge work and separated out from other facets of human social and private life, and the research base, an outpost for maintaining a presence and carrying out a research agenda in the outer reaches of a geopolitical unit's space of influence. Thinking through this distinction, I would note first that while Halley VI acts primarily as a research base, aspects of the laboratory's spatial logics don't fully recede, especially when we consider what Peter Galison has framed as phases in the development of the laboratory, phases indexed not just to distinctions within the faculties and disciplines of knowledge production but to the dominant material cultures and political economic imperatives in which scientists, engineers, and the funding of scientific and technological development are situated. Galison's periodization specifically posits an eclipsing of a "late modern" industrial factory-style laboratory by a "postmodern" dispersal of the space of science, scientific projects stitched together not like factory-produced commodities but as if under the auspice of a multinational corporation, distant data-collection processes and hybrid uses of laboratory machines interwoven through emergent digital infrastructures.[11] To a significant extent, Halley VI, in acting as a research base, conforms to the logics of this latter phase of Galison's periodization, acting as a remote node, sited presently for what it allows for in terms of geographically specific data collection, and linked digitally back to the station's national 'home' in the UK.

Truth in the Sciences, trans. Jonathan Bennett (earlymoderntexts.com, 2017), 5, https://earlymoderntexts.com/assets/pdfs/descartes1637.pdf. For Kant, in the first Critique, metaphysics sought to construct a kind of Tower of Babel on flimsy foundations, as per Daniel Purdy, *On the Ruins of Babel: Architectural Metaphor in German Thought* (Ithaca: Cornell University Press, 2011), 54-55. Kant responds with a carefully and securely planned "architectonic of knowledge," an "arrangement [that would articulate] individual fields of knowledge into a coherent whole" (Purdy 66). The designed space of modern science puts a literal fold on such imaginaries of the architectural structure of knowledge, as has been well-studied in the history and sociology of science. When Bruno Latour presented his satirically anthropological look at American post-war scientific life in action, he made sure to include a map of the Salk Institute's laboratory space, noting partitions that mapped onto disciplinary distinctions, as well as the distinction between those spaces labelled as "offices" and "libraries" and consisting of paper, books, dictionaries, etc. and those spaces referred to as "the bench" and filled with often active equipment, see Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton: Princeton University Press, 1986), 45-46. As if literalizing Kant, the scientific laboratory then could be thought to coherently (and in ideal form, ultimately synthetically) divide up at once the objects or arenas of knowledge production and the realm of sense experience from that of understanding (and ultimately judgment). These spatial divisions are perhaps indicative of a 20th-century ambition to construct the modern scientific laboratory as an "architectonics of knowledge." Such an ambition has echoes as far back as Francis Bacon's utopia, *The New Atlantis*, which details Salomon House, a proto-British Royal Society made up of an institutionally controlled set of spaces demarcated by discipline and in certain cases physically pegged to the needs of specific experimental practices. See Francis Bacon, "New Atlantis," in *Three Early Modern Utopias: Utopia, New Atlantis, and The Isle of Pines* (Oxford: Oxford university Press, 2009), 180-183. Of course, in so far as scientific knowledge production itself, as a cultural and material practice, can't be so easily mapped onto idealist schema of its divisions and syntheses, the space of science can be shown to navigate a wider array of concerns than that of the links between and distributions of disciplines. In the era of science's early institutionalization in 17th-century England, questions of performance, of trusted witness inflected through class distinctions, and of the cultivation and reproduction of public and private spheres dictated the who, where, and when of early scientific experiments, see Steven Shapin, "The House of Experiment in Seventeenth-Century England," *Isis* 79, no. 3 (1988): 373-404.

[11] Galison's periodization of the laboratory moves from the late 19th and early 20th century "high modern" steam- and electric-powered labs of autonomous scientists to the WWII and postwar era "late modern" industrial factory-style laboratories, designed and constructed with the full weight of the ambitions of the era's industrial powers (the US in particular) in mind. It's perhaps in this moment that the architectonic synthesis of distinct disciplines and faculties of knowledge could be conceived as a full-scale architectural project. See, Peter Galison, "Three Laboratories," *Social Research* 64, no. 3 (Fall 1997): 1127-1155.

But at Halley VI, scientific knowledge production itself comes to play a subordinate role in the design and construction of space. A relative diminishment of interest in the specific distributions and relations of disciplined knowledge obtains across the base.[12] If an acute geographic specificity inheres in the location of the Brunt Ice Shelf itself, within the base as designed, any imagined specificity to the physical scientific research taken on recedes into a homogenous stream of data processing facilities. Spaces of knowledge become in Halley VI, in effect, as construct-able, deconstruct-able, and interchangeable as digital systems, with efforts to conjure up a relationship to place-bound objects of knowledge displaced onto what extends in all directions from outside the base—Halley VI acts as a logistical hub, cordoned off from but linked visually to the remote expanse of the ice shelf. What opens out from this, at least rhetorically among the architects who conceived of the base, is a particular concern over the base's flow of life.

In addressing these concerns, Halley VI's spatial design, at a material and formal level, aims to produce a communal life integrated comfortably within but maintaining lines of sight and affective investment outward towards the surrounding environment. This communal life, one facet of the salvaged future imagined at Halley, depends on the production of a global subjectivity accommodated to conditions displaced from those of a "home" left behind onto a sensually-infused space, facilitating collectively produced leisure and adventure, frequent, informal conversation, and smooth flows, if not disintegrating distinctions, between work and life. I explore this facet of Halley below, highlighting Stiegler's arguments as to the technologically-mediated, generalized, historico-geographic displacement of sensual and social experience and memory onto exteriorized apparatuses. For Stiegler, contemporary developments in the co-constitution of human temporal being and technics proletarianize sensibility, an effect we can read into the imagined subject inhabiting Halley VI's sensory space. However we may evaluate such a proletarianization of sensibility towards a globalized subjectivity, such expectations are structured into the salvaged future of Halley's communal life.

This communal life is posited as the pharmacological possibility that opens up amidst the recession of knowledge and knowledge work into infrastructural management. Part of what lies behind the imagined sociality and flows of life that Halley VI aims to facilitate is a like perception of the marginalization of the human subject to knowledge-producing endeavors, understood to be carried out by increasingly automated technical instrumentation. The marginalization of the human to knowledge work becomes then a facet of the salvaged future of climate science as infrastructural management ostensibly opening up onto but also in tension with possibilities for communal living. In thinking specifically through the tension here, and in conversation with the actuality of life and labor at Halley, more squarely Marxist approaches to labor (including intellectual labor) and technology help in situating facets of Halley VI's imagined, salvaged future within tendential social and economic relations that residually assert themselves, pointing less obviously to a communal life eased of certain labors and pursuits and more towards social re-organizations of the labors of science characterizing the subsumption of knowledge work into logistical and infrastructural logics.

And here, in thinking fully through this subsumption, I turn in the final part of the chapter to a reading of Halley VI from without, rather than from within, considering what's projected by the base's outward image and what links the base into larger global and national logistical networks. Here, as well, I find it helpful to mark the distinction between laboratory and research base. And

[12] Though not a complete absence – as I will point to, the climate observatory's particular locale amidst the base is intentional, a function of both instrumental proximity to the sky and an effort to stage for the scientist direct sensual access to otherwise mediated objects of knowledge. It's also of course the case for now that scientists at Halley VI still do site-specific research tasks, as well as acting as subjects of proposed, spatially specific, psychological studies of isolation.

calling back to the longer imperial history of British Antarctic exploration, I would note that this new physical space of the base, despite eschewals of this history at the level of the experience of the base from within, carries forward nonetheless the idea of a far distant outpost consolidating national interests. Science, as figured in the base's futural imaginaries, plays a key role here. If the space of Halley, in historically predating the ATS, is quite literally traceable within the context of British Antarctic exploration and scientific history, the extent to which Halley VI specifically acts as a node within larger logistical networks, subsuming knowledge production into the project of climate and attendant infrastructural management, ties the base and the science that the base carries out to a set of overlapping British post-imperial geographies. Pointing then, in my reading of Halley VI from without, to the base's modular, deconstructable nationalism, I conclude below by teasing apart what the base suggests as the place of climate science, extricated out from the life and labor of scientists themselves, within contemporary configurations of global, national, and local space.

Speculative Laboratories of Human Life

To say that Halley VI acts as a speculative spatial form for performing Antarctic research is in part to claim a certain conscious futurism in the design and reception of the base, one that sits alongside the place of Antarctica more generally in imaginaries of the future. Allesandro Antonello argues that, analogously to the mid-20th century Earthrise photograph's production of distinct spatial sensibilities coordinated around the earth witnessed as a whole,[13] ice cores from Antarctica and Greenland have produced distinct and highly impactful temporal sensibilities, including that of a kind of tangible, material relation to future catastrophe, though a relation then "socially disembodied."[14] If often equally disembodied socially, the future imaginaries articulated through images and invocations of Halley VI are those of immense ingenuity and possibility, rather than catastrophe. From the inclusion of Halley VI images and descriptions in art exhibitions surveying "les nouvelles manières d'habiter le monde," ostensibly beyond the framework of the nation-state and informed by the perils of the Anthropocene,[15] to its framing on book covers and other popular images as a kind of alien object displaced from and as such beyond the constraints of space and time (see Figure 2), the base is widely positioned by reviewers and other interested parties as sitting on the cusp of future architectural needs and possibilities. Where changing climate conditions are called upon across these examples, they are so as a source of potential, as much as a source of fear or urgent concern. When asked about science fictional inspirations for the base design, Hugh Broughton, the head of the architectural firm that designed the base cited Gerry Anderson's Thunderbirds and the All-Terrain Walkers on the Star Wars ice planet Hoth as influences, before suggesting that, "In all seriousness however the futuristic nature of these buildings is a little inevitable."[16] Conditions, this statement suggests, at the extreme cusp of human experience demand built spaces at the science fictional cusp of the human imagination. Further on, Broughton speaks to both a carrying forward of genealogies of Antarctic exploration into the future of human travel to Mars (implicitly then projecting an image of the red planet's own built spaces of life and research), and to the problems presented by forthcoming hostile climate conditions around the world,

[13] For more on the spatial sensibilities engendered by the Earthrise photograph, see Benjamin Lazier, "Earthrise; or, the Globalization of the World Picture," *American Historical Review* 116, no. 3 (2011): 602–30.
[14] Allesandro Antonello and Mark Carey, "Ice Cores and the Temporalities of the Global Environment," *Environmental Humanities* 9, no. 2 (November 2017): 194-198.
[15] "constellation.s: habiter le monde," arc en rêve centre d'architecture, accessed February 28, 2021, https://www.arcenreve.eu/exposition/constellation-s.
[16] Hugh Broughton, "Eco Thoughts: An Interview with Hugh Broughton," interview by Leslie Carol Roberts, *The Believer*, April 23, 2020, https://believermag.com/logger/eco-thoughts-an-interview-with-hugh-broughton/.

suggesting that the "infra-structure free self-supporting facilities" that make up Halley VI could have wide-spread relevance in the midst of these approaching conditions.[17]

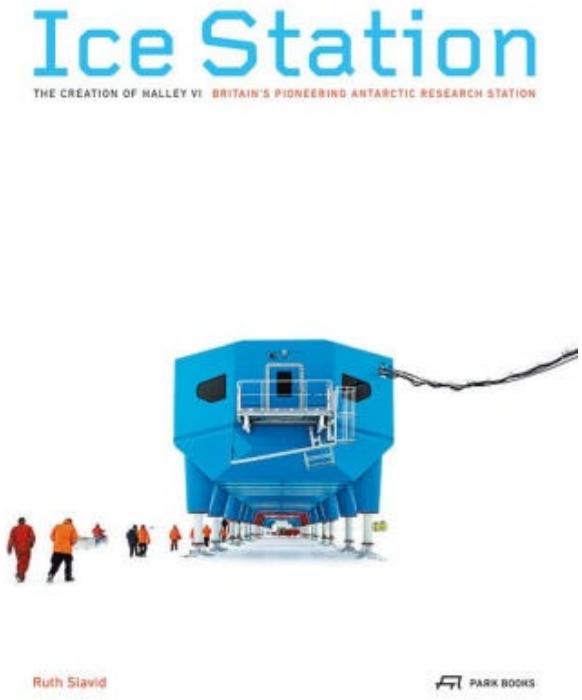

Figure 2. Book cover of *Ice Station: The Creation of Halley VI, Britain's Pioneering Antarctic Research Station* by Ruth Slavid.

Are there stakes to what Broughton presents as the science fictional appearance of the Halley VI design, beyond acting as a kind of flashy curiosity, perhaps making the base especially marketable for the architectural firm itself and as a supposed exemplary image of 21st century technological prowess?[18] In responding to this, I return to the concerns around genre and speculative fiction highlighted in the dissertation's introductory chapter. I suggest there that speculative fiction generically indexes a sense of present instability, encroaching crisis, and future uncertainty—speculative fiction in that sense registers a sense of the inevitability of a kind of temporal otherwise, analogous to but distinguished from the desired spatial alterities that Fredric Jameson ascribes to utopian form and indexes to a (now-passed) period of seemingly inescapable global hegemony. Science fiction porously borders both utopian and speculative fiction, and here I wish to treat the science fictional as a particular category of speculative fiction and all that speculative fiction registers in terms of temporal uncertainty. Jameson thinks through the generic distinctions between science fiction and fantasy by considering either's mobilization of history.[19] If fantasy hinges on a historicism of past and present that conjures up the past as something imbued with a now lost enchantment and the sinews of religious totality, science fiction can be indexed rather to what

[17] Broughton, "Eco Thoughts," interview.
[18] I will return to this point later in the chapter. See Ruth Slavid, *Ice Station: The Creation of Halley VI, Britain's Pioneering Antarctic Research Station* (Zurich: Park Books, 2015), 86.
[19] Fredric Jameson, *Archaeologies of the Future: The Desire Called Utopia and Other Science Fictions* (London and New York: Verso, 2005), 58-60.

Koselleck frames as the modern temporality of "progress" as it relates to scientific reason.[20] We see in science fiction, however fantastical it might at times be, the effort to think and represent the historical progress of modes of production,[21] albeit through the displacement of this progress from the realm of class struggle to that of technoscientific intervention. In relation to the characterization of speculative fiction I've given above as a representational medium concerned with instability, crisis, and uncertainty, science fiction becomes a means of resolving crisis through the retaining of a soteriological image of science and technology.

Of course, there at times might be a certain dissonance between actually existing science fictional texts in the present and the broader mobilization of science fiction in these soteriological terms.[22] Across the landscape of popular science fiction in the present, one finds narratives of humanist redemption *from* science and technology,[23] and perhaps the most globally significant science fiction literary series of the 21st century, Cixin Liu's *Remembrance of Earth's Past* trilogy, opens with global humanity's unexplainable loss of grounding scientific certainty, a loss that comes to be attributed to a transcendent, extra-human force from above.[24] Broughton's aforementioned science fictional imaginaries may appear dated or misleadingly applied, the Star Wars All-Terrain Walkers, in particular, serving within their own imagined world as a force for anti-humanist imperial entrenchment.[25] In returning to Broughton's statement above then, it's not so much any particular science fictional solution but science fiction more generally as a kind of futurist lens that seems to "inevitably" underpin design choices for Halley VI. Abstracted out from its particular instantiations, science fiction becomes a kind of signifier for the capacity of contemporary science and technology to secure human life against the odds of environmental hostility.

And in this way, Broughton speaks to a sense of science fiction, couched within the broader terrain of the speculative fictional, that spans beyond literary, filmic, and televisual media, reflecting something more like an orientation towards navigating particular crises or problems that sutures together canonical media examples with projects of science itself, with theoretical interventions into the world, etc. Extensions of science fiction into the sphere of science and technology itself have been noted. Scientists have been observed to use folk knowledge of popular science fiction as a means of mediating social relations in the laboratory.[26] Technologists report drawing on the backdrop of sci-fi infused popular culture in their own research into ongoing technological developments.[27] And as I'll track in the next chapter, generic tropes of sci-fi and speculative fictional texts inform the personal and creative writings of scientists situated at the Halley research station throughout the latter part of the 20th century. My interest here in bringing these generic concerns to

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[20] See, for instance, Reinhart Koselleck, "Historia Magistra Vitae: The Dissolution of the Topos into the Perspective of a Modernized Historical Process," in *Futures Past: On the Semantics of Historical Time*, trans. Keith Tribe (New York: Columbia University Press, 2004), 26-42.

[21] Jameson, *Archaeologies of the Future*, 60.

[22] At the same time, one still finds this soteriological image in sci-fi, from the saving grace of linguistic positivism in the film *Arrival*, based on the Ted Chiang short story "Story of Your Life," arguably to much of the work of grand, historically sweeping science fictional authors including Kim Stanley Robinson and Cixin Liu, albeit in every case imbricated with social and political intervention.

[23] See, for instance, the film adaptation of *Children of Men*.

[24] Cixin Liu, *The Three-Body Problem*, trans. Ken Liu (Tor Books, 2016).

[25] Perhaps this cultural reference point serves then as an accidental invocation of the base's expected marginalization of human labor and its service towards contemporary, British imperial consolidation, both of which I trace in my readings going forward.

[26] Janet Vertesi, "'All these worlds are yours except …': Science Fiction and Folk Fictions at NASA," *Engaging Science, Technology, and Society* 5 (2019): 135-159.

[27] Paul Dourish and Genevieve Bell, "'Resistance is futile': Reading Science Fiction alongside Ubiquitous Computing," *Personal and Ubiquitous Computing* 18, is. 4 (April 2014): 769-778.

light is in noting how science fiction is posed as a genre of contemporary laboratory architecture, and in fact as a necessary genre for responding to Halley's distinct environmental conditions, which are imagined then as the forthcoming conditions of future designs of built space, knowledge work, and life more generally.

Just how "inevitable" is the "futuristic nature" of such a base design? We might link this question not just to trends towards an ostensibly ecological futurism across polar scientific bases, but analogous futurisms in the ecologically-minded built spaces of the present,[28] and the implicit ways that Broughton's comments above signal the project of planning and designing for a future more generally and widely altered by climate change. Part of what lies behind Broughton's claim about the inevitability of the futuristic nature of the Halley VI design is the fact that Halleys I-IV lie buried under the ice, and act then as now-hidden ruins attesting to the unsustainability of earlier designs. Halley I offers a particular counterpoint as the first and now-distant effort to carve out durable built space on the ice shelf. Looking at Halley I (see Figure 3), one could draw out certain comparisons with older British fantasies and science fictions, from Hobbiton to the underground dwellings of the Morlocks in HG Well's *The Time Machine*. Nonetheless, a certain impromptu functionalism seems to reign in the establishing of interconnected timber huts under the heavy snow, jutting up onto the surface with hatches, chimneys, and select office buildings. Each further iteration of the base up through Halley V retains an austere functionalism in outward appearance, adjusting materials and mechanisms for navigating yearly snowfall. Up through Halley IV, these bases were intentionally buried. For such bases, questions that mark the outward appearance of the bases appear explicitly enmeshed with questions of material durability under the pressure of mounting snow. Halley V was the first elevated version of the base's physical space, though its boxy appearance otherwise doesn't openly gesture towards thoughts of an imperiled future.[29]

[28] For an interesting account of the contradictions in "green" city planning in the present, see Gökçe Günel, *Spaceship in the Desert: Energy, Climate Change, and Urban Design in Abu Dhabi* (Durham: Duke University Press, 2019).
[29] Hanne Nielsen, "From Shelter to Showpiece: The Evolution of Halley," The Polar Connection, March 23, 2017, https://polarconnection.org/halley-history/.

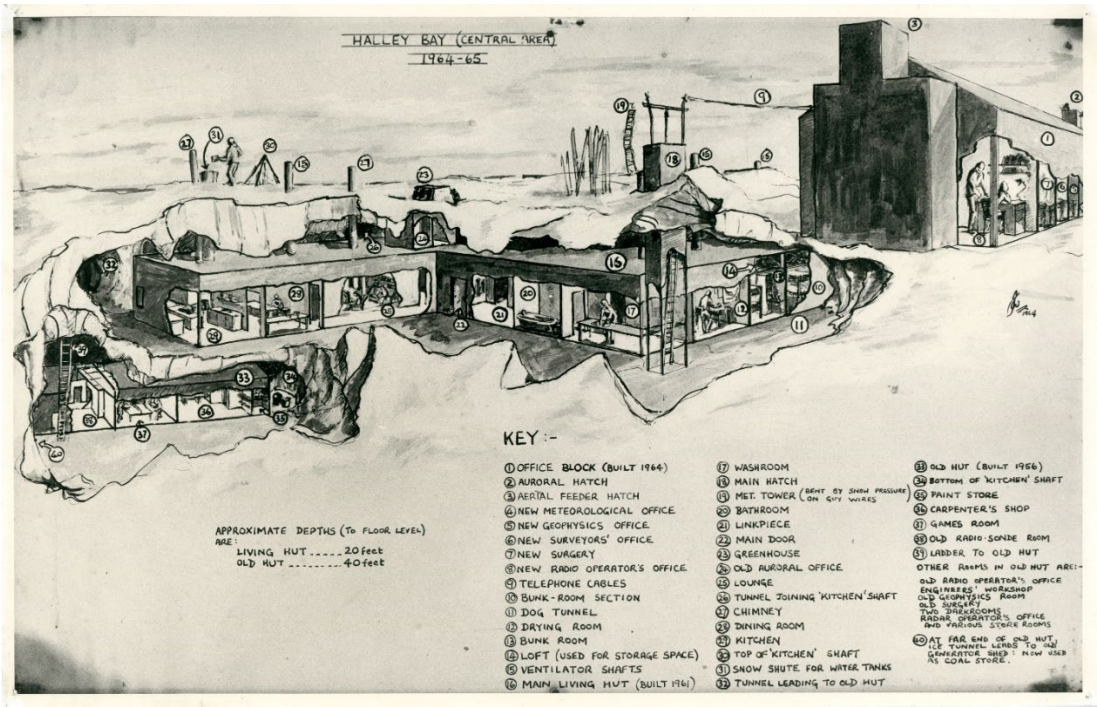

Figure 3. Sketch of Halley I from the 1964-1965 expedition. Reproduced courtesy of the British Antarctic Survey Archives Service. Archives ref. AD11/1Z/1964/1.

If the visually spare design principles that inhere in the outward appearance of the earlier Halley bases serve as one point of contrast, a look into Hugh Broughton Architects' broader portfolio helps think through continuities and discontinuities between Halley VI and other approaches to designing for crisis and uncertainty. Since being tapped to work on Halley VI, Hugh Broughton Architects has been the leading architectural firm working on polar scientific research bases, replicating to a significant degree the colorful, sci-fi informed approach for Spanish, Brazilian, South Korean, and New Zealand-led Antarctic bases, as well as for a proposed atmospheric observatory at the northern tip of the Greenland ice cap.[30] Ranging from nearly direct recreations of the highly marketable Halley VI design, altered to reflect differing national colors and terrain specificity, to more indirectly referential reworkings of extant bases, these projects mark the emergence of a polar architectural futurism, licensed in a sense by the success, for the firm, of Halley VI.[31]

The England-based firm's domestic work, on the other hand, largely consisting of redevelopment and restoration projects, doesn't appear immediately comparable to the more sci-fi drenched polar projects. Hugh Broughton's longest-running major project, started upon the firm's founding in 1996 and completed in 2019, was a redevelopment of the Trade Union Congress's London-based headquarters, the Congress House. As opposed to the literal threat of cracking, sinking, and continuously re-constituted geophysical space that informs the Halley VI design requirements, the Congress House redevelopment project is situated against the backdrop of eroded

[30] "Work: Remote," Hugh Broughton Architects, accessed February 28, 2021, https://hbarchitects.co.uk/work/remote/.
[31] Niall Patrick Walsh, "In Antarctica, Architecture Is Heating Up," *ArchDaily*, February 28, 2020, https://www.archdaily.com/934590/in-antarctica-architecture-is-heating-up; John Gendall, "The Coolest Architecture in the World Is in Antarctica," *The New York Times*, January 6, 2020, https://www.nytimes.com/2020/01/06/science/antarctica-architecture.html.

labor unions since the Thatcherite 80s in the UK. As the Hugh Broughton press materials note, "from the 1980s union membership had fallen making less money available for building maintenance. As a result the Trades Union Congress decided to look to its own building to help generate funds for its upkeep, in particular their sizeable conference facilities."[32] The project's at once then a reconfiguration of the TUC's headquarters space towards new and newly value-extracting uses and part of a broader reconfiguration of the mass federation of English and Welsh unions amidst the de-industrial era's de-composed working class.[33] In serving these reconfigurations, a chic look and generalized use from which the TUC can extract temporary rents from other organizations become the Congress House design's central logic. The redevelopment then has a recognizable, sleek, tasteful, early 21st-century feel (see Figure 4).

Figure 4. Example interior of the Trade Union Congress. Source: Hugh Broughton Architects[34]

It's the rhetoric that surrounds Hugh Broughton's domestic redevelopment and restoration projects that helps provide something of a through-line between a project like the Congress House, or the firm's restoration of the late-17th century Baroque-era Painted Hall of the Old Royal Naval College, and the marked futurism of the polar research spaces. Across their projects, the firm lays out principles structured around negotiations of context and environmental stabilization and sustainability. In the case of the TUC Congress House, this appears as the "setting [of] a workable framework for managing the inevitable change of a working environment whilst protecting the historic context."[35] Materials on the Painted Hall highlight efforts to keep the room's "internal

[32] "TUC Congress House: Phased Redevelopment of a Post-war Icon in Bloomsbury," Hugh Broughton Architects, accessed February 18, 2021, https://hbarchitects.co.uk/congress-house/.
[33] I draw in my terminology here on a concept of "class composition" that originated in the context of Italian postwar Marxist thought and has served as an analytical tool in more recent Anglophone Marxist accounts of the contemporary. For an outline of the concept of "class composition," its uses, and its distinctions from other Marxist theorizations of class, see Salar Mohandesi, "Class Consciousness or Class Composition?" *Science & Society* 77, no. 1 (January 2013): 72-97, https://www.jstor.org/stable/41714416.
[34] "TUC Congress House."
[35] "TUC Congress House."

environment stabilized," in such a way as to protect the room's venerated Baroque interior, while offering an adjoining interpretation space that "includes the exposed remains of the palace built by Henry VII."[36] In that sense, what gives legitimacy to the firm for the project of maintaining a scientific life within polar extremes is not a committed futurism or an expertise in managing acute climatic extremes, but a way of situating an idea of history as a grounding context through which to offer stability amidst a shifting environment.

Both "history" and "environment" here are rhetorically malleable. For the Congress House, the "historical context" is situated within the "no longer" of the post-war economic boom in the UK and the relative strength of organized labor within the boom,[37] set against the naturalized "environment" of declining union membership and the growing dominance of FIRE industries in contemporary Britain, environment here figuring the ostensibly inherent, de-historicized present. The Painted Hall is more explicitly a project of preserving the differentiated past, of making history into that which we might authentically if only temporarily step into and register in the Baroque-era paintings but also more fully in the exposed palace remains, the environment in this case indexing a material present to mitigate or stabilize in service of that preservation. If the conditions and characteristics of "history" and the "environment" are dramatically shifted in the case of Halley VI, the logic in their domestic work of balancing these terms carries through to Hugh Broughton's sci-fi drenched polar design. "History" in the case of Halley VI is more fully-charged, indexing the "inevitable" and in the case of Antarctica, accelerated, historical movement towards a future time of unprecedented human needs, while the "environment" has taken on the scientific character of the project itself, situating Halley VI not in a naturalized present or the nebulous atmospheric space of the Painted Hall but in the geophysical terrain of shifting and cracking ice, hostile winds, and sunless winters. Across these invocations of "history" and "environment," social, climatic, and geophysical phenomena come to be articulated as manageable domains and backdrops in ways that will echo, throughout the remainder of the chapter, an architectural vision that explicitly posits a salvaged future while implicitly positioning science as a matter of informational and infrastructural management.

If a certain rhetorical through-line might help lend legitimacy to the firm for taking on a project like Halley VI, what ties these projects together as built spaces as well might be an effort at a kind of timeless pristine-ness, a cleanliness and comfort that brushes off the dust of history and also of future calamity, while accommodating and even naturalizing crises of the present. Inhering in Halley VI is an explicitly figured future but one that's de-temporalized, as its globally-sourced interior sees the space of human life dis-placed out from the seemingly atopic expanse in which it's situated. In the following sections, I will track, through readings of the base from within and without, the visions of life and science that are implicitly structured into Halley VI's "polar futurism." These are visions of people and things constituted as interconnected global subjects, amidst a free-flowing communal life, the continuous facilitation of global circulatory networks, and an overarching respect for the at-times violent Earth as planetary home, visions recognizable as idealities against which to situate a set of shadow dynamics that speak otherwise than in the language of pure futurity to how we might make sense of Halley.

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[36] "The Painted Hall: Careful Conservation of Wren's Renowned Painted Hall," Hugh Broughton Architects, accessed February 18, 2021, https://hbarchitects.co.uk/painted-hall/.

[37] See Robert Brenner, *The Economics of Global Turbulence: The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945-2005* (London and New York: Verso, 2006): 45-47.

Configurations of Space, Knowledge, and Life within Halley VI

I turn now to a reading of Halley VI from within, quickly noting the wider context of Antarctica's spatialization since the onset of the Antarctic Treaty System (ATS). The ATS legally designates Antarctica a space of peaceful, cooperative science and state non-possession, but has stood in an uneasy tension with the composite legal geography that existed prior. Consisting of territorial claims from seven countries, derived from a mix of national exploration histories, claims by proximity, and those by imperial possession, as well as legal designations as a *terra nullius* by the US and USSR and as a *terra communis* elsewhere, the continent stood within the postwar international order in a state of legal indeterminacy prior to the ATS. That the ATS itself did not officially denounce territorial possessions, including those already made prior to its signing, meant aspects of that indeterminacy carried forward into the post-ATS period.[38] From early tests of the treaty system that saw the US and Soviet Union establish research stations within Australian and New Zealander territorial space[39] to more recent bids to establish national territorial lineages in sites otherwise marked off for non-development,[40] where Antarctic research stations come to be located in the first place stages geopolitical contentions and negotiations.

Alongside considerations of where research stations are located, the built space of accommodations, offices, roadways, and the like make claims on national self-conceptions and imperatives, in relation to and at times in tacit confrontation with other Antarctic-inhabiting nations. Christy Collis and Quentin Stevens highlight, for instance, distinctions between the Australian-run Mawson base, the American-run McMurdo station, and the former Soviet-run Mirny station. These spaces manifest certain tensions, myths, and expectations around questions of constructed domestic comfort as pitted against often masculinist, frontiersman hardship; questions of hierarchy versus efforts towards egalitarian classlessness; and questions of how specifically to tap into and build around mythic exploratory histories of the continent, emphasizing or eschewing narratives of imperial progress. The Soviet Mirny station's relative comfort, for instance, was understood by inhabitants as in line with hopes for a civilian-scientist culture in relation to the more explicit militarism, both tangible within and structured into the centralized hierarchies of the American McMurdo station.[41]

Against this background, Halley emerges as holding at once certain functional concerns within the volatile space of the ice shelf in mind and certain implicit, if unconscious, claims around home, nation, work, and life. Notably, the older masculinist frontiersman ideas as to how one roughs it in the remote ice wilderness are all but absent within the base. Broughton's comments in interviews impress an overt sense in which the base is supposed to constitute home, as space of comfort and stability. Within the base as well, there exists a conscious division of leisure, work, and sleeping accommodations, different modules dedicated to each and a particular investment in the

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[38] Christy Collis, "Critical Legal Geographies of Possession: Antarctica and the International Geophysical Year 1957-1958," *GeoJournal* 75 (2010): 387-395.

[39] Christy Collis and Quentin Stevens, "Modern Colonialism in Antarctica: The Coldest Battlefield in the Cold War," *Proceedings 7th Australasian Urban History/Planning History Conference* (Deakin University, 2004).

[40] Jessica O'Reilly presents a recent example which acts as an especially interesting case study. India, in 2006, put forth what ultimately ended up being a successful bid to build a national research station in a site of non-development, the Larsemann Hills, with delegates pointing to proposed geological links between the site's under-ice river and the sacred Godavari river in India, links effectively extending the national history of the Indian subcontinent into the geological history of the Gondwana supercontinent. See Jessica O'Reilly, "Tectonic History and Gondwanan Geopolitics in the Larsemann Hills, Antarctica," *Political and Legal Anthropology Review* 34, no.2 (2011): 214-232.

[41] Collis and Stevens, "Modern Colonialism in Antarctica"; Christy Collis and Quentin Stevens, "Cold Colonies: Antarctic Spatialities at Mawson and McMurdo stations," *cultural geographies* 14 (2007): 234-254.

centrality of leisure, justified in the context of the base's intention for long stays through the harshly sunless winters. Fixating on the large, central module, one finds the claim to a home-y balance further elaborated within the space of leisure itself, divided over two floors and featuring separate areas for conversation, quiet solitude, play, and exercise. Early Halley inhabitants joke about the extent to which the English homeland ought to be reproduced in the oft-harsh under-ice confines of Halley I. They draw on classic images of modern alienation, the deadening shuffle between work and home echoed famously for instance in the opening of *Modern Times*. There jokes implicitly imagine Halley's integrated life as resisting such alienated life, communally holding together a range of activities and people.[42] At an overarching level, a like imaginary sees the outer compartments of Halley VI funneling towards a joyous, communal center. But, moving across the base, a radically altered ethos of sensuality, labor, and knowledge comes to call into question the in-base memory of an England (or Britain) left behind.

As normally held together,[43] the Halley VI base proceeds from two sleeping modules on the far northern end to two science modules at the far southern end, with command and operations modules filtering towards the large red central social module in the middle. The climate observatory, a primary hub for meteorological and ozone research, sits atop the southern-most module of the base and offers a helpful entry point for thinking about the spatial articulation of knowledge at Halley. The observatory presents—to the scientist within—an array of mediating channels for engaging with and observing objects of research, namely weather phenomena in the upper atmosphere and ozone content. Situated in the middle of the observatory is a bulky ozone-measuring spectrophotometer, one of the long-running instruments of the Halley research station, which is pointed directly upward through the observatory's roof and is presently hooked up to computing infrastructure directly surrounding it that processes incoming ozone data. Making up what presents itself as an ostensibly more direct channel for atmospheric observation are large windows, spanning from ceiling to halfway down the room height of the room, arranged panoramically around the observatory. Windows represent, for Hugh Broughton in designing the observatory and the base more generally, an important means of tying the resident scientist to their surrounding landscape. In their use, the sill and floor space directly below the arc of windows at the southern edge of the observatory stays relatively free of work stations, situating an observer at the windows face-to-face with the wide-open outer expanse (or with the milky white nothingness that often visually surrounds the base during snow storms). The scientist is most often positioned at a third mediating channel of observation, the row of computers that sit atop a desk lining the wall opposite the staircase entry into the observatory. There, the scientist works with streams of meteorological data, taken from the upper atmosphere, and collected using a range of equipment, including satellites, radar devices set up on the ice shelf, and weather balloons launched at the station.[44]

The set-up of these mediating channels enacts two flows of information understood to be taking place at the research station. The first flow originates from instrumentation making contact with the outer terrain and atmosphere and channels results of that contact back through digital infrastructure through which the scientist captures and processes said results. Within this circuit, the locale of the station is not altogether and in every case random of course, sitting as the station does, for instance, directly below the hole in the ozone, as well as in one of the least polluted parts of the planet, a necessity for much of the scientific research on the upper atmosphere. The location of the

[42] Opening article of *Halley Comet Magazine,* 1958, AD7/Z/3, British Antarctic Survey Archives, Cambridge, United Kingdom.
[43] That is to say, acknowledging the base's modular deconstructability.
[44] Slavid, *Ice Station*, 34, 74-76.

acting scientist interacting with this circuit of information is, on the other hand, to a large degree, arbitrary, at least for a significant majority of their working time. Networked computers make the latter stage of this circuit, the data processing and analysis which takes up much of the scientist's time, highly portable, a process even within the station that could be easily moved to the social or sleeping modules where necessary. As of 2019, the station's been closed for overwintering for three years, during which time scientists spend three months out of the year at Halley VI. In talking with one scientist, who works on ice shelf calving, he indicated that nine months out of the year then, the work of the Halley VI scientist happens back "home," wherever that may be. The increasingly automated use and maintenance of the front end of the circuit, the instrumentation, makes up much of the three on-site months,[45] a process that base-produced materials show happening in conjunction with teams of technicians, electricians, and on-site engineers.[46] The base's scientific work comes to be filtered towards the ongoing collection and management of data. Tellingly, Halley VI's 2013 Winter Base Commander notes the importance of the on-base generators, as "they provide our life support and the collection of science data for Halley VI."[47] At an equal level, in-base residents carry out life, while Halley VI as a whole collects data. That, amidst this disembodied data collection, the meteorologist sits in proximity to the ozone measurement instrumentation and with a panoramic vantage point of the Antarctic sky acts willfully then to articulate the merging together of fragmented processes within the overall constitution of techno-scientific knowledge.

If the meteorology station stages a flow of information from instrumental contact with the outer terrain to data processing and analysis, the lab's windows stage a second flow of information, and one on which Hugh Broughton Architects put substantial emphasis. That's to say, the windows as a mediating channel within the architectural form of the base are meant to induce the flow of direct sensory experience, a supposed unmediated flow of information from the outside, that's perceived as filling in a kind of gap between instrumentation and data-mediated representation of objects of research. Speaking in an interview about a separate Antarctic project, the New Zealand-led Scott Base, Broughton claims, "Central to Māori values is a sense of shared responsibility for the mauri, or life force of the environment, and for the health and well-being of all people who depend upon it for their survival and this connectivity will be a key feature of the interior design. For example windows are carefully placed to make the most of natural light and reinforce connections with the Antarctic landscape."[48] The windows at the Scott Base are positioned here as an enactment of indigenous values concerning embodied, sensual, and unmediated connection to the surrounding environment, values that would then instill the base residents with a kind of responsibility for and attachment to the objects of their research. Within this framing, what are proffered as indigenous values stand in for what scientific ways of investigating and knowing the world fail to fully offer, an affective and ethical relationality to natural objects, a relationality that mechanisms such as the positioning of windows intend to produce.[49] Indigenous values in this formulation become then one

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[45] Marsh.

[46] Slavid, *Ice Station*, 77; "Halley Research Station - being there," British Antarctic Survey, Youtube, video, accessed February 18, 2021, https://www.youtube.com/watch?v=dgPqyCvjDxg.

[47] "Halley Research Station – being there."

[48] Broughton, "Eco Thoughts."

[49] If the separation out of the scientific from other modes of relating to objects of concern appears uniquely mediated through cold, data-infused abstractions and representations in the present, the critical articulation of a relational gap in the scientific is of course not new. In many ways, this story of science has analogies in a number of phenomenological approaches to the scientific, from Husserl's phenomenological reduction to Arendt's concern over the loss of a "common sense," which in various ways are both directed back towards Galileo, among others, as a central culprit. Though I wish here only to recognize the way this critical narrative is implicitly invoked in the logics that undergird Halley VI as an architectural form, I draw on Stiegler among others throughout this dissertation to help complicate any

among a range of entities, including the on-base scientists themselves, dis-placed and dis-placable from particular histories, social formations, and land-based relations and brought to bear on the ice shelf's apparent blank canvas.

In stark contrast to Halley V and, of course, to each of the underground bases that preceded it, Halley VI offers sweeping vistas over the surrounding terrain. This is perhaps most notable in the expansive two-story window of the central social module, that drenches the space of idle chat, exercise, and play with the peering sight of the ice shelf. The panoramic view of the climate observatory is echoed on the far north end of the station, where a quiet room at the end of a sleeping module, lined on one side with a large shelf of books, directs the gaze outward. In various ways and at various moments then, the imagined scientist inside the base is re-connected with the environment outside.[50] At moments of scientific knowledge production itself, the panoramic view offers an orthogonal point of access to that of the scientized flow of information mediated by the observatory's computer modules. Within the base's arena of sociality, the view sits in the backdrop like a reminder of the Antarctic's sublime force. And in the space of quiet contemplation, the view's offered up in a way that might penetrate the psyche, acting as a source for a meditative connection to the surroundings.

This "direct" connectivity to the outer environment conjures within the elementally protected confines of the base itself a local, even "indigenous"[51] experience of and relation to the outer environment. A different register of manufactured sensuality infuses the base's interior, a sensuality intended to situate the base as an enduring "home," particularly for those on-site through the sunless winter seasons. Among the core psychological and physiological conditions that long-term Antarctic inhabitants face manifest as difficulties maintaining energy, focus, regular daily routines, and emotional health through the winters.[52] The architectural team working on Halley VI developed various sensory mechanisms for mitigating these problems and producing a home-y cheer throughout the year. With an eye towards the effects of light exposure on mood and psychological health, Halley VI incorporates an array of lighting mechanisms worked on in conjunction with a color psychologist, including a "special alarm clock" set up to create the sense of an artificial dawn.[53] Elsewhere, a comforting sensual experience, in moving through the base, is induced by globally sourced materials, such as the Lebanese Cedar with which the "upper level of the social module is lined," intended to remind residents of the aromas of plant life where there otherwise is none.[54] As Broughton makes clear, the "home" these sensory mechanisms intend to evince is precisely *not* that of a particular native land. Residents of the base (and this has been the case since the first iteration

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clear, determinate demarcation between techo-science and what are often proffered as richer or mor authentic modes of knowing or relating to the world.

[50] It goes without saying that scientists do, while stationed at Halley, go outside for their research as well as for recreational activities.

[51] For a discussion of Antarctica and indigeneity, see Jessica O'Reilly, *The Technocratic Antarctic: An Ethnography of Scientific Expertise and Environmental Governance* (Ithaca: Cornell University Press, 2017), 30-31. Without necessarily endorsing this idea, O'Reilly notes that certain scientists and environmentalists "make claims for themselves as indigenous Antarctic people" (30), part of a wider sensibility that, among her research subjects, wishes to link environmentalism and indigeneity. I am weary of this use of "indigeneity" which here seems to signify a malleable conceptual category for linking individuals to sites of particular personal and cognitive investment, a category seemingly then divorced in this usage from particular peoples and forms of life that confront colonial erasure and dispossession and seek to preserve or re-constitute pre-colonial relations to land and cultural practice.

[52] Lawrence A Palinkas and Peter Suedfeld, "Psychological Effects of Polar Expeditions," *Lancet* 371, is. 9607 (January 2008): 153-163; Josephine Arendt, "Biological Rhythms During Residence in Polar Regions," *Chronobiology International* 29, no. 4 (May 2012): 379-394.

[53] Broughton, "Eco Thoughts."

[54] Ibid.

of Halley in the latter 1950s) come from various parts of the English-speaking British imperial and post-imperial world—England, but also routinely Scotland, Australia, New Zealand, and South Africa.[55] And so, the "home" they inhabit is made to evoke nowhere in particular or everywhere (at least across the British post-imperium) at once.

The sensual productions within the base, variously globally-sourced and displaced onto this everywhere/nowhere "home" on the Ice Shelf, correspond to an imagined, networked global citizenry within. This sits snugly with oft-invoked images of the scientist as paragon of global citizen, universal subject, and/or speaker of a kind of species-voice,[56] as well as with the tasteful lack of clear spatial and temporal (or national/regional and period-based) identifiers within the base, echoed in the sleek, contemporary interiors of Broughton's domestic projects. The tasteful, globalized sensuality of the base evokes, if nothing else, what Nadia Seremetakis identifies as the tastelessness that came to be associated, in her homeland of Greece, with the commodity chains of the European Economic Community (EEC) upon formation of the EU, a tastelessness of sense experience divorced from the historicity of the senses.[57] In Stiegler's terms, technics function to displace memory onto exteriorized apparatuses – writing displaces the memory of oral traditions of communication into a collection and ordering of graphemes; industrial mechanisms, as Marx noted in his writing on machine-powered factory labor,[58] displace the muscle memory of various skills of laborers on to technical apparatuses; a computer program displaces the memory of steps of an intellectual process on to the computer itself.[59] Each displacement of memory onto what Stiegler calls a *tertiary* or exteriorized, socio-technical retention acts to decontextualize (and to a degree, in turn, to recontextualize) shared memory, divorcing memory from the habituating and individuating processes that produce it.[60] For Stiegler then, the disoriented and disorienting technics of the contemporary techno-logical age enact a decontextualization en masse, and one that could be understood to manifest in the industrial production and globalized distribution of artificial dawns, the "natural" aromas of shipped-in cedar tree wood, and like ways of engineering sense experience literally dis-placed from recurrent sites of shared memory and place-bound, sensually mediated knowledge.

To the extent such a decontextualizing move also inherently entails a recontextualizing one, these displacements of sense both from the realm of scientific knowledge production onto that of direct relationality and from sites of possible historicity onto the futural form of the base itself are part of the larger claims the architectural form of the base makes to conjure up a new vivid, communal life within. The base's modules are connected along a linear axis, a constraint set by the

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[55] "Halley Research Station – being there"; "Sports Roundup" from on-base *Halley Comet Magazine*, Easter 1959, AD7/Z/3, British Antarctic Survey Archives, Cambridge, United Kingdom; "The Fairest Cape of All" from on-base *Halley Comet Magazine*, Midwinter 1959, AD7/Z/3, British Antarctic Survey Archives, Cambridge, United Kingdom.

[56] For this latter term, I am drawing on the reading that Nasser Zakariya gives of Carl Sagan's *Cosmos* series, in which humanity comes to be invoked as a kind of universal "we" channeled through the voice of the scientist as the "trans-historically understood" writer of the myth of the universe and the conscious discovery of its principles of operation. See Nasser Zakariya, *A Final Story: Science, Myth, and Beginnings* (Chicago and London: University of Chicago Press, 2017), 309-318.

[57] C. Nadia Seremetakis, "The Memory of the Senses, Pt. I: Marks of the Transitory," *The Senses Still: Perception and Memory as Material Culture in Modernity* (Chicago and London: University of Chicago Press, 1994), 8.

[58] Karl Marx, *Grundrisse*, trans. Martin Nicolaus (London: Penguin Books, 1973), 614-616, https://www.marxists.org/archive/marx/works/download/pdf/grundrisse.pdf.

[59] Bernard Stiegler, *Technics and Time, 2: Disorientation*, trans. Stephen Barker (Stanford: Stanford University Press, 2009), 34-37, 75-81.

[60] Stiegler, *Technics and Time, 2*, 65-69.

outer environmental conditions.[61] The arrangement and layout of modules along this linear axis effects a particular flow of movement among the residents of the base. At a more explicit level, residents use shared bathroom, locker, and dining spaces on a daily basis. They likewise enter and exit modules through corridors specifically widened and imbued with natural light "to facilitate informal interactions as people pass."[62] Implicitly as well, imagining, for instance, a resident scientist, their normative activity from morning to evening necessarily carries them from the sleeping modules on one far end of the base to the science modules on the opposite end, and notably then through command and operations modules that sit on either side of the central social module. Each major shift in focus within their everyday life—from rest to the work of knowledge production; from work then to leisure; from leisure back to rest; etc.—necessitates crossing through a threshold immersed within the vital, infrastructural operations of the base. As an echo of the panoramic, outward view that fills in the sensualistic gap in data-mediated knowledge production, an essential inward-ops view is, via this mandated daily movement, articulated within the base as if to fill in a separate gap in knowledge work by ensuring the transparency of infrastructure and the labor that maintains it to all, and perhaps especially to the knowledge workers.

From the perspective of operations and command—or that of the managerial staff, as well as the technicians, plumbers, cooks, and other on-site laborers—the scientific knowledge work itself sits at one extreme end, less centrally integrated into the vital core of the base. Though presumably much of the base's technical and operations staff would have frequent reason to enter scientific modules for specific jobs, fixes, instrumental adjustments, etc., these modules exist as the one section of the base that non-scientist residents don't inherently need to enter in the course of a normal day. The base is split-able, across a centrally positioned bridge, that ties together power and drainage in normal conditions, while allowing each of the two sides to operate independently and sustainably from the other in case of emergencies. A split, within such a scenario, given the standard layout of modules across the linear axis of the base, would explicitly separate out science/knowledge from life, vitality, and sociality, as well as the brunt of day-to-day mechanical operations underpinning these things.

Within the context of the presumed movement of individuals through the base's spatial arrangement, a movement directed recurrently across spaces of infrastructural labor, one can read then the specific, oft-highlighted, eye-catching centrality of the central module (see Figure 5). As the base's visible center and its largest module, the social module, designed for both individual and social play, chat, and relaxation, appears from within and without as the space to which activity and attention at Halley VI is funneled. Hugh Broughton firm materials and other commentaries on the base tend towards centrally highlighting the two-story module,[63] while movement from either end of the base almost necessarily leads inhabitants through the space as an intermediary between work and sleep. The module itself is divided between two floors, connected to each other via a central spiral staircase. The bottom floor consists of a communal dining area, that blurs into a generalized leisure space, with standard lobby-type amenities, including a TV, a coffee machine, couches, small tables surrounded by chairs, etc., as well as pool and foosball tables and a dart board. Images from the base in use show a portion of this leisure space made into a mock pub in the evening, perhaps the clearest signifier of Britishness within the base. Surrounding the spiral staircase in the module's center are

[61] The linearity allows the module to sit perpendicular to the primary wind direction on the ice shelf, fostering snow drift build-up on one side and an icy patch along the side of the base on the other. This is understood to be optimal for management of the extensive annual snow fall, as well as maneuverability in the immediate vicinity of the base.
[62] Slavid, *Ice Station*, 29.
[63] Amanda Williams, "Just Chilling Out: How British Scientists in Antarctica Cut off from the Rest of the World for 14 Months Find Ways to Relax," *The Daily Mail*, June 4, 2014, https://www.dailymail.co.uk/news/article-2648269/Just-chilling-How-British-scientists-Antarctica-cut-rest-world-14-months-ways-relax.html.

the aforementioned Lebanese cedar walls, creating a hotel-like atmosphere moving into the upper floor, which includes a computer center, a TV room with books and a movie projector, a plant room, and a small home-gym style fitness center, as well as two window pod installations that point upward, intended to give residents a view of the aurora borealis in the Antarctic night sky, from within the base itself.

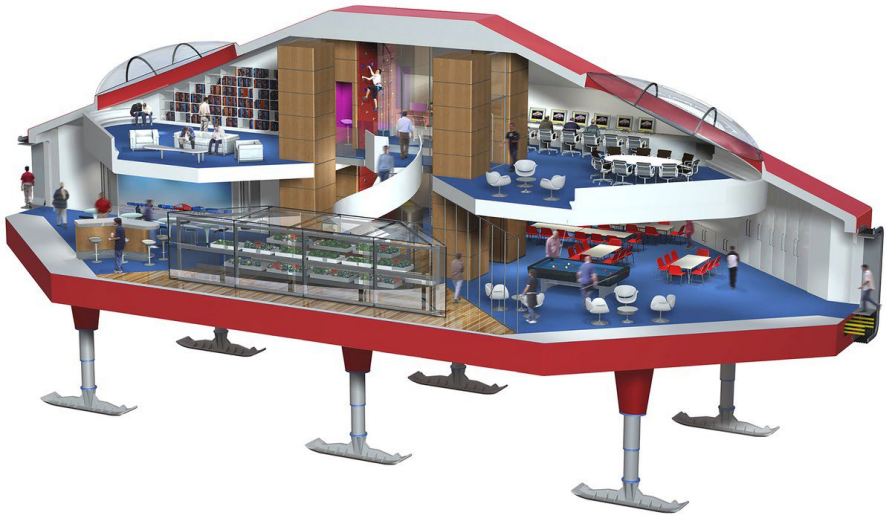

Figure 5. Early computer-generated model of the Halley VI central module as initially designed. While certain features shown here, such as the climbing wall, didn't make it into module as built, the image offers a sense of the various modes of leisure and sociality the module was intended to facilitate. Source: Hugh Broughton Architects.[64]

Across this central living module then, one sees what constitutes within the base an elaboration of a notion of communal life balanced across play, exercise, conversation, hobbies, and cultural consumption. Peter Galison and Caroline Jones note the conscious construction of a center-periphery dynamic in the architecture of the postwar factory-style centralized laboratory. Commenting on the Berkeley Radiation Laboratory, divided between a "multistory Central laboratory" and a "host of specialized buildings planned for the periphery," they argue, "The center would secure participation in the group identity; at the periphery a subsidiary individuation could be sustained. This 'center of thought' would combine office spaces, small laboratories, a library, and the theoretical group."[65] The expectations of the Halley VI center correspond in part to this older center-periphery dynamic, the social module acting as what the architects call a "social heart" that might cohere the group of inhabitants as a vibrant community, against which the outer modules, with bedrooms, small offices, specific laboratory spaces, a quiet reading room, and work stations for various kinds of on-base labor offer a degree of individuation, situating inhabitants into various roles and giving them spaces to psychically reproduce themselves with a degree of autonomy. But the actual makeup of those individuating, peripheral spaces, in their particularities, appears of course akin to the factory-laboratory center—offices, labs, work-stations—as if the older spatial "center" of knowledge production has been displaced outward into the base's periphery. Group identity, at Halley VI, coheres around a shared life pointing outwards towards subsidiary, individuating labors

[64] "Halley VI British Antarctic Research Station."
[65] Peter Galison and Caroline A. Jones, "Factory, Laboratory, Studio: Dispersing Sites of Production," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson (Cambridge, MA: The MIT Press, 1999), 501.

rather than a shared body of work pointing outwards towards the particular, subsidiary, individuating instances of scientific specialization and expertise.

Galison and Jones claim that the factory-laboratory produced an "admiration tinged with horror" at the degree of management and mechanization of science that its architecture invoked. The upper levels of the center laboratory offered an expansive, managerial view of the coordinated, dis-individuated shop-floor processes down below. [66] Halley VI doesn't produce the same fear-inducing, centralizing, observational sightlines, and the central module's designed with the production of a kind of self-sustaining year-round cheer in mind. The base's gaze from elsewhere comes rather in the form of the outer landscape, the sight of which penetrates certain key locales across the base but most noticeably the central module's massive window display. Absent the imposing gaze of senior scientists, figures of upper administration, and representatives of Cold War-era state and private enterprise, the expansive sky, as a discerning Halley VI-resident eye would note, amasses diffuse layers of tools for situating, justifying, observing, and networking the base, in the form of satellite infrastructure in which the base's key projects are firmly entrenched—a view from above that's less immediate, if no less significant.

Underlying the base's emphasis on life as such, lived communally and comfortably in an ostensibly sensually rich, manufactured home on the ice, is an awareness, however unconscious, of a perceived increasing marginality of people to the knowledge work that Halley VI, as a holistic unit, carries out. Stiegler frames this marginality as part of a broader, multi-layered process inhering in modern technics, which effects what he terms a *proletarianization* of knowledge. This proletarianization happens in the course of the aforementioned displacements of memory (and in that sense is, to a degree for Stiegler, ontologically constitutive of the human qua technics – i.e. industrial and computer technics are an advanced stage of a process that's already readily apparent in the displacement of orally-held memory that Plato diagnosed as happening with the onset of writing[67]). Again, Marx diagnoses what Stiegler, drawing on Gilbert Simondon, frames as an instance of this proletarianization, in the "Fragment on Machines," as well as *Capital*'s analysis of the role of technology in the production of relative surplus value. Per Marx, the modern factory system, in "its use by capital," acts as a kind of automaton, "itself…the subject, and the workers are merely conscious organs, co-ordinated with the unconscious organs of the automaton, and together with the latter subordinated to the central moving force."[68] The worker's consciousness here appears incidental, their existence as organs subordinated to a larger "moving force" undifferentiated from that of the coordinated and coordinating "unconscious organs" of the factory's machinery. A set of embodied knowledges in the form of skillful employment of instruments of labor lose, in relation to the machine, the capacity to efficiently generate surplus value and for Stiegler then, the worker becomes proletarianized in a second sense to that of Marx (whereby proletarianization is specifically a function of being cut off from the capacity to acquire means of subsistence directly, rather than as mediated by wage labor[69]), insofar as they are stripped of a knowledge that holds power over conscious activity.

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[66] Galison and Jones, "Factory, Laboratory, Studio," 506.

[67] Stiegler, *Technics and Times, 2*, 175; Plato, *Phaedrus*, trans. Alexander Nehamas & Paul Woodruff (Indianapolis: Hackett Publishing Company, 1995), 79-81.

[68] Karl Marx, *Capital Volume 1*, trans. Ben Fowkes (London and New York: Penguin Books, 1976), 544-545. Marx elsewhere, himself often given over to fantastical imagery and touches of the speculative fictional, describes modern industrial machinery as "Cyclopean" (506) and as a "mechanical monster…whose demonic power, at first hidden by the slow and measured motions of its gigantic members, finally bursts forth in the fast and feverish whirl of its countless working organs" (503).

[69] Marx, *Capital Volume 1*, 271-272.

This is only an initial stage, in Stiegler's theorization, in the proletarianization of knowledge engendered by modern technics and one that specifically displaces knowledge carried out through the skillful manipulation of the body. As degrading as the effects of the proletarianization of muscle memory are for the conditions of wage labor under industrial capitalism, more alarming for Stiegler are the potential effects of an ongoing, insurmountable proletarianization of the brain's capacity for producing, storing, and autonomously acting on systematic knowledge. In the simplest sense, this further proletarianization of knowledge and memory, a function of computing technology in particular, is ubiquitously apparent. Archives are increasingly digitized. Networked computers can relatively easily take on rote mental processes, from retaining directions to recalling mathematical formulas, as well as more complex manipulations of thought—translation, for instance—in ways that diminish, for many, the human need for autonomous capacity to perform these mental processes.

One moment in this process is that of the exteriorization of mental capacity and forms of memory themselves onto these aforementioned machinic tools, effecting a loss over time, experienced perhaps as a generational waning of certain kinds of knowledges and skill sets – language acquisition, mental calculation, rote memorization, etc. Beyond that moment, for Stiegler, as a kind of redoubling of the movement of exteriorization is a subjective interiorization of machinic logics constituted by what in the most general sense he frames in terms of the program. Riffing on notions of the program as that which sets forth habits of everyday life,[70] as well as the basic unit of designated computational manipulation of information (i.e. a computer program), and relating the program, via its shared etymological roots, to grammatology, he conjures up a notion of "programmatology" to think a present era of informatic technology as entrenched in machinic programs that reconstitute habit, behavior, and judgement.[71] In these terms then, he speaks of a proletarianization of sensibility, in which aesthetic judgment becomes the terrain of programs to which individuals respond[72] (in the most banal sense, a process one can relate easily to the curatorial algorithms of streaming platforms of various kinds, for instance). And ultimately, insofar as time, in its ontological sense, is originarily constituted in relation to technics (as Stiegler centrally argues throughout the three volumes of *Technics and Time*), the moment of subjective interiorization of programming logics is also one that reconstitutes experiential temporalities of everyday life, informing rhythms, patterns, and habits of movement, sense, labor, etc. This "informatic programmatology" does so moreover, Stiegler suggests, to an extent that risks diminishing what, per Heidegger—whose notion of temporalization Stiegler both draws on substantially and pushes against in his fixation on technics—is fundamental about ontological time, namely the ongoing possibility of the arising of the new.[73] A technical conditioning of possible anticipation and remembrance, via the program, Stiegler argues, threatens to blur the differántial disjunction of past, present, and future into what, for the human, is experienced as adaptation to a conditioned being

[70] Here, Stiegler's drawing explicitly on the work of French evolutionary anthropologist, André Leroi-Gourhan. Much of Stiegler's language of exteriorization and "collective memory," as well as the narrative Stiegler develops around the evolution of human technics as, in part, an evolution of collective memory transmission, draws directly on Leroi-Gourhan's work, which, moving from oral transmission to the mid-20th century present of the emergence of "mechanical memory" in early computing technology, narrates stages in the development of transmitted cultural programs. See André Leroi-Gourhan, *Gesture and Speech*, trans. Anna Bostock Berger (Cambridge: The MIT Press, 1993), 249-251, 258.

[71] Stiegler, *Technics and Time, 2*, 69, 81-83.

[72] Bernard Stiegler, "The Proletarianization of Sensibility," trans. Arne De Boever, *boundary 2* 44, no. 1 (2017).

[73] Stiegler, *Technics and Time, 2*, 160-161.

within a fundamentally unchanging present,[74] perhaps even against the background of catastrophic environmental change.

Stiegler's concerns here then hover around the proletarianization of knowledge as affecting sensibility and behavior in the contemporary subject, rather than an earlier regime of knowledge's proletarianization bearing on the producer[75]—that is to say, the worker, producing commodities. And while, what for him stands as the upshot of his account of the human and technics dwells compellingly on the emergence of an alarmingly dystopic techno-futurism, I wish to pause at this point on the perhaps more banal processes that tie a reading of Halley VI back to what Stiegler frames as the producer's proletarianization. If Marx's factory appears as an automaton, in which the individual industrial worker acts, like any given machinic part, as a technical appendage conditioned to the automaton's rhythms and forces, Halley VI, appears, in the ideal sense articulated by its architectural layout, as the holistic unit of knowledge production, the networked being that acquires information, in which the individual scientist and technician acts as growingly marginal appendage, maintaining infrastructure and perceiving the incoming results of processes of data collection. The base continues to stage the spatial and sensual links between scientist, observational instrument, and object of scientific inquiry, albeit in ways that are relatively easy to deconstruct and decompose. As the steps of experimental and analytical processes become increasingly displaced onto the technological apparatus, the labor of science increasingly becomes that of maintaining extant infrastructure.

This account of what science as a proletarianizing working process looks like may at once be speculative and ideally constituted in the articulations of an architectural form. But it bears nonetheless on those who inhabit the base. As was alluded to earlier, scientists have not overwintered at Halley VI since 2016, a base that had been operational year-round otherwise since 1956, longer than any other active BAS station, a precautionary measure in case a substantial calving event on the ice shelf occurs while the base is inaccessible. For one scientist I spoke to—a glaciologist who studies the Brunt Ice Shelf and as such holds the expert say on whether the base is safe to inhabit at particular times of year—this meant those working out of the base spent an unusually busy 3 months there during the summer. In fact, when I asked him whether he appreciated the base design, he said it was great but unfortunately didn't really serve those using the base under non-overwintering conditions, cooped up as they are while there in their projects and largely unable to make use of the substantial leisure space, nor the amenities designed to make the base feel like home during the nightless winters. Perhaps more interesting though was his response to the question of when overwintering at the base might be expected to start up again. He suggested,

> They invested resources into this automation that we've been working on the last couple years. Back in August 2015-2016, you need scientists there taking measurements… The more things that become automated, the less need there is for people be there. That could be the way science goes in Antarctica… You can do it just as well in the automated way to save logistical costs. I'm not sure [about re-wintering] to be honest, even when I say to give the green light…[76]

The inhabitants of Halley VI then are squeezed towards longer days of work when they are on base and squeezed out of the base by the comparative costs with now-already established machines for

[74] Stiegler, *Technics and Time, 2*, 190-198.
[75] For a helpful account and critique of Stiegler's periodization of the proletarianization of knowledge, see Benoît Dillet, "Proletarianization, Deproletarianization, and the Rise of the Amateur," *boundary 2* 44, no. 1 (2017).
[76] Marsh.

longer and longer portions of the year. That Halley VI's comfortable human home environment spends the majority of its time solely housing machinery seems all the more exacerbated by the substantial limitations the COVID-19 pandemic puts on BAS research agendas.[77]

In the design of Halley VI, a perceived growing marginality of the human to the work of knowledge production comes to be flipped into a liberating possibility, namely that of the growing marginality of work to human life on the ice shelf. But the very real marginality of humans to certain knowledge producing processes equates neither to the absence of humans from those processes nor to the absence of social relations that configure wage relations, value generation, political economic imperatives, and the like. Infrastructure, however automated in its own right, requires some degree of ongoing maintenance; forms of "tacit knowledge"[78] continue to mediate interaction with experimental and computing apparatuses; certain aspects of knowledge production proliferate (as noted before, Antarctic scientists don't quit working off-base) as others are displaced; and experimental procedures of particular kinds resist automation—the scientist I spoke to somewhat wryly joked that the releasing of weather balloons into the atmosphere is one facet of base life that's yet to be automated.[79] At least in part, these enduring shadows of the human in the backdrop of Stieglerian technological displacement of memory capture a countervailing trend to that Stiegler identifies, namely a real subsumption[80] of human subjectivity under advanced capitalist logics within regimes of skilled knowledge and technical work. Broadly classable under the category of immaterial labor, these modes of work, mediated increasingly by information technology, Maurizio Lazzarato has argued, proliferate the necessity of subjectivity as that "raw material" worked on by the labor process.[81] The where and how of subjectivity's application comes to be continually displaced in the proletarianization of knowledge, though not necessarily the fact of said application itself. Amidst the diffuse "factory"[82] of contemporary knowledge work, the physical presence of particular individuals is readily subject to relocation as a function of logistical calculation (akin to any job that interfaces with ongoing cycles of restructuring) while a subjective presence of those individuals is retained.

In this light, the image the comments of the scientist quoted above paint suggests dynamics not unlike what Aaron Benanav theorizes in his critical commentary on full automation discourse. Benanav's analysis takes stock of a world driven by the automation of particular tasks and labors towards ever further underemployment. Against full automation optimists, spanning the political spectrum,[83] Benanav argues that full automation ought not to be seen as any kind of "technological fix" to social problems, including that of widespread subjugation to the wage relation, but rather as a facet of an ongoing restructuring of the category of "employment" itself. As opposed to a large-scale

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[77] Kevin A. Hughes and Peter Convey, "Implications of the COVID-19 Pandemic for Antarctica," *Antarctic Science* 32, no. 6 (December 2020): 426-439, https://doi.org/10.1017/S095410202000053X.

[78] On the uses of "tacit knowledge" in the sciences, see Donald Mackenzie and Graham Spinardi, "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons," *American Journal of Sociology* 101, no. 1 (July 1995): 75-78. Mackenzie and Spinardi draw, among other sources, on the foundational work of Michael Polanyi on "tacit knowing."

[79] Marsh.

[80] Marx considers the "formal" and the "real" subsumption of productive activity under capitalism. The former refers to a stage when the end result of a particular productive activity is the exchange by the capitalist of the commodities produced on the market towards the extraction of surplus-value, the latter rather to a stage when productive activity comes to be re-organized, socially and technologically, via its orientation towards exchange. See Marx, *Capital Volume 1*, 1019-1025.

[81] Maurizio Lazzarato, "Immaterial Labor," in *Radical Thought in Italy: A Potential Politics*, eds. Paolo Virno and Michael Hardt (Minneapolis: University of Minnesota Press, 1996), 134-136.

[82] This characterization arises for both Lazzarato in his account of immaterial labor and in Galison and Jones's look at the postmodern laboratory.

[83] For a characterization of this discourse, see Aaron Benanav, "Automation and the Future of Work-1," *New Left Review* 119 (Sept/Oct 2019), https://newleftreview.org/issues/ii119/articles/aaron-benanav-automation-and-the-future-of-work-1.

liberation from waged work, automation and technological development more generally, as Marx himself noted, have long been part of an ongoing and ever-renewing social abjection of different kinds of labor.[84]

One finds then in the base a contradiction between the emphasis on homely comfort and sustainable human life, on one hand, and the increasingly marginal relation of humans to the experimental procedures the base facilitates, on the other. In Stiegler's terms, this contradiction might be situated as a kind of differánce between the protentional desires expressed in the base's induced form of life and what the base accomplishes as itself an increasingly robust and dislodged tertiary retention bearing destructively back on that form of life. A desired communal life—one overtly signaled by the central social module, widened corridor spaces, shared bathroom and dining spaces, etc., and more subtly coded in such things as the necessary visibility of the base's operational labor to scientific and technical workers therein—stands as the base's quasi-speculative fictional utopian dream. What Stiegler frames as the proletarianization of sensibility is, for the architects of Halley VI, moreover at least in part a source of possibility as well. However detached from historicity and place, the sensual productions of the base's interior offer a necessary disjuncture between the extremity of the base's environmental conditions and the sense experiences that base inhabitants are conditioned to receive. A subject oriented towards programmed sensibility is uniquely well-accommodated by the base itself, amidst conditions of a-topic being and environmental alterity, though the production through technics of a sensually programmed, a-historical subject is certainly a discomforting prospect. These imagined possibilities, however one may evaluate them, lag behind even as they occupy the same literal and imaginary space as the proletarianization of knowledge they're tethered to. It remains unclear what kind of mediating term would keep, in this case, protential desires of any kind from consistently falling victim to the tertiary retentions that constrain and mitigate them.

The Spatial Scales of Science as Infrastructure: A Reading of Halley VI from without

In the prior section, I attempted to perform a reading of Halley VI from within, recognizing that the internal design of the base—across myriad facets from window placement to layout to sensual productions—functions to situate the human inhabitants therein in relation to ideas of work, knowledge, and life. Arguing that the base's internal design expresses the sense of a growing marginality of the human to knowledge work and the project of science more generally (though spinning that marginality positively as the opening up for the human of a communal life not subordinated to such work), I pointed to a number of instances that evince a kind of parallel expression, namely that the imagined investigative entity in the project of science on the ice shelf was no longer the scientist but rather the technological base itself. Going forward in this section, I aim then, taking this latter expression of the base's design seriously, to perform a further reading of the base as a holistic unit, situating it as a node tied simultaneously to a set of spatial scales across which the scientific investigations the base carries out inhere. How does the base, as a holistic unit, express a set of techno-scientific connections with and resolutions to local, national, and global problems? I will think about this in relation to the science carried out at Halley VI as well as to a number of features at the base that can be read from without—exterior color scheme, mobility, deconstructability, replicability, etc.[85] As a caveat, I should reiterate that the base interior's

[84] Aaron Benanav, "Automation and the Future of Work-2," *New Left Review* 120 (Nov/Dec 2019), https://newleftreview.org/issues/ii120/articles/aaron-benanav-automation-and-the-future-of-work-2.

[85] I should note here, I largely bracket out a set of concerns I will explore further in Chapter 4, concerns around the material production of the base itself and how to situate this material production in terms of global supply chains, labor

expression of human marginality to the project of knowledge work I take to be fundamentally ideological. That is to say, the base's pharmacological approach to that marginality, treating the poison of knowledge's proletarianization as the cure of an opened up communal life increasingly unsubordinated to alienated and individuating labors, is one kind of ideal expression of and resolution to questions of social relations and material developments. In a like sense, in treating the base as a node or logistical hub, operating holistically to carry out scientific endeavors, my aim is to follow a set of logics inhering in the base as an architectural production, but without losing sight of the spectral human labor that shadows the base's ideal expression of its own technological autonomy.

Among the major projects listed on the Halley VI research project page, natural scientific studies can be broadly grouped into three categories: studies of the Southern Ocean and its effect on global climate dynamics; studies of the Brunt Ice Shelf itself and the impacts of cracks and chasms on future ice shelf calving events; and studies of what's termed "space weather," weather phenomena in the upper atmosphere resulting from molecular interactions, influenced in large part by solar radiation, phenomena which stays largely at a far remove from terrestrial weather or direct perceptibility.[86] One can draw parallels between the structures of knowing for each project: a complex system with vast and immensely impactful uncertainties is brought under a level of order through data-mediated modelling practices. Media studies scholars point to the ways in which digital media structure our relationship to and capacity to visualize planetary phenomena.[87] If we consider the mediated science happening at Halley VI, it's perhaps especially interesting to consider what planetary phenomena specifically are being mediated and the spatial scale at which we should understand the imperatives to comprehending these phenomena.

Doing so, one finds objects at the scale of the global, the national, and the local inhering within these research agendas. In the case of studies of the Southern Ocean, the importance of such studies rests with the Southern Ocean's place in the global capture of carbon. Having captured a substantial amount of human-produced carbon that has entered the ocean to date—estimates suggest somewhere between a third and half—the Southern Ocean plays a major role in regulating global carbon cycles and thus global climate conditions and their evolution over the coming decades, though one that remains relatively understudied and difficult to accommodate within extant earth systems models.[88] Studies of the Southern Ocean then fixate on a scientifically constituted object, the "Southern Ocean carbon sink," that resists concrete locality and demands being thought at the level of global interaction in a few different senses. The SO carbon sink is legible specifically within its wider interactions and positioning within wider flows. It's situated by scientists for instance within the global carbon cycle as an absorptive space through which flows of carbon released into the atmosphere potentially move, and as such further regulates the ongoing global circulation of carbon, as well as heat, water, and other materials.[89] Consequently moreover, the SO carbon sink

markets, and histories of capitalist and colonialist movement of people and commodities through South Africa, which acts as a primary way station mediating access to the base.

[86] "Projects," Halley VI Research Station, British Antarctic Survey, accessed February 22, 2021, https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/halley/#projects.

[87] Jeffrey Moro, "Grid Techniques for a Planet in Crisis: The Infrastructures of Weather Prediction," *Amodern* 9 (April 2020), http://amodern.net/article/grid-techniques/#pdf.

[88] Edmond A. Mathez and Jason E. Smerdon, *Climate Change: The Science of Global Warming and Our Energy Future*, 2nd. Ed (New York: Columbia University Press, 2018), 57-63.

[89] Thomas Barningham, "Thomas Barningham from University of East Anglia Shares His Voyage and Time at Halley," Antarctic Blog: Ocean Meets Air #2, British Antarctic Survey, March 4, 2016, https://www.bas.ac.uk/blogpost/ocean-meets-air-2/.

becomes legible only in an array of globally diffuse material interactions—most pointedly that of air and sea; but also of differing strata of ocean water; of air, water, and forms of oceanic life; etc.[90]

In its constitution as a meaningful object of knowledge, the SO carbon sink, or perhaps the Southern Ocean more generally, appears as a diffuse, globally interactive space perceived through a kind of logistical tracking of circulatory flows. It makes sense then that the project of knowing this object comes to appear continuous with the specifically logistical constitution of Halley as a research station. The Southern Ocean Optimal Approach to Assess [the carbon, state, variability, and climatic drivers] (SONATA), BAS's principal project studying the Southern Ocean as of 2021, for instance, functions through the calibration, integration, and registration of distinct measurements, a project pitched across "three complementary streams of research"—labelled "oceanic," "atmospheric," and "processes and drivers view." The nuts and bolts of the "oceanic" stream of research entails coordination with the US-led Southern Ocean Carbon and Climate Observations and Modelling (SOCCOM) project, calibrating extant pH measurements in the Southern Ocean against atmospheric CO2 content. This CO2 content, the focus of the "atmospheric stream," is being measured across three points—the Brunt Ice Shelf itself, measurements being taken through the Clean Air Sector Laboratory (CASLab) that sits a short distance from Halley VI as part of the larger Halley research station; the Falkland Islands; and the James Clark Ross research ship. The measurements taken across these first two streams then function as part of the calibration of climate models and simulations examining an array of variable factors in understanding the make-up and evolution of the SO carbon sink.[91]

Scientists register the SO carbon sink as a legible object through an integration of material readings across British post-imperial space—that of the remote research base, of the moving ship, of the colony, and of geopolitical allyship. Knowing in this sense is continuous with a set of logistical concerns, that of, for instance, hauling the CASLab, in effect a large piece of equipment, across the ice in conjunction with necessary relocations of Halley VI,[92] or transporting scientists from Halley VI back to the UK by way of Cape Town, a process performed by the same James Clark Ross research ship used for atmospheric measurement.[93] The James Clark Ross likewise functions in part as a cargo ship providing overarching logistical support to Halley. Management of the CASLab is a project of coordination from afar, its lead scientist having never been physically in the space of the ice shelf,[94] and a substantial part of its functioning a matter of contingently moving younger researchers through Halley to the extent necessary to maintain otherwise relatively autonomous, up-to-date nodes of information.[95] A century and a half after Marx sought to schematize the reproduction of capital as a social totality, abstracting capitalist production into a set of departments and numerically following the circulation of money and commodities between workers, capitalists, and firms in each department,[96] climate scientists and oceanographers schematize the Southern Ocean as a node in an overarching regulatory cycle, consisting of circulatory movements between differing streams (including in some sense the virtual stream of data simulation that acts like Marx's

[90] Barningham, "Voyage and Time at Halley."
[91] "Southern OceaN Optimal Approach To Assess the Carbon State, Variability and Climatic Drivers (SONATA)," UK Research and Innovation, accessed February 22, 2021, https://gtr.ukri.org/projects?ref=NE%2FP021360%2F1#/tabOverview.
[92] "Clean Air Sector Laboratory (CASLab): Science," Office, Labs, and Research Facilities, British Antarctic Survey, accessed February 22, 2021, https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/halley/clean-air-sector-laboratory-caslab/#science.
[93] "RRS *James Clark Ross*: About," Offices, Labs, and Research Facilities, British Antarctic Survey, accessed February 22, 2021, https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/rrs-james-clark-ross/.
[94] A. Jones, email to author, July 3, 2020.
[95] Barningham, "Voyage and Time at Halley."
[96] Karl Marx, *Capital Volume II*, trans. David Fernbach (London and New York: Penguin Books, 1978), 586-595.

reproduction schema representationally to map these other circulatory movements), with stakes for the capacity of that cycle to reproduce itself. Following this cycle at an ongoing level becomes itself a circulatory process dependent on its own logistical reproduction.[97]

In drawing out this analogy, I would argue that such logistical tracking is part of what it means more generally to constitute knowledge at a global scale, which is to say, not just knowledge by and for "global" subjects, but moreover knowledge of objects understood to be part of or coursing through a system of global circulation and interaction.[98] Marx understood his reproduction schema as economic idealities that could model successful cyclical reproduction of the social totality of capital only as such, while belying underlying points of material disjuncture, that of for instance the disjuncture between temporalities of fixed capital investment and those of capital's turnover time.[99] SONATA's three-stream view of oceans, atmospheres, and processes/drivers articulates a kind of continuity between representational schema such as data simulation and material measurement within the global environment's broader regulatory system, a continuity we might call into question in light of, for instance, Kathryn Yusoff's critiques of an unexamined "globality" in Earth-wide climate modelling. For Yusoff, such modelling hinges on a logic of ongoing and infinite informational accumulation at a discernible temporal lag from materially perceivable climate dynamism and thus manifests a discontinuity between perceptible effects of sudden, abrupt, and catastrophic change and any composite picture of a modelled earth or climate.[100] The very apparent overlap between the logistical infrastructure of movement and cross-spatial, cross-territorial coordination in remote and extreme environments and the material mechanisms for legibly representing climatic objects of knowledge such as the SO carbon sink emerges, I would suggest, as a function of how science is configured within the contemporary world-system. And the existence then of Halley VI on the ice shelf, along with its built-in mobility, acts as an expression of this configuration, ensuring the maintenance of a crucial node in the larger calibration mechanisms of global research, even when the ostensibly human core of the base, evinced in its interior, comes to be hollowed out.

I move now from looking at how scientists at Halley study the Southern Ocean to studies of the Brunt Ice Shelf. While ice calving and the composition and decomposition of Antarctic ice sheets, like the Southern Ocean, play an important role in global climate systems, the specific importance of the Brunt Ice Shelf and its future bears at a hyper-local level on Halley VI researchers, who, in their modelling of the ice shelf's major chasm and crack, are attempting to perceive the viability of their own localized research initiatives over time. The creation of a substantial separation off from the larger ice shelf threatens Halley, again the longest-running BAS research station, and in

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[97] Here, the analogy could be extended then to the reproduction of a total "economy" as discursive object, which Timothy Mitchell has argued itself hinged on carbon-based (specifically oil-based) infrastructure in the postwar era. See Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London and New York: Verso, 2011), 123-125.

[98] I would suggest one might separate out this "global" scale from the planetary or universal scale, insofar as science pitched at this scale is situated within a material totality modeled geographically through a set of nodes and flows, neither then taking the Earth as a holistic unit nor thinking the universe at a physical, social, or existential level. It's worth noting however that an expansive proto-logistics underlay universal scientific knowledge going back to Newton, as Simon Schaffer has compellingly shown. Schaffer notes that Newton relied on an information order made possible by early British colonial outposts and seafaring to map the movement of celestial bodies from different global vantage points. See Simon Schaffer, "Newton on the Beach: The Information Order of *Principia Mathematica*," *History of Science* 47 (2009): 243-276. I use the term "proto-logistics" insofar as such British colonial ventures far precede the formalization of logistics as a science of circulatory and infrastructural management and the generalization of such logistics to contemporary capitalist life.

[99] Marx, *Capital Volume II*, 542-545.

[100] Kathryn Yusoff, "Excess, Catastrophe, and Climate Change," *Environment and Planning D: Society and Space* 27, is. 6 (December 2009): 1015-1020.

the worst case scenarios, threatens the safety of researchers, insofar as they have any intent of overwintering at Halley VI in the future. As noted by the glaciologist quoted above, these threatening cracks and chasms, while at times approached up close as a kind of "field trip" for directly perceiving the vulnerability of the ice shelf, are more predominantly studied through an array of finely attuned GPS monitoring systems.[101]

Locality at Halley then is at once experienced as the immediate threat of impending proximate disaster and brought forth as a recognizable set of conditions through planet-wide forms of mediation.[102] It's at this spatial scale where the base's mobility most immediately responds to a set of distinct conditions and concerns, allowing re-location out ahead of possible disaster, and as a function of the base-produced, mediated understanding of how precisely the shelf's cracks are evolving over time. The legs that hoist the base above the ice allow in a literal sense for this mobility, while at the same time visibly signifying a capacity for movement that entails as well the less-obvious problems of making smaller infrastructural units such as on-ice antennae and the CASLab portable. Questions of locality become, moreover, logistically integrated into the apparatuses and phenomena made to inhere at a global scale, evinced for instance in the necessity of instrumental calibration across the variable localities of the ice shelf that ensure the ongoing production of a normalized stream of atmospheric data upon any specific spatial re-location. As a function of the ice shelf's cold, windy extremity, the local, for those within the base, is produced as a set of a sweeping sensual vistas, accessible via wide window panes and designed for in-base infusions of natural light, but necessarily alongside enclosure – not then what's wholly embodied as a kind of icy pain but what's visualized as a vast, foreboding expanse.[103] For the base as logistical unit, the local is produced as at once the conditions of possibility for and that which needs to be held at bay so as not to threaten the endurance of global science bearing on planetary futures—conditions of possibility insofar as the very reason for the base's locality are the near-unmatchable specifics of the local atmosphere, that which is held at bay insofar as the mediated forms of knowing that discern local conditions act as a mechanism to control against imminent disaster.

Circuits of phenomena and their integration into structures of knowing are perhaps most complex in the case of space weather research. A relatively recent and still "esoteric" field of research,[104] "space weather" was first officially used as a term to describe solar-terrestrial interactions in 1959, though it only gained larger popularity as a term in scientific and journalistic writing in the mid to late 1960s.[105] Present-day space weather researchers track and model the interactions between solar radiation phenomena and meteorological events that occur as a function of ionic interactions in the upper atmosphere. Such research necessarily now folds in as well the increasing impacts of greenhouse gas emissions (phenomena from down below) on the now-changing composition of the upper atmosphere. In many ways, the construction of space weather as a site of research and

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[101] Marsh.

[102] There's a cute echo of this in one of the newer, smaller-scale projects at Halley aimed at studying local wildlife, which entails a kind of neighborly tracking from above, allowing imagining of animals otherwise near-impossible to reliably interact with.

[103] This differs distinctly from, for instance, what Yusoff characterizes as the mapping of the Antarctic landscape onto the bodies of early Antarctic explorers. As she notes, "The trails and markings on the body (injury, loss, and insanity) serve as expanded histories of human presence and capture the arresting sensation of the Antarctic landscape" (218), this insight then forming for her the basis of a reading of photographs from early 1910s *Terra Nova* expedition to Antarctica, captured later by Apsley Cherry-Gerard in the memoir, *The Worst Journey in the World*. See Kathryn Yusoff, "Antarctic Exposure: Archives of the Feeling Body," *cultural geographies* 14, no. 2 (April 2007): 211-233.

[104] "Medal Win for Space Weather Scientist," News & Media, British Antarctic Survey, November 13, 2020, https://www.bas.ac.uk/media-post/medal-win-for-space-weather-scientist/.

[105] William B. Cade III and Christina Chan-Park, "The Origin of 'Space Weather'," *Space Weather* 13, is. 2 (February 2015): 101.

concern at Halley echoes terrestrial meteorology. Space weather researchers deploy space weather balloons, equipped with radiation sensors that feed data back to people and digital systems on the ground. They also draw on the Halley Super Dual Auroral Radar Network (SuperDARN) radar, a set of radar infrastructure on the ice that transmits radio waves into the upper atmosphere, used to study "winds, waves, and tides" of ionized gas.[106] Data from the SuperDARN radar is employed in creating "space weather maps" (see Figure 6) that mimic in many ways the appearance of standard weather maps.[107] Likewise, space weather data is modelled in ways that allow for forecasting of possible "severe" and potentially catastrophic weather events.[108] Forecasting models are increasingly integrated into efforts to maintain ongoing forecasting systems, such as the EU-funded SPACESTORM project that draws on data collected at Halley[109] and the National Weather Service's Space Weather Prediction Center in the US.[110]

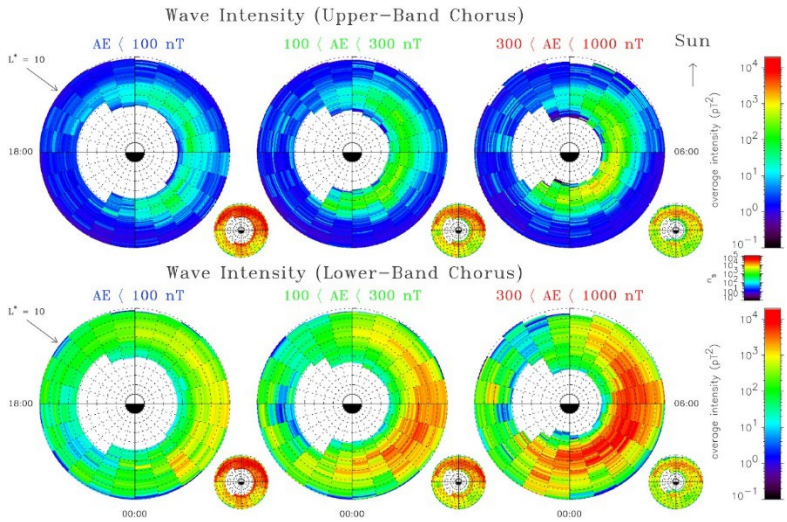

Figure 6. Space weather diagram. Source: Meredith, et al.'s "Global Model of Whistler Mode Chorus in the Near-Equatorial Region (|λm|< 18°)."

If terrestrial meteorology exists as among the most routinely encountered knowledge practices, the weather a near-universal[111] feature of everyday life,[112] space weather would seem to

[106] "Halley Radars," Offices, Labs, and Research Facilities, British Antarctic Survey, accessed February 23, 2021, https://www.bas.ac.uk/polar-operations/sites-and-facilities/facility/halley/radars/.
[107] The example appearing in Figure 6 is taken from Nigel P. Meredith, et al., "Global Model of Whistler Mode Chorus in the Near-Equatorial Region (|λm|< 18°)," *Geophysical Research Letters* 47, is. 11 (June 2020), https://doi.org/10.1029/2020GL087311.
[108] C. Forsyth, et al. "Forecasting GOES 15 >2 MeV Electron Fluxes From Solar Wind Data and Geomagnetic Indices," *Space Weather* 18, is. 8 (August 2020); "Space Weather Observatory: About," Research Projects, British Antarctic Survey, accessed February 23, 2021, https://www.bas.ac.uk/project/national-capability-space-weather/#about.
[109] "Home," Spacestorm, accessed February 23, 2021, https://www.spacestorm.eu/.
[110] "Home," Space Weather Prediction Center, National Ocean and Atmospheric Administration, accessed February 23, 2021, https://www.swpc.noaa.gov/.
[111] Even coastal Northern California now includes a seasonal bout of smoke to disrupt the otherwise weather-less experience of daily life.
[112] For more on the history of meteorology and its transformation into a specifically mathematically-inflected, scientific discipline of knowledge, see Kristine C. Harper, *Weather by the Numbers: The Genesis of Modern Meteorology* (Cambridge, MA: The MIT Press, 2008). Scholars have also sought to expand notions of weather to consider the way overarching environments are infused with ambient social, cultural, political, etc. determinants. See, for instance, Christina Sharpe, *In*

occupy a substantial distance from the average person. Why speak of "severe" or inclement space weather (is not space itself severe on its own terms)? Who cares what the weather in the upper atmosphere will be like in the coming weeks or days, except as a kind of curious novelty? In fact, space weather, in its justification as an arena of research, is pitched as deeply embedded within daily life in the contemporary world, something for which we encounter the effects (or ideally, lack thereof) almost constantly. That is because the significance of this research is a matter, in large part, of the effects space weather events have on the sustainable functioning of active satellites. For Halley, active satellites bear in turn back on contemporary infrastructures of everyday life, of knowledge-making itself, insofar as it relies on sustained collection of satellite data, and of maintaining the UK's place within global circuits of capital, information, communications, surveillance, etc.[113] Researchers peer out into the ether to grasp a mediated picture of vulnerability. But, beyond the elemental vulnerability of the Brunt Ice Shelf as a stable arena for science, the mediated picture of vulnerability emerging out of space weather research is itself a mediated vulnerability, the vulnerability of distant objects to over-crowding, debris, and distant weather phenomena, that recursively reflects back on the very means and circuits of knowing being deployed in the first place, as well as on the nation as guarantor of the project of Antarctic science.

In that sense, BAS materials frame the significance of space weather research in terms of national infrastructural resilience. Researchers effect strategies for "mitigation" through forecasting, as an effort to sustain and manage what appears, even relative to the ocean, as an oft-ignored because comparably invisible arena for contemporary infrastructure, the far reaches of earth's atmosphere. As Deborah Cowen notes, inhering within logistics is an ongoing problem of securitization that engenders configurations of legal and geopolitical space anew. For Cowen, securitization of global supply chains at once pushes national territorial boundaries to their "seams" and comes to be articulated not in tension with but alongside imperatives of national security.[114] "Mitigation" against catastrophic space weather acts at a geophysical level within this logic of securitization, as it plays out in the barely visible dimension of the upper atmosphere. However precariously, the malleable contours of the nation are extended to this distant and barely visible dimension of planetary space by virtue of what mitigation strategies such as space weather forecasting secure—namely, forms of fixed capital investment tied to broader state security initiatives and private financial and communications networks that play a substantial role in national identity as well as employment across the UK.[115]

In reading across the scientific research agendas at Halley, one comes to see them as articulated in relation to distinct spatialities, though ones that are frequently interlinked, porous, and precariously held together. The way these distinct scientific projects are spatially indexed is constructed within and reflects back on legal, geopolitical, and political economic regimes. The Southern Ocean carbon sink becomes indexed to a framework of global circulation at once as a matter of geophysical phenomena dictating globally-impactful planetary climate regulation *and* in conjunction with imaginaries of the ocean as a global space, imaginaries frequently traced back to

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the Wake: On Blackness and Being (Durham, NC: Duke University Press, 2016). In particular, Sharpe notes in a chapter titled, "The Weather," using the weather as a framework for making sense of an experience of Blackness "in the wake" or afterlife of American chattel slavery, "…the weather is a totality of our environments; the weather is the total climate; and the climate is antiblack" (104).

[113] Richard Horne, "Asking the Big Questions: What Is Space Weather?" Interview by Daniel Scuka, *ESA Web TV*, European Space Agency, November 8, 2018, Video, 4:48-5:05, https://www.youtube.com/watch?v=w41PO0a1pe0&feature=emb_logo.

[114] Deborah Cowen, *The Deadly Life of Logistics: Mapping Violence in Global Trade* (Minneapolis: University of Minnesota Press, 2014), 79-84.

[115] David Edgerton, *The Rise and Fall of the British Nation: A Twentieth Century History* (London: Allen Lane, 2018), 4.

legal thought marking a distinction between land and sea in which the sea or ocean acts as that geographic body that resists territorial sovereignty,[116] as well as to Marxian accounts of the global circulation of commodities across oceanic space.[117] Of course if the ocean is constructed as a global space and a matter of global concern within scientific accounts emanating from Halley research, that construction is linked to national holdings littered around the Southern Ocean—Halley, the Falkland Islands, the James Clark Ross ship. If the locality of the Brunt Ice Shelf would make its scientific constitution seem more immediate in its basic urgency to scientists whose survival relies on a careful analysis of its safety for inhabitance, that locality is, as I've suggested, highly mediated, held together by examination from far above and made discursively pertinent through the ice shelf's uniqueness within global space. And, from the standpoint of conventional spatial and territorial imaginaries, themselves persistently called into question by configurations of the "nation" in relation to Antarctic science, it's a matter of convention rather than any kind of intrinsic spatial linkages that the upper atmosphere comes to be discursively constituted as a kind of threatened "national" space. Upper atmospheric space becomes then, like oceanic space, a site that would seem to resist territorialization while nonetheless littered with objects of national proprietorship and significance.

To untangle this knot of spatial scales may lead one in many directions. At the moment however, I would like to return to the architectural dimensions of Halley in its current form, read from the outside, as a kind of logistical hub composed primarily of the modular Halley VI base, though with certain additional components—radar equipment and the CASLab. In doing so, within the context of Halley's science, I would note the following: from the outside, the base's appearance gestures towards the precariously held together spatialities in which its science is situated, and towards the porous leaking of the local, the national, and the global into one another even as each is forthrightly asserted. What remains of this section attempts to work through elements of the base's outer appearance, tracking along the way the ways in which nation, globe, and locality are made into interlaced referents.

When one looks at the base from the outside, alongside the prominent union jack that adorns the central red module, the red and blue of the modules produce, together with the white ice, the image of the union jack's colors. At one level then, the base appears as if, whether consciously or not, integrated into the landscape as a symbol of national pride on the remote ice shelf,[118] like an even more pronounced version of the flags planted during the so-called "Heroic Age of Antarctic Exploration." At the same time, the base's modularity is at play, immediately apparent in the shape and frequently referred back to in press materials that seek to highlight the ingenuity of the base's design. This grants to those approaching the base, either as an image or as an actual physical structure, a recognition of the ongoing possibility of deconstructing said national symbol, already only anxiously and tentatively produced when one registers the almost candy-colored lightness of the outer module's blue hue, as against the bold navy blue of the flag.

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[116] The sea, understood to be elementally unfixed, famously plays this role in Carl Schmitt's articulation of a spatio-legal "nomos" of the Earth that takes hold in modern international law. See Carl Schmitt, *Land and Sea: A World-Historical Meditation*, trans. Samuel Garrett Zeitlin (Telos Press, 2015) and Carl Schmitt, *The Nomos of the Earth in the International Law of the Jus Publicum Europaeum*, trans. G.L. Ulmen (Telos Press, 2003). For an in-depth account and useful problematization and rethinking of Schmitt's claims regarding the sea as juridical space, see Ch. 1 of Renisa Mawani's *Across Oceans of Law: The Komagata Maru and Jurisdiction in the Time of Empire* (Durham, NC: Duke University Press, 2018), 50-70.

[117] See, for instance, Laleh Khalili, *Sinews of War and Trade: Shipping in the Arabian* Peninsula (New York and London: Verso, 2020), or Liam Campling and Alejandro Colás, *Capitalism and the Sea: The Maritime Factor in the Making of the Modern World* (New York and London: Verso, 2021).

[118] A kind of monumentality has often acutely accompanied the most extreme Antarctic bases – one might look for instance at the Soviet Pole of Inaccessibility base, now buried under ice except for the bust of Lenin that juts out above the surface, what one could see as a distinctly tangible specter of a certain Marxism.

A crucial functional feature for meeting the base's needs, the hydraulic legs that lift the base above the ice at the same time hoist contemporary Antarctic life over and above the abandoned iterations of Halley that lie invisibly below (and since Halley VI's 2016 location shift, away from) the ice and snow that the base sits atop. That this feature serves a clear and direct function shouldn't detract from the realization that certain choices are being made here, even if by apparent absence, as to how to register or ignore the history of Halley's physical space. Comparing the shaping of historical space across major research stations on the Antarctic land mass, Collis and Stevens note that the Australian Mawson station sought to maintain a kind of imperial narrative of the historical development of Antarctica, through a base-wide layout shifting from preserved early buildings to newer high-comfort and high-technological facilities. McMurdo, the largest US-led Antarctic base, was regularly deconstructing and reconstructing its built space, albeit preserving certain landmarks of the continent's Heroic Age, a sort of differentiated investment thereby in what it means to create and preserve space with a sense of history and monumentality.[119] If a certain progress narrative, one fixated on a soteriological investment in contemporary and future technoscience, tinges Halley VI's move upward above the ice, it's one that's not concerned, as opposed to either of the Mawson or McMurdo stations, with making visible the history of the nation's project of Antarctic scientific achievement, the physical vestiges of which history at Halley lie now buried under decades of accumulating snow.

The UK is at once a stark referent in reading the appearance of the base on the ice and something to make pliant, to distance oneself from, and to spatially transcend. Tom Nairn's classic analysis of nationalism characterized the phenomenon as Janus-faced, looking forward and back at once. Thinking through the readily apparent conflicts and limitations in the mobilization of nationalism for post-colonial state formation, Nairn argued that nationalism holds a simultaneously progressive and retrogressive character, at once a developmental force capable of mobilizing units of political and economic power, and one that draws regressively on interior myths, folklore, and histories from a deep past.[120] To the extent that spatial scales are frequently temporally mapped, a global or international order located within an emerging future of transnational enterprise and the nation situated within a past modernity increasingly eclipsed by global capital flows and cosmopolitan cultural exchange, one might read Halley VI from the outside as analogously Janus-faced. A British imperial past of sorts is allowed to lay buried under the ice as a near-alien spatial form juts out, signaling its own mobility as emblematic of the eclipsing of territorial fixity, a hallmark moreover of the Antarctic international legal order, while at the same time the garish color-coding and direct outward-facing signifiers that appear in images of the base can't help but to announce the base as a product of British national ingenuity. This way of casting the tension between the supra-national and the national informs what I noted earlier as the inclination to read the base as figuring a future of planetary inhabitance beyond the nation. No longer a stockpile of particular cultural myths or histories, the nation, to the extent it's still figured, becomes then simply a sign of a kind of institutional continuity underlying the endurance of Halley from past to present to longed-for future.

Such a notion appears all the more reinforced by the pliancy of Halley VI. As noted earlier, iterations of the base are being worked on by Hugh Broughton for Brazilian, Spanish, and South-Korean-led Antarctic research stations, as well as for an Atmospheric Watch Observatory established by the US National Science Foundation (NSF) in Greenland. For Benedict Anderson, models of nationalism, though developed within particular conditions, "became 'modular,' capable of being transplanted, with varying degrees of self-consciousness, to a great variety of social

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[119] Collis and Stevens, "Cold Colonies," 245.

[120] Tom Nairn, "The Modern Janus," *New Left Review* 94 (Nov/Dec 1975), https://newleftreview.org/issues/i94/articles/tom-nairn-the-modern-janus.

terrains…"[121] Halley VI's modular, deconstructable nationalism on ice carries forward this argument with hyper-literal force, as its made replicable in iterations that extend the modularity of the base to a kind of portability elsewhere, retaining alongside the characteristic features of Halley VI's modular shape, much in the way of window layouts, legs hoisting built space above the ice, and the overarching appearance of the large central social module. Slight tweaks are made in terms of the number of modules and how they are aligned in relation to one another, what might stand as adaptations to the social and geophysical needs of particular research stations, differing as they do in location within Antarctica, number of people they need to support, cultural habits, etc. And as would perhaps be expected, the gaudy color scheme of Halley VI is iterated anew in each case – Brazil's iteration is green and yellow; Spain's is red and gold; South Korea's red and silver base appears least directly derived from the colors of the national flag, though set within the mixture of blue and white that characterizes the base's position at the edge of a bay and under the auroral blues of the night sky, a kind of nationalist color scheme becomes perceptible. In the exhaustive extension of this iterability, the concept now exists for an all-purpose "relocatable mini-module to support remote science and logistics,"[122] akin to a mini-Halley VI but with a neutral yellow hue and the image of a global map implanted on the side as a sort of nod to its own omni-national utility.

Though read within a progressive narrative—mobilizing the pliancy of the UK as referent towards a vision of global futures in which the nation, even when enduringly necessary in some strict sense, becomes a kind of empty sign subordinated to international cooperation—Halley VI continues to exist as a national object. This holds, as noted before, in the research that situates the station as a kind of outpost, tethered to the crucial upper atmospheric region, of nation-securing infrastructure. The base likewise is made into a symbol of distinctly British ingenuity and innovation in commemorative British stamps and coins as well as in the UK government-led GREAT campaign,[123] self-described as the "UK government's most ambitious international promotional campaign, uniting the efforts of the public and private sector to generate jobs and growth for Britain and Northern Ireland."[124] The self-promotional campaign, launched in 2011 to mobilize international attention on the UK in the lead-up to the 2012 London Olympics,[125] aims to draw in cosmopolitan investment while projecting a post-imperial national image that "encourage[s] people around the world to think and feel differently about the UK."[126] Through appeals to an innovation that's made to signify the very heights of future possibility, Halley VI in such a campaign becomes a form through which to re-write empire as an image of the 21st-century global nation, strengthened by facing outwards to peer innovators and towards those remote outer reaches out of which narratives of the future are made available.

That an exemplary image of the 21st-century global British "nation" might be made to inhere in a small, deconstructable base jutting out from the remote reaches of the earth, and supporting the life of a few dozen odd people at a time makes a certain sense. Schmitt characterized Britain as a sea power, self-consciously and diffusely mobile and ungirded to the land,[127] a characterization we might

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[121] Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (London and New York: Verso, 1983), 4.
[122] Slavid, *Ice Station*, 89.
[123] Slavid, *Ice Station*, 86.
[124] "Welcome to Great Britain and Northern Ireland," GREAT Britain and Northern Ireland, accessed February 23, 2021, https://www.greatbritaincampaign.com/.
[125] GREAT HQ, "Nine Years of GREAT Campaign," Government Communication Service, September 14, 2020, https://gcs.civilservice.gov.uk/blog/nine-years-of-great-campaign/.
[126] "About GREAT," GREAT Britain and Northern Ireland, accessed February 23, 2021, https://www.greatbritaincampaign.com/about.
[127] Schmitt, *Land and Sea*, 75-81.

take to enduringly structure the national scientific project's relationship to a site that's landless, rather consisting of a slowly flowing and floating ice sheet to always only unsteadily latch built space onto. British nationalism itself, it's been noted, is not a common theme in 20th-century histories of the UK precisely because of its relative non-visibility relative to the category of empire,[128] better suited as the latter category appears to be for describing predominantly oceanic rather than landed relations of state power. More recent scholarship situates the "British Nation" as emergent in the postwar period and constituting a consolidation of national (and not imperial) histories, protectionist industry, self-sustaining agriculture, and nationalist critiques of cosmopolitan capitalism: all inhering in the "United Kingdom" as nation and distinct from Britain as imperial power and decline.[129] In this reading, the same processes that, for instance, resulted in the rebranding of the Trade Union Congress as a cosmopolitan conference space can be seen as tending towards the emergence of something like the global nation apparent in the GREAT promotional campaign, against which a revanchist yearning for the insular, consolidated postwar nation is articulated, as would be attested to by events such as the 2016 Brexit vote.[130] Hugh Broughton projects, in comments about the interior design of Halley VI, an anxiety towards asserting an image of the British nation as synonymous with the English countryside or other signifiers of insular British sensual life, when discussing what it looks like to make the base feel like home,[131] preferring, if only implicitly, a sensibility at once more global and more directly attuned to an idea of unmediated locality.

This is all to say that the category of "nation" here is a tricky one, variably discernable as emerging out of disillusionment with empire or as continuous with the endurance of present-day neo-imperial forms. As Cowen, as well as Laleh Khalili more recently,[132] has noted, securing the lubricated flow of trade in material goods but also financial assets—the latter perhaps especially pertinent to upper atmospheric national satellite infrastructure—has come to be articulated as a matter of national security and can also very well be read as a matter of securing present-day empire, with all the power to bypass and manipulate legal regimes that comes with such a category. The simultaneous situatedness of Halley VI, figured across its outward appearance, in an aspirational globality, a national scientific project, and an urgently felt locality, brings me to an image that Jameson proffers in an essay on national allegory. Describing a form of totality he attributes to a period of "global class formation" and the incommensurability of different dimensions of class situatedness within this totality, Jameson draws out the metaphor of multidimensional chess. As Jameson puts it, we find ourselves in a totality "in which a number of distinct chessboards coexist simultaneously with distinct configurations of forces on each, so that a move on any one of these boards has distinct but unforeseeable consequences for the configurations and the relative power-relations on the others."[133] This situation is one characterized at once by the kind of simultaneity that Benedict Anderson speaks to in working through the conditions of possibility of imagined community and a kind of incommensurability across different "dimensions" of the chess board, an incommensurability between configurations of power relations and their effects at an array of scales.[134]

I want to take seriously this image insofar as I read Halley VI, in its outward appearance, as figuring its own logistical situatedness, and as a kind of metonym for the logistical situatedness of the nation in alliance with national and global capital tethering science to infrastructural

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[128] Edgerton, *Rise and Fall of the British Nation*, 9.
[129] Edgerton, *Rise and Fall of the British Nation*, 4-7.
[130] Edgerton, *Rise and Fall of the British Nation*, 4.
[131] Broughton, "Eco Thoughts."
[132] Khalili, *Sinews of War and Trade.*
[133] Fredric Jameson, *Allegory and Ideology* (London and New York: Verso, 2019), 190-191.
[134] Jameson, *Allegory and* Ideology, 193-194.

management. Jameson offered his image of the multi-dimensional chess board in the 1980s, with the backdrop of competing Cold War global superpowers still in mind. A different configuration of forces figured at the level of the globe is presently operative, within which one can read aims to produce global subjects, who could be said to both be situated within a global organization of the senses and within a period of conscious concern for the globe and its far reaches. The former instantiation of aspirational globality Halley VI aims to promote directly among its inhabitants as the latter comes to be structured into uses of Halley VI as image of Antarctic precarity, significance, and ingenuity. Both are underpinned by efforts towards integration of global infrastructure networks and can be read as co-constitutive with the discursive production of a particularity that global concern and sensibility serve to evacuate.[135] Crucially, the production of such global subjectivity is cut across by a configuration of forces inhering in the "nation" as underpinning a logic of infrastructural security and risk-mitigation. The deconstructable base and its surrounding networked radar and atmospheric measurement equipment signal upward (geographically and geophysically) to the territorially unbounded nation, for which scientists, technicians, engineers, operations and construction crew cycle through British post-imperial space as a cohort of infrastructural laborers, contingently and temporarily assembled within Halley VI as workplace and home. And these cohorts of infrastructural laborers are figured as continuously and collectively facing an embattled, though at times sublime, relationship with the hostility of their immediate surroundings, a hostility that demands the means for movement and escape and that's come to increasingly hollow out the science laboratory qua infrastructure as a space for direct human activity. Halley VI recognizes itself as at once a global, national, and local place precisely because it occupies a de-territorialized logistical space that aims to sustain global circulatory networks, to ensure national security—security taking on an array of valences—as tied to the stable functioning of such circulatory networks, and to make use of a highly particular geophysical locality.

Conclusion: Antarctica as a Sandbox for Planetary Futures

Throughout this chapter, I've sought to discern a set of logics inhering in the architectural form of Halley VI, taking the construction of Halley VI as, in certain ways (and surely, with certain limits), metonymic for a larger set of concerns around how science is constructed and carried out in the present. In opening, I noted that Halley VI may be seen as an extension of what Galison calls the "postmodern" laboratory, a project of networked laboratory construction that for Galison is both akin to and imbricated with transnational corporate structures of large-scale project management and digital environments. Carrying forward this argument, I have suggested that these dynamics of the "postmodern" laboratory extended further bear deeply on how science—in its doing as configurations of people, objects of knowledge, and instrumentation—is understood to be assembled. Halley VI is one such instance, at the extreme spatial cusp of what Galison frames as science's "postmodern" dispersal, where we can begin to trace the spatial logics of science's material and imagined assembly in the present.

As I noted in beginning to do so, Halley VI presents a self-consciously science fictional picture of present and future climate research. Not just kitsch or novelty for its own sake, this science fictional appearance is something we should read for, recognizing the ways in which the station and the architectural efforts that have gone into it materially project certain kinds of future imaginaries of a planetary "home." Different trajectories and problematics at play in these imaginaries can be found in different ways of locating a reading of the architectural form of the base.

[135] For more on critiques of scientific globality as a key discursive structure of racialization, see Denise Ferreira da Silva, *Towards a Global Idea of Race* (Minneapolis: University of Minnesota Press, 2007), 32.

I have sought to do a reading from within and a reading from without. From within, the imaginaries at play in the base ask where the human belongs in relation to work, knowledge, and life, implicitly figuring expectations around the marginalization of human thought and activity to a machinic constitution of institutional science, while offering an idea of the communal life of informal interaction and immediate experiential and affective investments that might result therefrom. From without, they ask after the bounds of home, of local environment, of national belonging, and of global life, all recognized as facets of legible space porously leaking into one another amidst a planetary future of co-constitutive climate and infrastructural management. In the 19th century, the Arctic—inaccessible to most—served as a "representational space, a blank page on which to draft different national and imperial narratives that either embraced or critiqued Britain's increased investment in imperial or colonial projects."[136] In the early decades of the 21st century, the opposite pole serves less as a kind of projector screen and more as a sandbox for experiments in assembly. These experiments construct, as instantiated in built space, ideas and images of how entities—ranging from the markedly global subjects imagined within Halley VI, to pieces of equipment, to logistically networked nations—will and ought to inhabit a planetary future in crisis.

[136] Jen Hill, *White Horizon: The Arctic in the Nineteenth-Century British Imagination* (Albany, NY: State University of New York Press, 2008), 3.

Chapter Two
Grieving, Joking, and Coping: A Minor Archaeology of the Human Sciences in Antarctica

Navigation delivers man to the uncertainty of fate; on water, each of us is in the hands of his own destiny; every embarkation is, potentially, the last. It is for the other world that the madman sets sail in his fools' boat; it is from the other world that he comes when he disembarks.

- Michel Foucault, *Madness and Civilization*[1]

When, in 1898, the *Belgica* became the first ship to overwinter within the Antarctic circle, the on-board doctor, Frederick Cook, described the eventual scene as a "madhouse." The human psyche was pushed, pulled, battered, and re-formed at the outer reaches of human-inhabited space. Cook made notes throughout the nearly two-month sunless dead of winter about the psychological response of crew and expedition leaders to the cold, dark hell they found themselves in, a response that mixed general malaise with bouts of insanity, either exacerbated by the physiological tolls, scurvy included, of extreme cold and wind, disrupted circadian rhythms, and a diet limited to canned goods and, as it became absolutely necessary, near-raw seal and penguin meat.[2] One crew member, the Norwegian Adam Tollefsen, was institutionalized upon returning to Europe and never recovered from a haunting paranoia. Whether the result of psychological collapse or the psychic scars of an encounter with the kind of mythic other-worldly Antarctic monster one would come to find in such films as *The Thing*, we'll never know, as he ultimately burned the diaries that might have served as documentation of his psychic deterioration.[3]

The *Belgica* came to accidentally reproduce the "ship of fools," a spatialization of madness that Foucault positions in the late medieval era.[4] Rapidly over the next century, the development of Antarctic psychological discourse and evaluation would serve to manage and constrain the distinctly Antarctic "madness" and despair induced by conditions of extremity, remoteness, and severe disruption of standard temporal patterns. Yet residues of this early "ship of fools" linger in the Antarctic landscape as inhabitants and scientific observers alike have tried to make sense of what it does to the human to embark for that other world down in the deep polar south. For much of the short history of Antarctic inhabitance, one needed the "right stuff" to make it down there but the "right stuff" wasn't always the most strength, wherewithal, smarts, etc. A canonical volume from the 1970s consolidating psychological, physiological, and behavioral literatures on Antarctic inhabitance suggests it was the right kind of oddities, unusual mixtures of self-motivation, predilections for sustained social isolation, and willingness to buy in to weird, insular, even "immature" new routines, habits, and "microcultures," that facilitated a successful Antarctic venture:[5] Antarctica itself was perhaps a ship of minor fools and outcasts. More recently, a host of experiments have sought to characterize the physical, physiological, and neuro-pathological shifts engendered by a stay in Antarctica, noting the continent's relevance as a kind of laboratory analog to other extreme forms of

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[1] Michel Foucault, *Madness and Civilization: A History of Insanity in the Age of Reason*, trans. Richard Howard (London and New York: Routledge, 2001), 8.

[2] While a few on board the *Belgica* effectively refused such meat, at their own peril, others, especially Roald Amundsen, who's credited with first reaching the South Pole more than a decade later, apparently quite liked the taste of raw seal. See, Julian Sancton, *Madhouse at the End of the World* (New York: Crown, 2021), 186-187.

[3] Sancton, *Madhouse*, 275.

[4] Foucault, *Madness and Civilization*, 5.

[5] Natani Kirmach and Jay T. Shurley, "Sociopsychological Aspects of a Winter Vigil at a South Pole Station," in *Human Adaptability to Antarctic Conditions*, ed. E.K. Eric Gunderson (Washington, D.C.: American Geophysical Union, 1974), 95-97.

isolation and sensual depravation, space travel in particular. What pathologies, stresses, and afflictions, researchers ask, does a remote Antarctic station produce and how can we therefrom prepare in planning to send "ships of fools" into an expanding world of hyper-remote inhabitation?

In *The World, the Flesh, and the Devil*, a speculative scientific tract from the 1920s, the physicist JD Bernal addresses the limits that a collective humanity would have to overcome to expand human life into the outer reaches of space. Humanity, per Bernal, would need to step beyond certain inorganic physical limits (i.e. the world), the limits of the organic human body (i.e. the flesh), but also, crucially, limits to what humans could cognitively accept, understand, and process. The titular devil was in the mind, a mind in his time he saw as not yet capable of overcoming certain attachments – to the world in its current form, to the human body, to subjective individuation and intersubjective love.[6] When Hannah Arendt, a few decades later, came to express horror at human desires for interstellar expansion, a kind of literalization of modernity's search for an Archimedean Point at which to look back out at ourselves, it was the devil, she thought, that might save us. The set of psychological limits that kept us attached to our earthly home might be precisely, she imagined, what we'd mercifully encounter in our pursuit of space, eschewing then the hope of moving ever beyond and finding ever further limits to our reach and settling back instead into a worldly being.[7]

If the following chapter aims to step back from an overdetermined linkage between Antarctica and space, recognizing this as only one of many ways to map the southern continent within larger symbolic geographies, what it retains in looking at the history of discourses on the Antarctic mind is an interest in how humans come to be understood as psychologically warped, but also at times brought back down to earth, within the particularities of extreme space. I produce going forward what I would frame as a "minor archaeology" of the human sciences in Antarctica over the course of the 20th and into the 21st century, focusing most particularly on efforts to characterize the Antarctic psyche. Doing so entails efforts at reproducing consolidated conversations around the conditions and effects of Antarctic life in distinct phases, recognizing these conversations as situated within distinct periods of Antarctic life and sociality, characterized by particular technics, institutions, media, and problematics. Such an archaeology is "minor" insofar as it does less to trace grand, cohesive epistemes and their shifts, as marked out by the core scientific discourses of an epoch, than it does to cohere moments, often loose and informal though at times more rigorous and institutionally-situated, in an ongoing conversation fit to the contingent needs of Antarctic inhabitants and organizations.

Within this "minor archaeology," one traces a conceptual field that negotiates the relationship of the Antarctic mind to its *situation* and to *patterns of human activity*, though either is continually reconfigured. The situation of the Antarctic mind ranges from sheer geophysical brutality to social particularity to institutional organization to embodied neuropathology, while patterns of human activity map onto a spectrum between the distinct seasonal rhythms of the Antarctic or the regularized patterns of capitalist work life. As the psychological conversation moves through this conceptual field, it takes on distinct forms of mediation that in turn come to reflect and interact with modes of stabilizing the Antarctic mind – as I'll show, the conversation moves through narrative as a distinct mediatic form, through humor and levity, and ultimately through positivist social science, the latter acting as one piece in a larger technics that has rapidly facilitated a growth and spread in Antarctic inhabitance and a dramatic subsumption of Antarctic work life and sociality under the fold

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[6] J. D. Bernal, *The World, the Flesh, and the Devil: An Enquiry into the Future of the Three Enemies of the Rational Soul*, 1929, Available through Foyle Publishing at: http://www.quarkweb.com/foyle/WorldFleshDevil.pdf.

[7] Hannah Arendt, "The Conquest of Space and the Stature of Man," in *Between Past and Future: Eight Exercises in Political Thought* (New York: Penguin, 2006), 272-274.

of contemporary (largely) Global North social organization. What I'll try to show as well is that, as perhaps a point of continuity across this shifting conversation, psychological discourse in the Antarctic, in its shifting framings of the relation of mind to situation and activity, has been a site of contestations over conditions of labor, imperatives driving forth Antarctic research, and thinking around what Antarctic life ought to tell us about the world Antarctic researchers and laborers eventually return to. Are the uniquely punishing (though also, at times, uniquely sublime) conditions of the Antarctic something to work through or against? Are they an opportunity of sorts to meditate on life back home, and if so, what do these conditions figure?

The concerns of this chapter build off recent historical studies of "human sciences" in situations of extremity and catastrophe. Philip Clements's *Science in an Extreme Environment*, for instance, looks specifically at the 1963 American Mount Everest condition as a case study. In tracing the efforts of geologists, psychologists, and physiologists to sell and carry out the endeavor of a coordinated trek up Mount Everest, he demonstrates the rhetorical efforts that went into framing Mount Everest as a locale specifically for and unique to science, a laboratory of temperature and altitude extremity and the stress responses caused thereby that could allow a kind of "reality testing" of what was only ever artificially reproducible in the normative lab. He also demonstrates the epistemological difficulties of "reality testing" itself, from questions over reproducibility to the stresses that testing itself put on subjects likewise dealing with the extraordinary physical difficulty of trekking to and ascending Mount Everest.[8] Focusing on extreme physiology, Vanessa Heggie's *Higher and Colder* likewise tracks research efforts in exceptional locales, including Mount Everest itself, other sites of high-altitude research, and the poles. Heggie's work broaches similar epistemological questions, around the nature of real-world scientific testing, and discrepancies between artificial laboratory productions of specific conditions and the "field" as site of real world analysis, Heggie moving moreover into an analysis of the social undergirdings of 20th-century science and especially science at the inhabitable fringes of the Earth, a rarefied and exclusive space, constituted by nepotistic networks and ad hoc, very often gendered and raced ideas of mental and physical fitness.[9] And beyond extremity found at the world's latitudinal and altitudinal fringes, Stefanos Geroulanos and Todd Meyers in *The Human Body in the Age of Catastrophe* traces the response of physiological discourses to the medical needs and empirical experiences of World War I, noting the emergence of discourses that came to cast the human body as an integrated whole though one that's threatened, fragile, and prone to systemic collapse.[10]

The historical concerns and insights of these recent historical studies are in many ways crucial to what I trace in this chapter, where narrative retrospectives of Antarctic travel come to be filtered themselves through the historical course of the 1910s; questions of "acclimitazation" crucial to the history of extreme physiology are visible in evolving discourses of human adaptation, coping, and behavioral response to the Antarctic; and the hyper-particularity of the conditions of human scientific research push against easy generalizations extrapolated from the conclusions and observations of Antarctic meta-science. What I present going forth, though, makes a point of homing in on the human psyche, noting the predominance of such to contemporary human scientific research on the subject and the capacity to trace an expansive pre-history to contemporary, paradigmatic, Antarctic psychology. The human psyche here though, consisting of individual minds, collective and repeated behaviors, and fields of ongoing interaction, drips out into and absorbs

[8] Philip W. Clements, *Science in an Extreme Environment: the 1963 American Mount Everest Expedition* (Pittsburgh: University of Pittsburgh Press, 2018), 49, 116-117.
[9] Vanessa Heggie, *Higher and Colder: A History of Extreme Physiology and Exploration* (Chicago: The University of Chicago Press, 2019), 5, 26-27, 64.
[10] Stefanos Geroulanos and Todd Meyers, *The Human Body in the Age of Catastrophe: Brittleness, Integration, Science, and the Great War* (Chicago: The University of Chicago Press, 2018), 24.

landscapes, socio-political concerns, organizational structures, technologies, architectures, and physical facets of bodies under duress. And the Antarctic psyche, moreover, is constituted not exclusively by formal, institutional research but by interactions between such and the lay conversations, contingent observations, and organizational needs of researchers and in that sense, I distinctly aim to offer a kind of history of science as an integrated part of an evolving, problematizable scientific labor process.

Studying, Narrating, and Eschewing the Mind in Imperial Travelogues

In the following section, I read imperial-era travelogues and diaries from the "Heroic Age of Exploration." The most mythologized period in Antarctic history, the particular conditions of the era are characterized by a hyper-masculine adventurism, wealthy, often-aristocratic explorers assembling teams of sailors, scientists, trusted friends, military officers, and companion animals, to venture down to the continent for years at a time, with no means of rapid communication back north and the limited supplies that ships were capable of carrying. Unsurprisingly, many people died on these expeditions, most famously the expedition leader Robert Falcon Scott and the crew of four others, who came to be named the "Polar Party," who joined him for the last leg of a trek to reach the South Pole (which they discovered upon arrival had already been reached by Roald Amundsen's rival crew a few weeks before).

Writings from this era reflect something of a pre-history of the formal study of Antarctic psychology. A mix of real-time diaries exploring the depths of severe mental stress and the warped psychological responses to local conditions, self-conscious news-making including editorializing for the crew of ongoing expeditions, and retrospective speculation into what folks, including oneself, must have been thinking and feeling at particular moments in time, as well as into the particular mental afflictions that appeared to take hold as evinced by diaries, the source material for this part of the chapter was less a formal psychological discourse and more a set of conversations between those involved in polar expeditions and armchair enthusiasts following the goings-on of the polar regions. At the same time, these expeditions did include medical professionals with ranging specializations and the necessity of developing and drawing on knowledges of human mind and body as an integrated part of the overarching endeavor of polar exploration.[11] Moreover, efforts to test out the limits of human psychology alongside and in conjunction with human physiology were recognized as intrinsic to the scientific value of such expeditionary projects. Expeditions were guided by past example, building on previous polar expeditions but also in certain cases on insights drawn from observations of indigenous societies in the polar North.[12] And from the Antarctic, expeditioners brought back Emperor penguin embryos, geological specimens, scurvy-addled military officers, and reflections on what facets of the continent's unique conditions were so hellishly unbearable and the behaviors through which humans at a personal and social level responded or failed to respond to local challenges.

Much of this part of the chapter responds to one text in particular, Apsley Cherry-Garrard's *The Worst Journey in the World*. Published in 1922, Cherry-Garrard's canonical tome, documenting the *Terra Nova* expedition of 1910-1913, has endured as the most famous and most widely commented upon "Heroic Age" expedition to Antarctica. It's not surprising that Cherry-Garrard's book emerged

[11] See much of Sancton, *Madhouse*, for discussion of Frederick Cook's medical expertise and its uses on the *Belgica* expedition; See, as well, Heggie, *Higher and Colder*, 87-89: here, Heggie notes an early "self-experiment on diet and metabolism" (87) conducted by three members of the *Terra Nova* expedition during their famously grueling winter journey, including the expedition's doctor and chief scientist, Edward Wilson.
[12] Heggie, *Higher and Colder*, 91-92, 104-105, 107-108.

as the era's most singular and widely canonized opus.[13] The book's author, a member of the *Terra Nova* crew and part of the second-to-last group to part from the crew's Scott-led, doomed Polar Party, draws on experience, personal diaries and the published and collected diaries of other crew members, particularly Scott himself, and a decade of pondering and second-guessing over how things might have gone differently, in putting together an often gripping and at times haunting account of the wider expedition at every stage. His book is the era's starkest psychological study of the Antarctic, among many other things, insofar as and because it doubles as an effort to come to grips with why things happened as they did and through doing so to mourn Scott, alongside the crew members Edward Wilson and Henry "Birdie" Bowers who, in pre-polar journey passages of the book, are noted as among the author's closest friends.

Bolstered by reference to Fredrick Cook's diaries from the *Belgica* expedition and Ernest Shackleton's also-famed travelogue, *South*, documenting the 1914-1917 "Imperial Trans-Antarctic Expedition," I carry out, in this section of the chapter, a reading of Cherry-Garrard's study of the *Terra Nova* expedition. This reading will start by laying out a general psychological symptomology of how mental strain manifested on this expedition before delving into a mixture of activities, prescriptions, and for Cherry-Garrard, narrative techniques for stabilizing the Antarctic mind. Finally, I'll take up what I note as both a kind of narrative excess to Cherry-Garrard's efforts at explanatory stabilization and hints at a seeming psychic excess to the real-time efforts at stabilization in the midst of the expedition. Ghosts, mirages, uncanny dreams, and the like emerge again and again in *The Worst Journey in the World*, alongside odd gaps in diary writing, haunting tonal shifts, and the like, all of which the reader encounters Cherry-Garrard reading and seeking means of interpreting.

By the time Cherry-Garrard went down with the Scott-led *Terra Nova* expedition, there were precedents for the kind of years-long journey into the deep south they were taking on, and in that sense, there were, as well, established, if still little understood, symptoms of the psychic strain of polar travel. Frederick Cook had published his *Through the First Antarctic Night, 1898-1899* in 1900, which elaborates on the effects of isolation, lack of sensual variation, the long polar night and other seasonal extremities of the Antarctic, and extreme cold and wind on Antarctic travelers, as well as Cook's efforts to treat his crewmates throughout the duration of the time they were stuck in the ice pack aboard the *Belgica*. Cook had further drawn on experiences in the polar North, including observations of indigenous communities in the long night of the Northern winter.[14] While Cherry-Garrard doesn't explicitly cite Cook's text, he does note that the *Terra Nova* crew was "rich [with books of] Arctic and Antarctic travel," that were "extremely popular" and "extensively used in discussions or lectures," throughout the expedition.[15] And at that point, Cook's reputation, though beginning to take hits, was still relatively intact.[16] Alongside extant polar travel literature, Scott himself, as well as the *Terra Nova*'s chief scientist Edward Wilson,[17] had previously been down to Antarctica with the multi-year *Discovery* expedition (1901-1904), the second documented mainland

[13] Though Shackleton's *South* and collected volumes of Scott's notebooks have also been widely read and studied, along with mid-20th century secondary accounts of Shackleton, Australia's Douglas Mawson, the Scott-Amundsen race, and other notable events from the era, Cherry-Garrard's book, among the original first-hand documentations from the "Heroic Age," has been more thoroughly canonized beyond Antarctic literature, appearing frequently on lists of the world's best works of travel literature in particular.

[14] Sancton, *Madhouse*, 38-39.

[15] Apsley Cherry-Garrard, *The Worst Journey in the World*, (The Narrative Press: 2000), 255, ProQuest Ebook.

[16] Cook claimed to have been the first man to reach the North Pole in 1908, a claim that's now widely called into question and was initially attacked in 1909. Having been a famed explorer, Cook was widely seen as a huckster by the end of the 1910s, a characterization amplified then by a fraud conviction in 1923, for which he was imprisoned until 1930. At the time of his death, Cook's reputation as a conman far outweighed his reputation as an explorer.

[17] Wilson was among the four crew members who died on the trek back from the South Pole along with Scott.

expedition onto the Antarctic continent. In that sense, for those like Cherry-Garrard on the *Terra Nova*, malaise, depression, and disturbances of sleep patterns, would have been familiar things to watch out for.

Cook, in his writings, elaborates further on the more extreme character of the psychological response to a first, and for some, unexpected overwintering in the Antarctic ice pack. The *Belgica* expedition was plagued early on by mismanagement, poor food, both nutritionally and aesthetically, a series of sudden deaths, and ongoing labor disputes, that saw several crew members walk off the job during stopovers in South America. That the ship was overwintering in the middle of the Antarctic ice pack was the product of a unilateral decision consciously made by Adrien de Gerlache, the ship's aristocratic, adventurist official leader, without consultation with the larger crew, and even at the behest of others in the crew's higher management structure.[18] Stuck in the ice pack, those aboard ship ceded control of their lives to the pressing forces of ice that threatened constantly to sink the ship, forces that could be heard as resounding grinding and cracks throughout the duration of their stay. A haunting history of ships sunk or frozen-in throughout 19th century expeditions into the Arctic ice was widely available to the crew's imaginations.[19] These conditions were further exacerbated by widespread scurvy that had taken hold early on in the Antarctic winter, for which regular consumption of raw or near-raw seal meat was the primary available treatment. Even the crew's beloved cat, Nansen, became a sign of what was to come, undergoing substantial behavioral shifts, isolating itself from the human crew and eventually leading to its death.[20]

The effects of these conditions included the standard-fare symptoms noted above but also deeper forms of psychological collapse. Cook writes, "Storms, tempests, and steady howling winds with snow are our constant lot….The sky is always cloudy and dirty; the air is always wet, cold, and agitated; under such circumstances the human mind assumes a like attitude."[21] The mind seemed to become pliable set against external forces. Though at best only modestly relieved upon the sun's eventual return, winter's sustained darkness pushed things to a breaking point, as if the sun's dipping below the horizon were reflected in what Cook characterized as a ceding of psychological control below the horizon of external forces.[22] During this period, Jan Van Mirlo, a Belgian seaman aboard, suddenly lost his ability to hear and speak, a condition lasting for roughly a week before giving way to a perceived madness.[23] Amidst acute cases like this and efforts to counteract the more general lethargy of everyone aboard, Cook used the term "madhouse" on multiple occasions to describe the scene.[24] The end of the polar night brought about an initial burst of cheer, but the more generalized and in certain cases, the more acute effects of the polar night lasted beyond the winter. It was in this period of spring when Tollefsen, noted above, began "display[ing] some very strange symptoms today which are indicative of insanity," per Cook. Per Lecointe, another office aboard, Tollefsen appeared to suffer "delusions of grandeur and mad terrors… Odd mystery: the word 'chose' [French for 'thing'] infuriates him. Since he doesn't speak French, he imagines that 'chose' means kill and that his companions have given each other the signal to execute him."[25] While Van Mirlo largely recovered, Tollefsen's extreme paranoia lasted for the remaining decades of his life. Mind, for better or worse, followed environment to a point but the scars of extreme environmental strain were retained.

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[18] Sancton, *Madhouse*, 125-127, 132.
[19] Sancton, *Madhouse*, 124.
[20] Sancton, *Madhouse*, 167, 171, 181-182.
[21] Sancton, *Madhouse*, 229.
[22] Sancton, *Madhouse*, 219.
[23] Sancton, *Madhouse*, 215.
[24] Sancton, *Madhouse*, 186.
[25] Sancton, *Madhouse*, 255.

By the time of the *Terra Nova* expedition, outstanding factors that exacerbated the effects of the Antarctic's extreme conditions were then, to a significant degree, known and addressed. Though the *Terra Nova* expedition employed multiple Russian seamen and animal handlers, English was a shared language across the crew (on the *Belgica*, a mix of English, French, and Norwegian, among other languages were spoken, with no obvious lingua franca between all crew members). The crew was conscious of a continental land mass in the polar south and prepared for periods of overwintering within a set of stably located terrestrial huts, rather than aboard a ship sandwiched in between shifting sheets of pack ice. Crew selection itself was a more consciously taken-on affair, Scott angling for experienced polar explorers and seamen, including trusted friends, and likely, as has routinely been the case since, selecting against those perceived as potentially disruptive. Though there's reason to doubt these claims, as I'll note further below, Cherry-Garrard repeatedly insists in *Worst Journey* that little interpersonal (yet alone class-based) conflict was to be found throughout the expedition.[26] At the very least, it's likely that the level of distrust on the *Belgica* between crew and captain, and between captain and surrounding officers, measures of classed conflict emanating from the excesses of a boss fixated on his own reputation, was not substantially repeated throughout the *Terra Nova* expedition.

With all this in mind, what Cherry-Garrard's narrative evinces is a shifted terrain of psychological concerns, one less sheerly indexed to the horrors of a new and punishing environment and more integrated into the specificities of contingent moments of potential catastrophe. What shape does one's thoughts take when laboring through the brute pain of Antarctic winter temperatures to maintain survival? What conversations and behavioral patterns emerge as groups reckon with a growing improbability of pulling through and how does this shape mind and behavior going forward? And, for Cherry-Garrard, reading back through the diaries of his companions (but also for the reader going back through Cherry-Garrard's narrative), what in writing evinces psychological and behavioral shifts that can begin to translate what's on the page into a composite picture of the psychic conditions of Antarctic life (and death)?

Two extended pieces, in particular, of the larger narrative that Cherry-Garrard offers focalize the psychic conditions of extreme duress and bitter cold. The first is the narrative of the ill-advised journey undergone by Cherry-Garrard, along with Edward Wilson, the chief scientist on the expedition, and Henry Bowers, a lieutenant and one of the expedition's primary officers, to trek 60 miles to the nearest known emperor penguin breeding grounds and there attain an embryo to bring back for scientific study.[27] In the dead of winter, the journey, lasting 6 weeks in total was carried out fully in darkness in temperatures ranging from the -40s to the -70s degrees Fahrenheit. The chances of survival in the course of this journey looked especially grim upon the return journey, as a winter storm carried away the tent that the three men shared – it was a matter of extraordinary chance that the tent, without which survival would have been impossible, was found at all, yet alone still-usable after the storm subsided.[28] In this context, Cherry-Garrard's writing stays by and large matter-of-fact, often even quite tedious, made up of rote descriptions of who did what when, the length of time it took to get in and out of frozen sleeping bags and trekking boots each night and morning, the minute actions involved in cooking daily meals, etc. [bring in Sharon Marcus article here] This bare tedium echoes a sentiment Cherry-Garrard shares on multiple occasions within the narrative: "Our conditions forced themselves upon us without pause: it was not possible to think of anything

[26] Cherry-Garrard, *Worst Journey*, 236-237.

[27] They did capture multiple emperor penguin embryos that were eventually brought to the UK for study. Of the three members of the journey, Cherry-Garrard was the only one not to die with the doomed polar party the following summer.

[28] Cherry-Garrard, *Worst Journey*, 331-340.

else. We got no respite. I found it best to refuse to let myself think of the past or the future—to live only for the job of the moment, and to compel myself to think only how to do it most efficiently. Once you let yourself imagine....”[29] The paragraph ends there, as if cutting itself off before it can start to imagine. At a phenomenological level, Cherry-Garrard suggests, the world became claustrophobically small for the winter party. Their field of vision was never afforded more than moonlight and often was drenched in blizzard conditions, the soundscape they faced was dominated by whipping blizzard winds, and their tactile encounters with surroundings was overdetermined by bitter, painful, flesh-scarring cold. In that context, there came to be no further field of projection, just the rote following through of one slow step or action followed by the next.

At various times in this sensually closed world, the three members of the winter party assume themselves, in all likelihood, dead. Reduced to bare punishing sensual encounter with no further scope of imaginary projection, Cherry-Garrard’s evocations of likely death reflect what initially appears like a kind of psychic resignation. In one moment, perhaps drawing on discourses surrounding the intervening world war, he notes: “for one had come to that point of suffering at which I did not really care if only I could die without much pain. They talk of the heroism of the dying—they little know—it would be so easy to die, a dose of morphia, a friendly crevasse, and blissful sleep. The trouble is to go on…”[30] Later, as the narrative of the return journey becomes especially dire amidst an oncoming hurricane, he expresses a similar sentiment: “Such extremity of suffering cannot be measured: madness or death may give relief. But this I know: we on this journey were already beginning to think of death as a friend. As we groped our way back that night, sleepless, icy, and dog-tired in the dark and the wind and the drift, a crevasse seemed almost a friendly gift.”[31] In either moment, the crevasse in particular, that fixture of the local environment that physically evokes death as a simple void that from time to time, free of anticipation, comes to swallow polar explorers whole,[32] emerges as a “friendly” possibility. Less a figure of resignation perse then, the crevasse would preserve that at times tedious continuity of physical action into the relief of an ending. A step into the crevasse would simply be another step in the closed world of a journey through the polar, winter night.

Treating death in this way becomes a narrative strategy in reflecting back on this moment. In terms of preserving the lives of the three men involved, the winter journey was ultimately not a failure and so retrospectively demands little from Cherry-Garrard the narrator as far as further extrapolation goes. The tedium of the narrative, ostensibly fit to match the tedium of the closed phenomenological world the three men found themselves in, stabilizes the most extreme moments of the Antarctic experience against the depths of horror that projection might call forth. It’s interesting then to shift to the analogous moments in Cherry-Garrard’s narration, drawing on interpretative readings of the diaries left behind, of the doomed polar journey. Cherry-Garrard reads the day-by-day recounting of the polar journey, details of the party’s growing ailments, their difficulties crossing particular terrain, the unusually extreme cold they faced in the polar summer, and the disappointment with which the party met the realization that they had been beat to the spot of the South Pole. But he also reads *into* this material and more so as the narration advances forward towards the party’s eventual death, trapped in a weeks-long blizzard only 11 miles short of their next and potentially life-saving depot (though by this time, the two most ailing party members had already died).

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[29] Cherry-Garrard, *Worst Journey*, 299.
[30] Cherry-Garrard, *Worst Journey*, 293-294.
[31] Cherry-Garrard, *Worst Journey*, 328.
[32] Throughout the history of Antarctic inhabitance, crevasses, cracks in the ground frequently hidden below the snow, have been among the foremost dangers.

In a telling moment, Cherry-Garrard returns to the question of facing death head-on, this time openly speaking about the potential necessity of suicide. Editorializing away from the narrative at hand of the polar party, he writes, "Practically any man who undertakes big polar journeys must face the possibility of having to commit suicide to save his companions… I remember discussing this question with Bowers, who had a scheme of doing himself in with a pick-axe if necessity arose, though how he could have accomplished it I don't know: or, as he said, there might be a crevasse… I was horrified at the time: I had never faced the thing out with myself like that."[33] If a stark account of the psychic burdens one runs into in situations of this kind, what's especially curious about this particular note is that it doesn't obviously follow any particular comment in Scott's diaries. It's obvious for readers of Cherry-Garrard's narration who he has in mind when he makes this comment: by this point in the polar party's return journey from the South Pole, Evans, the eventual first member of the party to die, appears uniquely ill.[34] The last bit of Scott's diary that Cherry-Gerrard quotes notes as much, stating, "but I think
another week might have had a very bad effect on P.O. Evans, who is going steadily downhill… but we must march to keep on the full ration, and we want rest, yet we shall pull through all right, D.V. We are by no means worn out."[35] Cherry-Garrard reads this statement saying more than it explicitly is, pointing to a set of considerations that he understands must necessarily underlie the connection of Evans's condition with ongoing rationing. But Cherry-Garrard doesn't explicitly draw out this link, his editorialization above coming off more like a winking aside than an explicit effort to reconstruct the likely conversations of the polar party at the time. There's the sense then that he's wondering at this moment, before reaching the haunting scene of Evans's actual death,[36] without saying it, whether suicide might have been the better option for Evans. Antarctic historiography, in fact, largely drawing on Cherry-Garrard's work and Scott's diarization came to lionize Oates's death by suicide in the final weeks before the remaining polar party died.[37]

Cherry-Garrard's comments here moreover betray a certain contradiction to earlier ones – by projecting conversations had during the brutal winter journey onto the final months of the doomed polar party's travails, he suggests a psychic terrain, one teeming with horror, that he had previously in his narration repressed – the crevasse here is no longer his own "friendly" gift or possibility but the matter-of-fact imagined solution of a separate companion on the winter journey, more capable than Cherry-Garrard of facing death if needed. It becomes in a way easier for Cherry-Garrard to read the depths of his own experiences of horror refracted through their projection onto the horrors faced by the polar party. The winter journey remains tediously reduced to the closed world of bare movement and activity but the polar journey, constructed out of found texts, comes to be rife terrain for various forms of psychic elaboration.

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[33] Cherry-Garrard, *Worst Journey*, 601.

[34] Commentators suspect Evans sustained a series of injuries in the lead-up to and midst of his rapid cognitive and physical decline, first a hand injury prior to the selection of the final members of the crew to go onto the polar party that left him uniquely prone to infection, and then a head injury during a documented fall on February 4th (13 days before his death). See Roland Huntford, *The Last Place on Earth: Scott and Amundsen's Race to the South Pole* (New York: Modern Library, 1999), 572-573; Isobel Williams, *Captain Scott's Invaluable Assistant: Edgar Evans*, (The History Press, 2012), 180-182, Ebook.

[35] Cherry-Garrard, *Worst Journey*, 600-601.

[36] Evans lagged behind the sledging team on the day of his death and was found collapsed on the ice, having sustained substantial injuries and losing consciousness as he was carried to the party's tent. See Cherry-Garrard, *Worst Journey*, 606-607.

[37] As famously recorded in Scott's diary, Oates, weakened, ailing, and likely unable to carry on without substantially holding back the rest of the party members, walked out of the party's tent one morning, saying before he left, "Well, I am just going outside, and I may be some time." For recording of this statement in Cherry-Garrard's text, see *Worst Journey*, 560.

This reading into the text continues further on. In one moment, Cherry-Garrard suggests "There was something wrong with this party," an "unknown factor" in excess of the bleak weather conditions and general exhaustion of sustained trekking.[38] It's unclear exactly what he has in mind, whether a kind of unknowable physiological or nutritional factor, an embedded conflict within the team written out of the various diaries, or a turning of mental gears in uniquely dark directions after the letdown of the arrival at the South Pole. But that sense of something, some particular dread, hangs over his narration. Some pages later, he identifies a specific moment when he interprets Scott's diaries as marking an understanding that the party was doomed. As to the diary entries on the tail end of February and the beginning of March, following Evans's death and about a month out from the death of the final party members, he notes, "But I think it was about now that they suspected, and then were sure, that they could not pull through." As with the invocation of suicide, this marks an interpretative move for Cherry-Garrard – Scott's diary entries note the bleak trekking conditions and go so far as to say, "what each man feels in his heart I can only guess,"[39] but don't themselves point to obvious resignation. Through ongoing discussions of conversations around what they'll do upon their return and frequent invocations of enduring cheer, Cherry-Garrard reads out a subterranean shift in tone towards despair at the coming end. [this might be another spot to quickly draw in the Marcus essay]

In the final sections of the chapter that narrates the death of the final four in the polar journey, Cherry-Garrard cuts out his own narrative voice, instead including only Scott's March diary entries and the letters he wrote out to the world and to the family members of those dying alongside him, all seemingly written in the last week before they died, all trapped in their tents, being pounded from the outside by a blizzard. As noted before, Cherry-Garrard effects a kind of narrative stabilization in his account of the winter journey, evoking the tedium of daily and hourly actions against the commanding pressures of Antarctica's winter environment. A different set of moves are noticeable in the narration of the polar journey, projective psychic elaborations and speculations about the possible psychic state of things become available, even necessary, in making sense of what's perceived elsewhere as an inexplicable loss. Until the narrative reaches too dire a point at which time such projections become too much and only the work of faithful reproduction of the words of those now dead serves. The reader sees Cherry-Garrard then working through the problem of narrating the extreme. What can be captured of and communicated from such experiences in text? What does the writer owe to those undergoing the experiences in question? What is open to be nakedly laid out or speculatively elaborated upon and what is too much to handle? He adopts certain mechanisms – adherence to rote activity in certain places; editorializing in others; tangible repression – to variably evoke, represent, contact, understand, analyze, or pull away from the Antarctic mind as it presents itself in the form of retrospective memories and real-time diaries.

And in fact, he's had practice stabilizing the Antarctic mind amidst extreme conditions, an effort that in situ he marks as something consciously taken on by himself and others throughout their Antarctic travels. The mechanisms for doing so aren't fixed or singular. Rather, an array of strategies, what add up to a kind of integrated mélange of labor, joy, camaraderie, physical fitness, and collective cultural production, serve for this purpose. Throughout the full Antarctic expedition, the time of the crew members was occupied again and again, with prolonged periods of near day-to-night labor constructing depots, campsites, and huts, carrying out scientific observations, collecting, sorting, organizing, and moving supplies, sledging, lectures on an array of topics, and the like. The expedition likewise included periods of sustained rest, rhythms of labor and inactivity frequently following something more like the motion of weeks and months than the patterns of work-a-day

[38] Cherry-Garrard, *Worst Journey*, 605.
[39] Cherry-Garrard, *Worst Journey*, 613.

life.[40] Linkages between working life and efforts to stave off malaise or worse psychic depths are at times made explicit. Of the winter journey, in a moment in the narrative where the effort to attain the desired penguin embryos that justified the journey in the first place seemed foolhardy, the thoughts of the small party leaning into the meaninglessness of their suffering, Cherry-Garrard notes, "It is desirable that the body should work, feed and sleep at regular hours, and this is too often forgotten when sledging. But just now we found we were unable to fit 8 hours marching and 7 hours in our sleeping-bags into a 24-hour day: the routine camp work took more than 9 hours, such were the conditions."[41] A routine, one with substantial hard work, this suggests, keeps things at bay and the environmental disruption of the capacity to produce such a routine becomes itself a potential source of trouble.[42]

The necessity to go on working comes to the fore in particular during the winter season following the non-return (and thus certain death) of the polar party. One especially pointed passage lays out the stake of that season's working routines:

> The first thing which we settled about the winter which lay ahead of us was that, so far as possible, everything should go on as usual. The scientific work must of course be continued, and there were the dogs and mules to be looked after: a night-watch to be kept and the meteorological observations and auroral notes to be taken…We were also to bring out another volume of the South Polar Times on Mid-winter Day. The importance of not allowing any sense of depression to become a part of the atmosphere of our life was clear to all. This was all the more necessary when, as we shall see, the constant blizzards confined us week after week to our hut.[43]

Like the winter journey before, but this time under conditions of indoor hut life grieving the loss of friends and crewmates, the world is, ideally at least, confined to the task at hand, reduced by the hectic blizzard conditions but this time aspirationally cordoned off from an "atmosphere" imbued with the effects of the wider set of happenings on the expedition. Among the tasks at hand are not just the labors of ensuring bare life on the ice, nor the scientific labors expected of the expedition, but the task of producing the South Polar Times, a newspaper of sorts for and by expedition participants, intended as a vehicle for humor, collective self-reflection, and informal analysis of the social setting.[44] What's interesting here is that this paper is a hobbyist affair, produced for the sake of festivity marking Mid-Winter Day, to this day a traditional day of leisure and celebration in British Antarctic research communities, and not intended for any kind of formal reporting back to sponsoring institutions nor as a means of decision making or sustaining social commitments amidst hut life.

In fact, collective cultural production and consumption is folded throughout Cherry-Garrard's narrative into the understanding produced of an integrated life that maintains psychic

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[40] In the first year of the journey, Cherry-Garrard notes for instance a period of 12-hour sleep days following the first six labor-intensive weeks after reaching and settling upon an on-land spot on the Antarctic continent (*Worst Journey*, 217).
[41] Cherry-Garrard, *Worst Journey*, 305-306.
[42] It's interesting to note here that "work" and what could be thought of as campsite social reproductive activity are separated out from one another, as if going through the grueling labors of dressing and undressing, preparing food, etc. in -70 degrees Fahrenheit weren't proper "work."
[43] Cherry-Garrard, *Worst Journey*, 510.
[44] It's this tradition of on-site literary production, according to Cherry-Garrard extending back into the 19th-century practices of the British imperial navy, that is taken up again by inhabitants of the Halley research station from the first years of its founding in the mid-1950s up into the 1990s, as will be further explored later in this chapter and in chapter three on Antarctic literary production.

health, to the extent possible, in the Antarctic environment. Through the first winter, "gramophones [and] pianolas" are noted among the core offerings that helped ensure the expeditioners "suffered very little" and even "thoroughly enjoyed" the extended polar night.[45] Their collective library was stocked with a range of literary classics and works of polar travel literature, frequently cited or drawn on for epigraphs throughout Cherry-Garrard's narrative.[46] As per his own tastes, Cherry-Garrard cites *Bleak House* as a particularly successful travel companion, but also notes "a volume of poetry was useful, because it gave one something to learn by heart and repeat during the blank hours of the daily march, when the idle mind is all too apt to think of food in times of hunger, or possibly of purely imaginary grievances, which may become distorted into real foundations of discord under the abnormal strain of living for months in the unrelieved company of three other men."[47] Poetry and music, in Cherry-Garrard's analysis are particular balms for the crew against psychic strain. And so one can understand the turn to communal singing that attends moments of exceptional hopelessness and loss of control over the surrounding conditions in the narrative. Where we see men coming together and singing are the points when an overwhelming storminess surrounds them, first a storminess at sea and then the hurricane that threatened to swallow up the lifelines of the winter journey.[48] Evoking now almost a kind of melodramatic movie trope, within the narrative these moments seem to pacify the sensual overdetermination at the heart of the storm, giving those involved a renewed control over their sensual and therefrom psychic environment as they waited out the pressures of surroundings come fully unhinged.

Cherry-Garrard's narrative at times turns horrific and suggests a punishing experience, even for the survivors. And yet, against the implications of its title, a utopic sensibility towards the Antarctic, particularly in accounting for the year preceding the doomed polar journey, emerges. To the extent the narrative's to be believed, they ultimately waded happily, for a time, through the extremity of their surrounding conditions, had all their wants satisfied and none of the "frills nor trimmings" of "civilization,"[49] and were granted among other things the "gift of sleep" visited by "soothing and wonderful dreams."[50] Certainly then, compared to the first overwintering trip down to Antarctica, Cherry-Garrard's narrative of the *Terra Nova* expedition suggests a reasonably stable, pacified, and even cherished psychic environment, one where the mind is battered, bruised, and distracted by hard ice and whipping winds, but never warped beyond recognition, and often opened to a new sensibility towards the world. Yet, pulses of something eerier, a kind of dread in excess of the available psychic balms course through the narrative and it's to these I turn in closing out this section.

Mirages abound in the Antarctica that the *Terra Nova* expedition moves through, understood as effects of the way the polar sun hits vast landscapes of ice. Tricks of the eye against the "alive" quality of shifting ice packs and a vast continental expanse rife with hidden dangers produced

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[45] Cherry-Garrard, *Worst Journey*, 527.

[46] Far and away, the most oft-referenced text in *Worst Journey* is Dante's *Inferno*, the journey ever further south analogized throughout to the *Inferno*'s descent into hell. This linkage of imaginaries of Hell and Antarctica is made again especially poignantly in a further reference to Milton's *Paradise Lost*, Milton's text providing a geography of hell that includes "a frozen Continent / Lies dark and wilde, beat with perpetual storms / Of Whirlwind and dire Hail, which on firm land /Thaws not, but gathers heap, and ruin seems / Of ancient pile; all else deep snow and ice." Of the on-site literature they had access to, Cherry-Garrard notes "Thackeray, Charlotte Brontë, Bulwer-Lytton and Dickens," a particular penchant for "the more recent novels, such as Barrie, Kipling, Merriman and Maurice Hewlett," and the sense that they were lacking by failing to bring along more philosophically-inflected works by "Shaw, Barker, Ibsen and Wells" (*Worst* Journey, 255).

[47] Cherry-Garrard, *Worst Journey*, 256.

[48] Cherry-Garrard, *Worst Journey*, 102 and 335.

[49] Cherry-Garrard, *Worst Journey*, 234.

[50] Cherry-Garrard, *Worst Journey*, 244.

moments of undue joy followed by stark frustration, cultivated terror, especially at the "black as hell" crevasses that seemed to lurk in all directions, and gave an "evil" quality to the ice itself.[51] For all he says otherwise, Cherry-Garrard repeatedly speaks in terms of "horror" and of the "haunted" qualities of their environment. The most horrific and ghostly mirages were those reported among the crew awaiting the hoped-for return of the polar party. Mirages in these moments promised the return of a party that with each passing day seemed more certainly lost. One diary entry of Cherry-Garrard's during this period, from just days before the polar party died, proves especially haunting, multiple crew members excitedly seeing the polar party advance towards the return hut through the hut's window, only to step outside and find nothing: "It was the nearest approach to ghost work that I have ever heard."[52]

As noted before, the diaries of the polar crew are tinged for Cherry-Garrard with a sense of something awry beyond what's noted, experiences lost to Cherry-Garrard and to ourselves as readers behind the diaristic text's oft-mundane description of daily activities and relative niceties. If the mysterious "something" reflects Cherry-Garrard's own intuition into all that's not said in these diaries, a reader of Cherry-Garrard's curated narrative of the polar journey might hit upon further gaps. Scott's diary stops on March 23rd before picking back up for one final entry on the 29th, the presumed day of his death alongside his two remaining crewmates. Writings appear to have been produced in the intervening time, but almost exclusively addressed outwards, to a presumed public and family members receiving news of their deaths.[53] What was said and done on those last days, how the dying men occupied their time, dying thoughts and concerns, are all absent. The sparseness of these final days in text, against the however-rote regularity of the narrative up to this, is striking, even if all it suggests is the fading stock of energy for the men involved, exhausted and with no further reserves of food.

Contradictions that bubble to the surface of Cherry-Garrard's narrative as well suggest an unobserved space behind the text. The aforementioned deep sleep in the worst conditions that he cites as among the continent's great "gifts" clashes with moments in his own diaries and those of others of near sleepless conditions in iced through sleeping bags.[54] To claims that without "idle hours" over three years, no serious conflicts or quarrels emerged even after the horrors of finding their crew mates dead and themselves weathering multiple polar winters[55] seem at times at odds with the "heated" arguments stitched into his discussions of daily routine,[56] or at least to sit uncomfortably with days of little to no conversation at all in the course of extended trekking.[57] Scott, by the end of the book a lost, noble martyr for science, blessed with nerves of steel and ambition to boot, appears earlier in the text at times wracked with especial fears and anxieties,[58] dominating but also temperamental and excessively sensitive, given to fits of depression.[59] One starts to see the fine line here between strong-willed leader and aristocratic boss putting the lives of others at stake for his own potential notoriety, though the "weak" aspects of his personality come to be understood by Cherry-Garrard as further elements of what he overcame to accomplish what he did.[60]

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[51] Cherry-Garrard, *Worst Journey*, 110, 164-165, 472-473.
[52] Cherry-Garrard, *Worst Journey*, 497.
[53] Cherry-Garrard, *Worst Journey*, 622-627.
[54] Cherry-Garrard, *Worst Journey*, 451.
[55] Cherry-Garrard, *Worst Journey*, 282.
[56] Cherry-Garrard, *Worst Journey*, 246.
[57] Cherry-Garrard, *Worst Journey*, 394.
[58] Cherry-Garrard, *Worst Journey*, 215.
[59] Cherry-Garrard, *Worst Journey*, 257-258.
[60] Cherry-Garrard, *Worst Journey*, 259.

Duress, conflict, and depths of fear and dread emerge moreover in moments of projection more than in their direct encounter. Projection onto the experiences of others but not oneself as noted earlier. Projection onto the environment itself, evil found lurking in the ice, the crevasse coming to embody one's darkest hopes for a release, a hurricane-riddled world experiencing "a fit of hysterics."[61] And amidst the image of utopian integration through which the social relations of the *Terra Nova* crew are couched, notions of class, social strife, and power relations aren't wholly absent but nearly always projected onto other beings. The crew's dogs are divided into "aristocrats like Osman, and Bolsheviks like Krisravitza."[62] Of Adelie penguins, we find, "If socialism be the nationalization of the means of production and distribution, then they are socialists."[63] What exactly the anthropomorphic projections on animal communities ultimately expresses here, they suggest some consciousness around the existence and effects of class relations that certainly inhered among the *Terra Nova* crew, separated as it was into an aristocratic leader, managerial staff, a layer of scientific laborers, and sailors and manual labors thrown into the expedition's grueling work. These moments of humorous projection appear continuous moreover with a trope of making the environmental surroundings the terrain of psychic and social conflict, as if in a sense re-casting moments of human toil, tragedy, and despair onto an exterior realm.

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Alongside Cherry-Garrard's *Worst Journey*, Ernest Shackleton's *South* was one of the most widely read Antarctic travel narratives of its time, presenting a narrative of at times extreme duress, tragedy, loss, and failure. And like *Worst Journey*, the thoughts that compose *South* travelled through the years of World War I before landing on the page. Shackleton, whose own expedition mapped onto the early years of World War I draws out the stakes of the war for his reflections explicitly and immediately, dedicating *South* to "My comrades who fell in the white warfare of the south and on the red fields of France and Flanders,"[64] invoking then again this phrase, "the white warfare of the south," in the first paragraphs of the book's preface. For Shackleton, this phrase suggests, Antarctica was a battlefield and one hostile and unforgiving to a degree comparable with the battlefields of the Great War. The effects of industrial weaponry ripping through bodies and medical practitioners dealing with "wound shock" and the holistic collapse of maimed individuals through the years of World War I produced a new set of physiological sensibilities characterized by efforts to treat the human body as an ever-threatened integrated system, susceptible to systemic collapse.[65] By the time of Cherry-Garrard's and Shackleton's expeditions, the "battlefields" of the Antarctic didn't so much rip through as press in on the being of the continent's early inhabitants. Tragedies, including deaths, non-returns, and the sudden sinking of an expedition's ship as happened in Shackleton's case, pierced what was consciously narrated as an integrated social milieu, demanding express efforts at staving off social disintegration, but for Cherry-Garrard, the predominant experience of people imperiled and at the limits of livability was not so much collapse then as rote reduction to bare activity and closed sensual horizons.

From that position, narrative, shot through by grief and second-guessing, comes to serve imperfectly as the place for psychic projection, opening a closed phenomenological world back onto the possibility of lending sense, cause, and psychic fullness to the horrors of the Antarctic

[61] Cherry-Garrard, *Worst Journey*, 331.
[62] Cherry-Garrard, *Worst Journey*, 542.
[63] Cherry-Garrard, *Worst Journey*, 648.
[64] Ernest Henry Shackleton, *South: The Story of Shackleton's Last Expedition, 1914-1917* (Durham, NC: Duke Classics, 2012), Dedication.
[65] Geroulanos and Myers, *The Human Body*, 28.

"battlefield." The Antarctic environment at moments itself adopts the place of this field of projection. Even as it presses in on the Antarctic psyche that Cherry-Garrard manifests, Antarctica's hostile landscape comes to absorb, through the text's bubbling projections, the social and psychic terrain of horror and conflict attending the text's descriptions of loss, near-death experience, and the particular difficulties of extreme life. Within decades though, this continuity of inner and outer environment that characterizes the *situation* of the "Heroic Age" Antarctic psyche would give way to other configurations, ones at times more expressly socialized, abstracted and scientized, or embodied.

Self-Conscious Reflection in Early Institutional Scientific Expeditions to the Southern Continent

"In the decades following World War II, some field scientists learned to laugh at what was by then the well-established tradition of fieldwork, with its stock props—the anthropologist's notebook, the geologist's dusty pick—and its oft-told tales of adversity overcome. They saw themselves as inheritors of a legacy that had proven its value but had also grown musty, like a treasured heirloom kept in storage too long. And so, even as they followed in the footsteps of their famous predecessors, they could be self-conscious and even self-mocking in a way that reflected the passing of the heroic age of fieldwork and the emergence of a new set of relations between lab, field, and office."

- Etienne Benson, "The Post-Heroic Field"[66]

Following the effects of global wars, polar research endeavors and the public interest surrounding them continued in stops and starts after the Shackleton Imperial Trans-Antarctic Expedition begun just before the onset of World War I. The extension of trans-continental means of communication into the deep polar south in the 1920s meant such research programs were no longer cut off for months or years at a time from "civilization" while new capacities to shoot and distribute film gave a kind of eye-witness access to the polar south previously only possible in smatterings of photographs.[67] In the decade or so following World War II, national Antarctic programs among major global powers developed in earnest as competing post-war nations sought to stake claims on the southern continent, before the International Geophysical Year (1958-1959) and the subsequent Antarctic Treaties came to act as the primary mediators of Antarctic geopolitics. It's in roughly these years between the mid-1950s and the mid-1960s that sustained Antarctic bases and programs came to be increasingly institutionalized, no longer the province of intrepid, if well-financed expeditionary parties acting mostly autonomously, but of administered research programs and in certain cases extensions of military institutions. At the same time, this era largely precedes the emergence of polar psychology as a recognizable, if still hyper-niche, sub-field of institutional research. Where formal psychological studies were carried out, they were largely isolated and based on extremely limited observation.

It's in this context that I turn now to a set of informal literatures for constituting an ongoing, self-conscious study of the Antarctic mind. The imperial travel literature of Cherry-Garrard, Shackleton, Cook, and the like no longer held the same kind of public interest as in and immediately following Antarctic exploration's "Heroic Age," the novelty of an Antarctic winter's extreme duress

[66] Etienne Benson, "The Post-Heroic Field," *Isis* 113, is. 1 (March 2022): 114.
[67] Alexandra H. Bush, "Cold Storage: A Media History of the Glacier" (PhD diss., University of California, Berkeley, 2019), 33-52.

or the mystery of a national hero's death amidst an epic quest to the South Pole having worn off, and with it the particular construction of the Antarctic mind as a retrospective act of narrating the sublime horrors and joys of Antarctic travel. Institutions were now constituting durable human communities in Antarctic research stations, with certain inhabitants returning over multiple years, and enjoying the relative comforts of an infrastructurally robust residence on the ice and communication back home. To the extent institutional psychology interacted with this project in Antarctic social construction, it was in the context of medical screening.[68]

But with people now inhabiting the Antarctic continuously, a body of lay, self-psychologizing thought emerged in everyday conversation, observations of the unique social setting inhabitants found themselves in, and persistent reckoning with the toll of Antarctic life. I aim in this section to reconstruct this body of thought as a particular moment in the development of a relatively continuous tradition of thinking around the Antarctic mind and behavior, one that helps stitch together the institutional psychology that would emerge in the last decades of the 20th century with the reflections of Cook, Cherry-Garrard, Shackleton, and a public intrigued by the travails of imperial explorers decades prior. I look most specifically at British materials from the mid-1950s through the 1960s, reading the lay theorizing to be found in base journals and station magazines, also drawing on oral histories in certain places to provide a grounding context.[69] The British naval tradition of in-situ newspapers produced in the midst of expeditionary parties that was continued by the *Terra Nova* expedition through the yearly production of the *South Polar Times* was further preserved in the ongoing production of *The Halley Comet* over much of the British Halley research station's history.[70] This represents a unique capturing of lay theorizing in the archives that document the history of polar life. Likewise, through the first decades of what was initially called the Falkland Islands Dependency Survey before being named the British Antarctic Survey, a segment of the archived on-base journals is notable for its relative looseness, capturing not just rote day-to-day happenings but a frequent mix of humor and editorializing on the conditions of Antarctic life.[71] This may well have been a kind of conscious continuation of the traditions of at times wryly humorous and highly opinionated diary keeping that *Worst Journey* and other popular works of British Antarctic travel literature evince.

What these materials offer then is a setting down in text, relatively unique within the archival records of Antarctic life, of informal conversations had around what kinds of psychological and behavioral adaptations subtended the construction of a durable Antarctic community and research program. Of course, as with *Worst Journey*, the commentary to be found here largely hovers around

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[68] Psychiatric screening was a practice common across a number of national research programs, though materials frequently note that uniquely among the British Antarctic research program, psychological evaluation was explicitly not incorporated into the selective measures for putting together communities of early Antarctic inhabitants.

[69] The information going forward is drawn specifically from the British Antarctic Survey Archives. Where specific passages from archival records are quoted or paraphrased, I will cite as 'BAS archives,' noting the specific record. For Halley Comet entries, I will further cite the page number, where for base journals, I will cite the record date.

[70] It's worth noting that the *South Polar Times* itself included what might be interpreted as lay psychologizing as well. I highlight the *Halley Comet* in particular because it indexes a moment of institutionalization and habituation in the construction of Antarctic life, sociality, and discourse, that marks the historical era of the 1950s and 1960s off from pre-World War I expeditions. In that context, the *Halley Comet* itself, relative to the more ad hoc expeditionary reporting of the *South Polar Times*, became a regular, habituated production, carrying into print running jokes, recurring patterns of life and behavior, repeated genres of writing and cultural tropes, serving in that way then as something of a stabilizing mediation of lay discourse.

[71] Archival records of, for instance, the West and East German Antarctic research programs, where they do present documentation of day-to-day happenings or on-base writings, hew exclusively to a fairly rote description of necessary base activities, with infrequent and staid accounts of meals and leisure activity. In an American context, likewise, the military administration of Antarctic research bases hovers over available materials.

British men,[72] the wry humor and off-the-cuff conjectural theorizing tinged with charged masculinism and imperial arrogance. Recognizing this then, one can see in this body of on-base writing a particular effort to fix upon that Antarctic mind that's apt for the environment, while finding the particular factors that explain the unsuitedness of others (and the presumed unsuitedness of those for whom Antarctic inhabitance was entirely inaccessible in the first place). But, as the Etienne Benson quote that opens this section of the chapter notes, humor, satire, and irony also served in subverting a "heroic" high-mindedness to postwar fieldwork, and in Antarctica, the laughing constitution of a psychological discourse integrated into the lay conversations of base life poked fun at self-scientization. Humor and irony served newly as a medium for the human sciences, allowing non-committal self-reflection, while also critiquing the imagined positivism of meta-scientific research on Antarctic inhabitance and slyly folding in the subjective and social-situational character of on-base behavioral oddity.

Base journals between the 1950s and 1960s sketch a picture of a loose, boisterous life within the Antarctic research station, full at times of work, some scientific, some basic operational necessities to get a durable station up and running, but also of merriment, frequent lie-ins after late night drinking sessions,[73] and an attention to the production of cheer and festivity. To the extent base journals follow the reality of this latter element of Antarctic life, certain British Antarctic bases may have differed from others. Halley's base journals (even taken separately from the distinct and sustained tradition of an on-base festive magazine) appear uniquely attentive to jokes, pranks, stage plays, and the other things people did for fun. They also contain the highest percentage of writing from the journals of this era that was clearly produced while drunk (e.g. "Tony H. and Dick Straff bith (sic) say they deserve mention for excellent work this week. At least 15 points each towards their Polar Medals. So they say. She's mine Itell (sic) you. This is a longinterval (sic). Midnight GMT ob., that's what it is. Tony B., projector, sorry projectionist, for the night has got a tape of two year old pops. Great stuff."[74]). Across bases, popular activities included skiing and ice golf outdoors, as well as bridge, Mah Jong, movie screenings, theatrical performances, reading novels aloud, baking, beer-brewing, and by the early-to-mid 1960s, listening to the Beatles. Echoing Cherry-Garrard's literary interests, *Bleak House* seems to have been a popular part of the on-base literary imaginary of certain inhabitants,[75] along with references to Wordsworth, Milton, Wells, and many other classic British poets and novelists. At Halley in the mid-1960s, inhabitants took turns circulating quotes to think with during their evening meal.[76] They maintained communications with Argentinian, Soviet, US, and Australian Antarctic bases and regularly tuned in to the BBC's "Calling Antarctica" radio program that broadcast messages between Antarcticans and family members back home. Mid-winter's day celebrations are never missed, with other major holidays, Christmas and Easter in particular, folded in as major moments of planned festivity.

Altogether, this suggests, at a general level, an easy-going, affable, and excited psycho-social world, recreational activity a central part of the overarching construction of life on base. In simple terms, these early base inhabitants, seemed in large part to enjoy being there, to enjoy each other's

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[72] I say largely because going back to the *Terra Nova*, British Antarctic expeditions, though exclusively male, were largely though not exclusively British. The *Terra Nova* crew counted among it two Russian animal handlers, while early mid-century British Antarctic research frequently also included contingents from South Africa, Australia, and/or New Zealand.

[73] A version of the now mostly lost tradition that EP Thompson highlights in "Time, Work-Discipline, and Industrial Capitalism" of taking a Saint Monday, a tradition the author of this chapter wishes to revitalize going forward, seems to have lived on in part in these early Antarctic bases.

[74] BAS archives, ad6_2z_1965_b, May 1, 1965.

[75] BAS archives, ad6_2z_1964_b, January 8, 1964.

[76] BAS archives, ad6_2z_1965_ b, February 21, 1965.

company, and to have plenty to do and a fair amount of collective independence in how they distributed their time, their efforts, and their various pleasures. They were, it seems, self-conscious of the peculiar situation they found themselves, reflecting in writing on their experiences and the relationship of Antarctic social organization and quotidian life to that back in the UK.[77]

This self-conscious interest in taking stock of their social life, personal experiences, and behavioral patterns though was persistently refracted through layers of playfulness, as well as a kind of ironizing of the distanced, objective stance of the modern human sciences. *The Halley Comet* contains self-anthropologizing moments, ethnographies of the Antarctic human and the social setting constructed thereby. A "report" in the Easter 1958 notes the special advantages of studying human communities in Antarctica, uniquely small and isolated in their constitution. The report deals with the compensations Antarcticans make – underground dwellings, heavy clothing, etc. – for their lack of physiological adaptation to the climate; the "uneconomical" "gear and totems" they bring with them on treks; and the "esoteric appliances," combining, the report suggests, "astrology and magic," that aid the communities in navigation. The report's author, an on-base dog named Stumpy, also notes the non-edibility of human clothing and intervenes in anthropological arguments over the reasons for human shelter and clothing, dog observers in less climatically harsh parts of the world assuming such adaptations rather hold a "purely egotistical and even sexual significance."[78] Though written out of STS's history, Stumpy may indeed have been among the first conscious ethnographers of a scientific community, preceding Bruno Latour and Steve Woolgar's work on the Salk Institute by nearly two decades.[79] Stumpy returns multiple times as an observer, the material for his ethnography imagined over several years of polar magazine writing.

An anonymous writing in the 1965 issue of the *Comet* begins with the author casting themselves as a kind of social outcast, given to a socially-deemed behavioral affliction. Brought in seemingly by a kind of Dostoyevskian underground man, the reader comes to find the behavioral affliction being referred to is that of being a "working-class Tory." The writer comes to lament their never-quite acceptance, given their background, into the bourgeois society they strove for and their casting as a class traitor by those now "below them": "we live a disturbed life," as the writing says, "forever reaching for that which we desire, yet always being trodden down by the clamour of righteous voices which are Society." That this article is not a serious self-confession digging into the distinct social and psychological turmoil of the author but rather a satire of a perceived postwar type in the UK becomes increasingly obvious as the article proceeds.[80]

Amidst jokes, satires, and ironizing invocations of the human sciences, the most pointed analysis of polar psychology in early *Halley Comet* issues stands as at once continuous and exceptional. Ultimately pulling the rug out from under itself, suggesting in a closing note that the psychologizing theorizer had himself been institutionalized, a 1959 *Halley Comet* report titled "Some Notes on Antarctic Psychology" by Sir R. Beastly,[81] scans initially as a lay if at least plausibly earnest effort to make sense of recognized behavioral phenomena in Antarctica through the lens of (lay understandings of) prominent psychological frameworks available at the time. The article takes as its starting point the long-observed polar winter malaise, associated with social withdrawal, difficulty

[77] BAS archives, ad7_z_3_1958_3, 1.

[78] BAS archives, ad7_z_3_1958_3, 4.

[79] Even preceding Stumpy though is a precedent set in *The South Polar Times*, where a Midwinter 1911 article titled "The Bipes," narrates an ethnography of sorts of the humans in the Terra Nova expedition, told from the perspective of rabbits. See *The South Polar Times, Volume III* (Smith, Elder, & Co.: London, 1914), 56-73

[80] BAS archives, ad7_z_3_1965, 15.

[81] To the best of my knowledge, nearly everything in the magazine over the years in which I've looked through it is written under select on-site nicknames, making it largely not possible to determine the actual authorship for different articles.

maintaining energy, and extended periods of sleep, initially offering the "Freudian's" likely explanation of such phenomena. For the Freudian, the limited social circle produces a restricted ego, while the "super ego, on the other hand, is overworked because the confined and often incompatible society necessitates a constant guard against conditioned personality within individuals." The id, it's then suggested, is "very seldom used," presumably a function of the extreme sexual depravation faced by an all-male crew of polar inhabitants for whom social norms militate against non-heterosexual intimacy. This together "leads to an extremely introverted personality which lies in bed all day."[82]

Not satisfied with the Freudian approach, the author touches on an array of other theories before advancing his own account. For many, he suggests, light is the most significant factor affecting behavior, prolonged darkness producing uniquely claustrophobic conditions. For those in the "materialistic school," the "Antarctic psychological state is due to a deficiency in Vitamin F." Pavlov-ians place things on the lack of temporal regularity in sensual stimuli for those living in underground dwellings amidst exceptional seasonal patterns of light. The author himself holds to a theory drawing on behavioral psychology research into conflict avoidance in animals conducted by mid-century Polish-American psychologist, Jules Masserman. Masserman was known for what at the time was referred to as "biodynamic psychiatry," a field that took on the "study of the evolution of animate behavior" from the lowest to the highest levels of organismic organization, seeing then in the behavioral deviances of animals analogies for considerations into human psychological adaptation to an individual's milieu or environment.[83] Drawing on Masserman, the anonymous Antarctican psychologist suggests that taking to sleep has been observed in cats as a kind of reflection of neurosis brought on by indecision. From this, he claims "that since the Antarctic situation may be the first in which many subjects have been required to make a decision, it is a potential cause of long sleeping hours."[84] By this point then, it seems clear that the end game of the article's musings was a joke at the expense of fellow Halley inhabitants, one calling them out for lack of decision-making capacities, perhaps with a note of especial ribbing at scientists themselves, avoidant of situations that require acting in the world.

For all the ribbing, joking, and cutting down to size of scientists (done, in all likelihood, in certain though not necessarily all cases by scientists themselves), what's striking about this report is the extent to which it appears at least somewhat earnest and intellectually engaged before coming to its closing jokes. In fact, the "Antarctic psychological state" that the report fixes as in need of explanation has since become a widely accepted phenomenon in formal studies of the psychological and physiological shifts effected by the polar winter in particular, as well as by extended isolation. And of course, these early polar researchers were likely to have at least passing, if not intimate familiarity with the stories of "Heroic Age" explorers like Cherry-Garrard, Scott, and Shackleton. By this point in the history of polar research and significantly before it reaches institutional literatures in the psychological, physiological, and behavioral sciences, a shared, generalized understanding of a distinct Antarctic state of being that coheres the various symptoms polar inhabitants face – lethargy, withdrawal, extended sleep – is posited as something not just to work through or to struggle against, but that institutional psychology might serve to explain and presumably then to offer treatment for. If more recent literatures suggest that this was perhaps the case, in however ad-hoc a manner, for Frederick Cook's early observations of psychic deterioration on the *Belgica*,[85] it's not so clearly so in

[82] BAS archives, ad7_z_3_1959_2, 5.
[83] Jules H. Masserman, "Biodynamic Psychiatry: An Academic Address," Aust. N.Z. J. Psychiatry 3 (1969): 7.
[84] BAS archives, ad7_z_3_1959_2, 5.
[85] This is, in a sense, part of the implicit argument in *Madness at the End of the World*, that in Cook's travel writings, we see an effort to codify scientific knowledge around the failure of humans to adapt to the Antarctic environment over

the writings of Shackleton, Cherry-Garrard and the like, whose focus was more on isolated symptoms, understanding the contingent thought processes of particular actors (rather than the generalized condition of an Antarctic mind), and representing the general scope of activities that seemed to enable constructing a composite life despite the toll exacted by the environment on mind and body.

This "Antarctic state" is taken for granted by the author and presumably then for the readers, fellow base inhabitants. To the extent we might see *The Halley Comet* as continuous to an extent with the informal chatter and shared discourses that circulated around a research base and a larger research program, it seems likely that these "notes on Antarctic psychology" reflect the kinds of topics and speculative ideas thrown around in meal-time conversations or other moments of idle talk. Or even more, such reflections might have drawn on or been woven into the widely documented tradition of preparing and carrying out wide-ranging lectures to fill the time and share knowledge among base inhabitants.[86] Elsewhere in *The Halley Comet* one can find a range of more serious articles that serve a function similar to that documented for the lectures, from discussions of homeland locales[87] to reviews of technical equipment including on-base vehicles[88] to a reasonably detailed history of geophysics culminating in a discussion of the International Geophysical Year and the significance of Halley Bay for geophysical research.[89] The question then emerges, to what extent is this codified understanding of a distinct "Antarctic state" that might be psychologically understood a serious concern, couched to a degree then in the playful, joking norms of a magazine meant to be read while drinking together on festive occasions and to what extent is it in fact expressly poking fun at some kind of imagined cohering of a generalized, Antarctic psychic subject?

Commentary from base inhabitants at the time suggests, to at least a certain extent, that, whatever the answer to this question may be, personal and social factors played at least as much a role among polar crew in their self-understanding of particular moods or states as environmental ones. David Limbert, a meteorologist who did two stints at Halley in the late 1950s and early 1960s, when asked about the effects of living buried under the snow on psychology, deflected the question in large part though did note an out-of-body experience he had, looking down upon himself, connecting this more than anything with the particular effect of his father's death while he was down in Antarctica.[90] Angus Murray Roberts, in the mid-1960s was hired as medical officer at Halley, a job he took in order to pursue a program in physiological and nutritional research, particularly concerning the bodily effects of a sugar-less diet. When asked whether, as a medical officer, he took note of the psychological conditions produced in the Antarctic, his answer doesn't harken back to Cook's efforts at direct psychological observation and treatment in the context of stark environmental conditions. Instead, he suggests there was far less conflict on British Antarctic bases than he had heard developed at US bases, run by a navel crew though inhabited by scientists and others flown down from the US. His quasi-joking speculation, beyond the military control held over the base, for why such a lack of conflict emerged was the standard practice of bringing FIDS/BAS personnel down by boat, giving any personality outliers a chance to expose themselves as such and be sent home at a stop along the way. Where he does note a generalized depression

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extended periods, knowledge that was then largely ignored by institutional scientific channels (if not necessarily by polar explorers themselves) over many decades because of Cook's eventual ill-repute.

[86] This goes back to the "Heroic Age" expeditions where nightly or weekly lectures are frequently mentioned. The practice is still observed in certain British Antarctic settings, noted for instance as a major part of oceanographic cruises.

[87] BAS archives, ad7_3_z_1961_2, 8-10; BAS archives, ad7_z_3_1959_2, 7-10.

[88] BAS archives, ad7_z_3_1964_1, 22-24.

[89] BAS archives, ad7_z_3_1964_1, 14-18.

[90] Interview of David William Limbert, British Antarctic Survey Oral History Project, AD6-24-1-17, interviewed by Christopher Eldon Lee, 107:00.

developed in his time at Halley, it came out of a blow to base morale caused by British Antarctic Survey officers cancelling the 1967-1968 field program.[91] For him then, it seemed self-evident that social, behavior, and psychological states among Antarctic inhabitants, like those elsewhere, were inflected by things like organizational structure and the dictates of a managerial strata over which those actually living, building, operating, and working in the base had little control.

In fact, with these comments in mind, one can recognize numerous instances in the writings of base inhabitants where what emerges is something like a conscious self-understanding of those on-base as employees that, for all their seeming autonomy still slog through their Antarctic life at the whims of far-distant organizational imperatives and decisions. At times, this comes through in the same kind of ironized, playful, projective, and never-too-serious cast as the various instances of the "human sciences" being carried out on polar subjects: a standalone poem that begins "There'll always be the workers, / There'll always be the boss" and ends "But the one who makes the money / Is the one who holds the shares";[92] a tongue-in-cheek page of advertisements that notes in its closing a return to work "pending appeal to arbitration" following a strike carried out by the base "Auroral Watcher";[93] satirical jabs at the police.[94] The last presence of Stumpy the ethnographer that I've found was in the Midwinter 1961 issue, this time part of a full team of observers brought down to Antarctica to observe human behavioral norms. Here though, he expresses frustration at being made with his "comrade brothers" to take on hard labor dictated by human overseers and suggests hopes of revolt.[95]

At other times though, the expression of this conscious self-understanding is earnest and the stakes feel serious. A record review, for instance, of a budget printing of a Chopin recital by the Polish pianist Witold Malcuzynski lauds the Transport & General Workers Union centenary that's suggested as the occasion for the recording and the overarching project of such budget recordings, "designed to furnish the minds of workers with great music at small capital outlay."[96] More notable is the editorial that opens the 1965 issue of the *Halley Comet*. From roughly a year before the morale hit noted above though echoing a mood of growing frustration with the FIDS/BAS organizational direction, the unattributed editorial serves as a collective expression of the Halley researchers' and inhabitants' frustrations. Opening with a comparison of the stagnant, dysfunctional British research program to its opposite pole, the American "machine," growing like "uncontrollable fungus," the editorial casts those at Halley as pawns of a sort, made, against their will and against the research that drives them forward, "to satisfy dubious political motives and to maintain the traditional legend of British invincibility."[97]

This isn't the first and wouldn't be the last expression of a discord in Antarctica between scientific institutions as extensions of state imperatives and scientific institutions as bodies of individual and collaborating scientists with their own concerns, motives, and interests. As scholars have shown with British Antarctic research during World War II and in the immediate postwar era, the primary state motive enabling sponsorship of the research was imperial, an effort to stake out a

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[91] Interview of Angus Murray Roberts, British Antarctic Survey Oral History Project, AD6-24-1-75, interviewed by Christopher Eldon Lee, 18:00-20:00.
[92] BAS archives, ad7_z_3_1961_1, 18.
[93] BAS archives, ad7_z_3_1958_3, 13.
[94] BAS archives, ad7_z_3_1964_1, 39.
[95] BAS archives, ad7_z_3_1961_1, 43-44. It's unclear what Stumpy's relation was to the dog "Bolsheviks" that preceded him in the Antarctic but here he appears to maintain a tradition of collective struggle projected onto the local animal companions, if also to embody stereotypes of the scientist's distaste for hard, manual labor.
[96] I doubt the full sincerity of this review for two reasons. First, Chopin is referred to as "Cousins" throughout the review and second, the Transport & General Workers Union was founded in 1922, so the timeline for a centenary would not make sense. If the review is offered in jest, it's unclear where the joke lies.
[97] BAS archives, ad7_z_3_1965, 3.

claim on portions of the southern continent, specifically in contention with South American claimants, Argentina in particular, part of an ongoing feud culminating in the Falkland Islands War under Thatcher.[98] Polar programs by various global powers, the US and the USSR in particular, in the early cold war years likewise were driven by aspirations towards territorial control and assertion of global dominance.[99] But scientists and polar inhabitants themselves throughout this era, even when they knew, as the disgruntled employees quoted above certainly did, the state interests undergirding their research endeavors, seemed little concerned over these disputes and much more interested in the continent's budding internationalism, enabling cultural and knowledge exchanges, and a kind of post-national Antarctic camaraderie. British Antarcticans routinely cavorted with Argentine and Chilean ones, US Antarctic scientists could be found at the Soviet Mirny base year after year. One stalwart of East Germany's Antarctic program fondly remembers the Westerns he and others of the first teams of East German researchers in Antarctica watched, while down with the Soviet Antarctic program.[100]

This is all to say that at times, if not frequently, the polar scientists of this era, like those quoted above experience the state imperatives interlaced with science as foisted upon them, part of the disjuncture between science's management and its labor force.[101] Such a disjuncture manifests further, the disgruntled editorial suggests, between the aims of researchers and the aims of the research institutions employing them. As it claims, "We are led to believe that [our aims] are primarily to consolidate our knowledge of the Antarctic continent – to research and discover – yet the specific aims demanded by this sentiment, to research and (presumably) to survey are clearly not reconciled with other less tangible motives – the adventurous, the economic, the political, and the strategic – which also govern our existence."[102] In this moment, it's possible for the editorial to suggest that the effort at research and discovery is not only separate from adventurist, economic, political, and strategic motives but in tension with them, either variably and thus confusedly "govern[ing] our existence." A further separation of institutional structures and the individuals upholding them is posited later on: "Ideally our bases should exist to support survey teams (amongst other things) whereas in fact, our surveyors seem to exist to support the bases. Are we merely trying to prolong this job for the duration of the Antarctic Treaty to give us a respectable reason for being here at all."?[103] Or to put it differently, the editorialists have come to recognize themselves as grist for the British Antarctic Survey's mill, brought along to justify the institution's existence in the first place, rather than the British Antarctic Survey serving as an institutional support for the scientific work that it claims to foster.

This set of qualms, calling into question the institutional imperatives of their employer, merge then into an expression of concern for basic working conditions. Obvious as it is that the first Halley station won't be durable in the long haul, the editorial asks, "Have we yet found the most satisfactory type of building construction? Can we improve our water supply and bathroom facilities? The various possible uses of electric power and the means to provide it; all deserve more careful attention than we are apt to give them."[104] The relative comfort of their working and living

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[98] Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London: I.B. Taurus, 2002).

[99] Christy Collis and Quentin Stevens, "Modern Colonialism in Antarctica: The Coldest Battlefield in the Cold War," Proceedings 7th Australasian Urban History/Planning History Conference (Deakin University, 2004).

[100] Interview of Hartwig Gernandt, Alfred Wegener-Institut Archives, Interview given and transcript provided by archivist Christian Salewski.

[101] And this in a situation that was perhaps less expressly militarized than the US Antarctic program as well as US Cold War science in particular.

[102] BAS archives, ad7_z_3_1965, 3.

[103] BAS archives, ad7_z_3_1965, 4.

[104] BAS archives, ad7_z_3_1965, 4.

quarters given the constraints of the environment; issues of sanitation; reliable availability of infrastructural necessities – none of this is especially far afield from the general terrain of workplace grievances across a vast array of spaces of labor. And the rhetorical framing of these questions performs common facets of worker grievance and appeals to management – a set of demands for improvement positioned as stemming from a "we" that implicates the collective Halley work force, both the site of authority for understanding what's really needed and constrained in their capacities to effect change by the impositions or even antagonism of a management structure.

None of this adds up to an out and out critique of the institutional imperatives guiding postwar research programs in and of themselves, so much as the effects these institutional imperatives have on the work the authors wish to carry out. That is to say, however unfortunately, the editorialists at Halley were almost certainly not radical anti-imperialists wishing to wrest control of the means of knowledge production away from management,[105] so much as disgruntled individuals wishing for better conditions to carry out their own research. The separation they effect between the state and institutional imperatives that sponsor them and the motives of pure "research and discovery" may very well have been a naïve one. And they ultimately position their underlying wishes as in conformity with their employer organization, a matter of constructing the best, most prolific Antarctic research program possible, even at the expense of the looser, goofier sensibility that had been cultivated on-base in its first decade of existence.

What I wish to point to though is that something that we might read in terms of worker's critique holds sway as part of the larger constitution of the "human sciences" as carried out in the Antarctic in this era. We find the "human sciences" in early institutionally-sponsored scientific communities, the first communities carrying out a sustained presence on the southern continent with the comforts of relatively fixed, robust abodes, networked communication amongst each other and back "home," and pre-formed knowledge of the dangers and more banal difficulties of the environment, but we find them as a lay, integrated part of how Antarctic inhabitants come to take stock of their situation. That a conscious ethnography or psychology of the Antarctic world might be cast through an ironized lens, a parody of the effected distance of the observing human scientist from their subjects of study, pokes fun at the idea that some kind of fixed and distinctly Antarctic experience or state of being could be distilled, even as these reflections do both hinge on and produce a shared sense of the unique facets of a sometimes punishing Antarctic life, one that at times would be recognizable to the institutional human scientific research to come, as well as to the adventurist studies of an earlier era. But crucially, if "human sciences" played out as a kind of lay conversation, it was in that sense necessarily continuous with a subterranean or low-key on-base politics that came to recognize the mood, feelings, working capacities, and relations of Antarctic inhabitants as embedded in social determinants as much as environmental ones. Coming to a self-understanding was the stuff of life, and of a life constructed as much and as loosely around hijinks,

[105] Though as noted elsewhere in the dissertation, individuals at Halley at this time had been involved in British postwar socialist politics, circulating among British trade unions but also among the political forces that eventually brought Allende briefly to power to in Chile. It's also worth noting that the 1930s saw a substantial alignment of the British scientific community with Marxism and Communist Party involvement in the UK, a trend most associated with figures such as JD Bernal and JBS Haldane. Though this alignment of scientific communities and the radical left substantially waned following World War II, and most of the scientists circulating through Halley in the 1950s and 1960s were young enough to have likely largely missed this period in British science and politics, Haldane and Bernal remained significant public figures in the early postwar era and it's possible their influence and that of the wider involvement of scientists in interwar communist politics might have exerted something of an enduring force at this time. Elsewhere, this tradition of radical anti-imperial and anti-capitalist critique and organizing among scientific communities was maintained and revitalized in the latter part of the 1960s with the first, primarily British, iteration of Science for the People. For more on these histories, see Helena Sheehan, Marxism and the Philosophy of Science: A Critical History (Atlantic Highlands, NJ: Humanities Press, International, 1985).

festivity, and the ongoing immanent construction of a novel social world, as around the hard labor of building and supporting underground huts or the activity of sustained scientific observation.

Institutional Psychology Makes a Study of On-Base Scientists

As the social and technical infrastructure of Antarctic research programs has expanded, a small but growing body of research has seen in Antarctica a laboratory, among others, affording the possibility of generalizing conclusions about how humans respond and adapt to environmental extremity and prolonged isolation. Such research was aware of a larger history of reflection on such concerns. Reports and literature surveys from the 1970s through the 1990s almost uniformly reference the major "Heroic Age" travel narratives, seeing in these accounts, like the mock-psychological report addressed in Section II, the central features of a recognizable and shared Antarctic state of being, with a general and reasonably consistent symptomology.[106] Antarctic or polar psychology wasn't then so much inventing a new sub-discipline as formalizing a kind of pre-paradigmatic terrain of general reflections into a sustained if diverse research program in its own right, a program of Antarctic meta-research.

In a short history of Antarctic psychology, British psychologist, Ron Roberts, suggests shifting frameworks and imperatives guiding researchers over the last roughly half-century. Entering into the institutional literature in the last couple decades of the 20th century, Antarctic psychology, he notes, was a pragmatic concern for certain research programs since the International Geophysical Year, specifically in matters of "personnel selection."[107] Though selective psychiatric screening has largely been eschewed by the British Antarctic Survey, US Antarctic programs have used the practice from early on. In the earliest efforts to consolidate a formal body of knowledge of Antarctic psychology, personnel evaluations used for psychiatric screening have been among the key source material.[108] Vanessa Heggie, in her work on extreme physiology, points to expectations in the 1960s and 1970s that physiological researchers might isolate signs of climatological adaptation in individual test subjects within extreme environments.[109] Human scientific research, combining physiological, behavioral, and psychological concerns rested on similar assumptions. An early survey of such research, the 1974 edited volume, *Human Adaptability to Antarctic Conditions*, posits itself as a "review of research on man's adaptation to the Antarctic environment," including chapters consolidating extant (though in many cases scant or spotty) research initiatives at US, British, Japanese, French, Belgian, and Swedish European research stations.[110] As Roberts notes, these studies served in evaluative processes of scientific and operational laborers that aimed to identify what kind of individual, based on personality, behavioral traits, prior experiences, etc. would be especially equipped to adapt stably and productively to the stress of the Antarctic environment.[111]

Among the articles in the collected volume on adaptability to Antarctic, a report titled "Sociopsychological Aspects of a Winter Vigil at South Pole Station" is at once exemplary of the

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[106] See, for instance, E.K. Eric Gunderson, "Psychological Studies in Antarctica," in *Human Adaptability to Antarctic Conditions*, ed. E.K. Eric Gunderson (Washington, D.C.: American Geophysical Union, 1974): 115-131; A.J.W. Taylor, *Antarctic Psychology*, Scientific Information Publishing Centre, 1987; Peter Suedfeld, "Polar Psychology: An Overview," *Environment and Behavior* 23, is. 6 (November 1991): 653-665.

[107] Ron Roberts, "Psychology at the End of the World," The British Psychology Society, September 18, 2014, https://www.bps.org.uk/psychologist/psychology-end-world.

[108] Gunderson, "Psychological Studies in Antarctica."

[109] Heggie, *Higher and Colder*, 150-151.

[110] E.K. Eric Gunderson, ed., *Human Adaptability to Antarctic Conditions* (Washington, D.C.: American Geophysical Union, 1974), vii.

[111] Roberts, "Psychology at the End of the World."

expectations in the larger literature of the time and a curious elaboration of the results onto wider concerns over social integration. An extensive look at the existing literature, with a focus primarily on studies of the small US inland station in the South Polar Plateau, the report serves in consolidating specific clinical evaluations and cross-disciplinary observations into a general socio-psychological account of an exceptionally remote and small polar station. In doing so, the report presents an exemplary picture of the general modality by which psychological researchers approached Antarctica at the time, vestiges of which carry into the present. The authors, for instance, draw out certain names and categories that serve in fixing oft-observed phenomena and consolidating a general symptomology. Though they don't explicitly cite what's now widely referred to as "wintering over syndrome," disruptions of standard patterns of sleep and daytime energy in the context of the sunless polar winter, they do focus on the "winter over" as the site of starkest psycho-physiological symptoms, referring further to the name "polar insomnia" as one invoked throughout the literature.[112] They moreover refer to the "long-eye syndrome," a behavior that will be a continuing focus of observation over the decades to follow, described in an earlier report as "a twelve-foot stare in a ten-foot room"[113] and noted here as involving "sleeplessness, hallucinations, breaking down in tears, loss of appetite, prolonged silence, suspiciousness, reduced work."[114] One finds, in discussing positive psychological phenomena of the Antarctic, discussion of the OAE, their acronym for an "old Antarctic explorer," a term they've taken from standard US Antarctican parlance to describe a relative veteran of polar research and re-framed as helping to codify an understanding of the successful adaptee to the Antarctic.[115]

Conventions of positivist social science emerge throughout the report. Among the experimental methods of field-data collection the report draws out are efforts at precisely quantifying percentages of time split between work, games, eating, reading, movie watching, and "net social talk," while graphs help to visualize the data around "adaptation scores" of observed subjects,[116] serious instances perhaps of precisely the kind of observation techniques and frameworks of social, psychological, and behavioral analysis parodied in the creative writings of early British Antarctic inhabitants.[117] As fitting with the pragmatic concerns noted by Roberts, the report ultimately aims towards a characterization of the qualities of individual subjects and social dynamics that lead most towards the relative success of Antarctic research projects and the relative cohesion of Antarctic research, as well as a consideration of future research needed to take into a wider range of subject positions as Antarctic research stations increasingly incorporated women.[118]

The report's especially interesting though for what it tells us about the standard explanatory framework that the "human sciences" at the time seemed to lean on for observed phenomena, and for elements of its own peculiar outlook. Following much of the era's extant research, the report suggests that the effects of the physical environment specifically, though harsh, might be overstated, concluding in one moment, "Still, undue emphasis should not be placed on crude facilities and harsh

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[112] Natani and Shurley, "Sociopsychological Aspects," 92.
[113] E.A. Haggard, "Isolation and Personality," in *Personality Change*, ed. P. Worschel and D. Byrne (New York: John Wiley, 1964), 457; Cited in Natani and Shurley, "Sociopsychological Aspects," 92.
[114] Natani and Shurley, "Sociopsychological Aspects," 92.
[115] Natani and Shurley, "Sociopsychological Aspects," 93.
[116] Natani and Shurley, "Sociopsychological Aspects," 104, 107.
[117] This parody occurs both in the previously discussed "psychological report" and in an array of other pieces at efforts to fix and quantify the terms of Antarctic life, including, for instance, a satirical social scientific report quantifying and comparing across the relative "ruggedness" of each British Antarctic station.
[118] As the report notes, the first two women at the South Pole station were brought down in 1973 for a two-week period (111), women largely not having been incorporated into US and British Antarctic research until the 1980s and 1990s. A far greater degree of gender parity inhered at Soviet research bases from the onset of Soviet Antarctic research, as noted in Heggie, *Higher and Colder*, 43.

physical conditions in the environment."[119] The literature at the time, as the report takes heed of, seems widely to insist on the importance of the specific social stressors – small group integration, isolation, lack of stimulus, and conflicts between different sub-divisions of inhabitants – that act on Antarctic inhabitants over the hostile environmental conditions. Even in addressing "wintering over" and the long-perceived effects of the polar night, the report turns to and largely follows the result of Soviet researchers who had "reversed the cause-effect relationship" in explanations of winter malaise, situating disrupted sleep and low energy within social factors rather than seeing social stressors as primarily extensions of the environment's effects on physiological rhythms.[120]

For the American sociopsychological researchers, much of what seemed to reflect the key factors driving social conflict in Antarctica were organizational in character. That the base was operated by military personnel while primarily supporting the research activities of scientists was, the report suggests, a particular site of division and subsequent conflict, but also in perceived differences in how different sub-groups responded to the social conditions of the Antarctic.[121] From normative personality types in distinct occupational sub-groups to differences in music taste, research came to suggest the split military/scientific operational structure presented a particular problem to on-base social cohesion, summed up in one moment as the clashing of "the disciplined, regulated, conservative activities of the Navy personnel on the one hand and the relatively unstructured, disorderly, independent life-styles of the scientists on the other."[122] Besides direct conflict and antagonism, the report points to studies purporting to demonstrate that limited social feedback and recognition, exacerbated by Antarctic remoteness and isolation, produced an excess sensitivity in Antarctic researchers to perceived failures of the wider organizational authorities and structures.[123] Expressions of frustration from those employed in exceptionally hostile conditions, expressions like that of the *Halley Comet* editorial noted in the previous section, are re-cast here as distinct sociopsychological phenomena.

In its own specific way of emphasizing the key social factors at play in Antarctic research bases, the American report comes to militate to a degree against excess leisure time. A sense that the mind must be occupied, often with hard and steady work, so as not to idly fall into the potential depths of horror that an Antarctic life foists on you, goes back to observers like Cook and Cherry-Garrard. Here, the sociopsychological researchers warn against excess leisure time paired with social strangeness of a heterogenous group being brought together and expected to forge tight and cohesive bonds.[124] Leisure time of individuals is problematized in terms of the "task…[of] filling their time in meaningful ways,"[125] and recognizing "The role of activities in structuring time and thoughts and in facilitating adaptation to a new environment."[126] On the one hand, in the existing literature that the report calls upon, the response to this problem largely falls on evaluations of individual personality types, certain studies suggesting even that in fact more atomized "social

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[119] Natani and Shurley, "Sociopsychological Aspects," 91.
[120] Natani and Shurley, "Sociopsychological Aspects," 92. More research should be done to uncover the distinct terms of Soviet psychology at the time, in light of recent interventions that help frame the post-Stalinist Soviet philosophical work of the era. See, in particular, Keti Chukrov, *Practicing the Good: Desire and Boredom in Soviet Socialism* (Minneapolis: University of Minnesota Press, 2020); and, with a particular focus on Soviet system-cybernetic science and governance, Eglė Rindzevičiūtė *The Power of Systems: How Policy Sciences Opened Up the Cold War World* (Ithaca, NY: Cornell University Press, 2016).
[121] That American Antarctic bases are administered by the military distinguishes them from numerous other national Antarctic programs, including the British.
[122] Natani and Shurley, "Sociopsychological Aspects," 94.
[123] Natani and Shurley, "Sociopsychological Aspects," 92.
[124] Natani and Shurley, "Sociopsychological Aspects," 96.
[125] Natani and Shurley, "Sociopsychological Aspects," 95.
[126] Natani and Shurley, "Sociopsychological Aspects," 94.

isolates" do better with filling out their independent time than those more accustomed to group settings.[127] Striking a similar chord perhaps, we find in the extant literature a way of understanding winter withdrawal as an adaptation as much as it is a psycho-behavioral symptom, an accommodation of the self to waning stocks of social energy.[128]

On the other hand, the report itself is perhaps unique in ultimately hitting upon a more collective understanding of human adaptation. Describing an Antarctic station in various moments as a "total institution," [129] a closed environment, separated off from larger society and consigning individuals to a "common fate" within it, the report puts particular emphasis on the construction of a "microculture" as a key factor in social and psychological well-being. Such a "microculture," in successful situations, we see, is integrated, idiosyncratic, and immanently rather than externally established, producing anew social relations and cultural identity among those who start out heterogenous and very often culturally distanced from one another. Or as the report puts:

> During the long antarctic winter a collection of heterogeneous strangers has formed a group with a distinct microculture that has developed its own measures of control, adaptation, and change with little assistance from outside authority. We hypothesize that, to accomplish this feat, the independent individuals who volunteer for antarctic duty also have developed a strong need for behaviors that give them positive feedback about their own self-control, control over their fate, and control over the environment. The isolates may thus individually and as a group establish internal routines and external expectations that seem idiosyncratic and immature or unrealistic to an outsider but that are extremely important to the station party for structuring time, maintaining self-identities, and providing social security.[130]

These are in fact some of the report's core conclusions and I highlight them here to say, among other things, that though this itself seems to reflect an idiosyncratic consideration on the part of the authors, none of it is terribly surprising. For decades, certain Antarctic stations had idiosyncratic holidays, festive traditions, channels for creative output, and the like. Almost uniformly, contemporary Antarctic scientists, when asked what it's like on-base in Antarctica say some variation of "we kind of form our own culture down there." If anything, what's surprising now in this conclusion is that it doesn't appear obvious to those forwarding it – in fact, the routines and materials of said microculture are positioned themselves as seeming "idiosyncratic and immature or unrealistic to an outsider."

It's with this in mind that I turn then to the final move of the report. As the report notes in its final paragraph,

> Many individuals find themselves psychologically, if not physically, isolated from their neighbors for one reason or another in the mundane life of an industrial society. Shneidman [1967, p. 535] reminds us that most of life is so dull that there is little to be said about it and that we are not as alert or active in our environment as we would like to be. Does this apparent withdrawal from life reflect increasing stress due to restrictive, hazardous, and overcrowded conditions present in the urban scene? Studies conducted in Antarctica may give us new insight into the biosocial conditions that elicit stress

[127] Natani and Shurley, "Sociopsychological Aspects," 95.
[128] Natani and Shurley, "Sociopsychological Aspects," 95.
[129] Natani and Shurley, "Sociopsychological Aspects," 92, 96.
[130] Natani and Shurley, "Sociopsychological Aspects," 110.

> responses, the time required for adaptation to stress, and some indication of the physiological as well as the psychosocial price of prolonged exposure to the confining and inhospitable aspects of the contemporary urban environment.[131]

Suddenly, Antarctic research stations are no longer marked by their exceptional conditions, whether the physical hostility of the environment or the unique social conditions of a minute "total institution." They're rather microcosms of a sort, helping us in a reduced setting make sense of wider tendencies towards atomization and withdrawal from the social world under the conditions of modern industrial life. From a certain vantage point, Antarctica is no more inhospitable than a claustrophobic and overcrowded city of postwar American capitalism, and thus Antarctica's seeming exceptionality helps us make better sense of a more generalized condition, otherwise hard to notice, in the latter. Edwin Shneidman, the prominent clinical psychologist invoked here, former Professor of Thanatology at UCLA, is best known for his work on suicide – the work cited here, *Essays in Self Destruction*, offers the sense that like the dark depths of the polar south, our very most thanatologically self-negating impulses are simply one end of a spectrum we all fall into, the outer reaches of a generalized condition of dullness and malaise. Again, this thinking as mapped onto Antarctica is not totally without precedent if one digs into the archives of Antarctic inhabitants themselves – the introduction of the 1958 Easter issue of the *Halley Comet* asks, in response to "the appearance of a television H outside the Twinkle Hut," "Are we to see the familiar English scene repeated here? Every chimney stack precariously terminated in an H or X.[132] Every morning the red eyed yawning inhabitants creeping snail like to work."[133] The great fear posited here, a fear limned to the effects of a television, is of an Antarctic life no longer marked by its exceptionality, one that gives way to the familiar dullness of postwar industrial England.

One could say that conventional wisdom among Antarctic inhabitants going back decades is recast throughout this report and the micro-studies it draws upon within the medium of a positivist social science that sees its own role as one of facilitating social and psychic integration for ongoing Antarctic inhabitance. Intrinsic to said positivist social science in this moment is a subordination of acute, extreme, and prolonged environmental characteristics of the continent to the socio-organizational determinants of psychic and behavioral responses to an extended Antarctic stay. This reflects a distinct way of situating Antarctic being akin to that of ragtag self-psychologizing Antarctic inhabitants themselves in the early era of formalized, institutional expeditions, though one as fixed and settled as the medium of positivist social science itself comes to appear, occupational divisions, regimes of administration, and institutional frameworks treated in their own way as an "environment" in which individuals and groups respond and adapt rather than something to question, rail against, and poke fun at in turn.

In relating the Antarctic mind to patterns of activity, for the Antarctic meta-researchers of the era, as they reflect on the social stakes of a remote "total institution" of the kind represented by an Antarctic base, what's key is that time must be filled. The concept of "total institutions" that the report quoted above draws upon comes from the work of American social psychologist, Erving Goffman, in his noted 1961 book, *Asylums*.[134] Though extending the concept to cover a range of

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[131] Natani and Shurley, "Sociopsychological Aspects," 111.

[132] I am unsure what exactly this lettering convention is in reference to but I assume it has to do with the technical elements of the era's television products.

[133] BAS Archives, Ad7_z_3_1958_3, 2.

[134] This helps mark another trope in the history of the human sciences in Antarctica, the link between the Antarctic base, hut, or research station and penal and psychiatric facilities. Cook, for instance, as earlier noted, referred to the trapped *Belgica* as a madhouse, and the invocation of prisons, psychiatric hospitals, or both endure throughout the century. The

institutions that isolate their inhabitants from the world at large, from nursing homes to monasteries to military barracks to shipping vessels, his study in large part fixates on sites of incarceration: psychiatric facilities and prisons in particular. For Goffman, insofar as such institutions largely eschew the wage relation, they present a problem to efforts to motivate activity among inhabitants.[135] Such institutions, as Goffman frames it, also rely on a "mortification" of the self, and particularly the self as a being attached to the larger world, a mortification that might at once be self-negating and generative: "Mortification or curtailment of the self is very likely to involve acute psychological stress for the individual, but for an individual sick with his world or guilt-ridden in it mortification may bring psychological relief."[136] The social isolates that psychological researchers find in the "total institution" of the Antarctic base, as they shed the particularities they carry in from the now-distant world towards constructing a shared micro-culture away from it all, practice a kind of muted self-mortification that, in "ideal" scenarios of healthy, oddball integration, takes the place of wage and command structures in organizing the time and activity of those who, left overmuch to their own leisure, risk falling ever further away into the dark depths of the odd situation they occupy.

Within this framework, the role psychiatric evaluation and psychological literatures play, in aiming to facilitate fluid social integration under extraordinary conditions, re-produces the ongoing "human scientific" conversation about the conditions of life in Antarctica, a conversation dating back to the earliest Antarctic expeditions, as an acute, exteriorized technics[137] of observation and management. And, following the thinking of Stiegler on the co-construction of technics and time through the exteriorization of subjective being in technical objects, one could note that among the core ways such literatures position themselves as capable of intervening in the psychic being and behavioral well-being of inhabitants is through the management of time. Goffman, writing about inmates in psychiatric and penal institutions, suggests that "total institutions" produce an experience of time as "marked" and "pulled," part of a wider perception of time wasted and destroyed.[138] Antarcticans, insofar as I have found, largely don't speak of their time down below as such,[139] but the Antarctic overwinter is certainly a time that becomes increasingly drawn out, leaden, and heavy. The positivist social scientific mediation of the Antarctic psyche takes such weighted time and dices it up into the constitutive activities that serve as measures of "time use," producing in turn a smattering of possible ways of filling out leaden time {"work," "eating," "games," "reading," "movie watching," and "net social talk" listed among the key categories of activity in one table}[140] towards a prescriptive analysis of the set patterns of activity that ostensibly serve as techniques for integration.

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Up to the present, as Antarctic research programs have grown larger and more robust and as the built spaces of Antarctica have become increasingly heavily planned and artificed, the technics of intervention into the patterns of activity that make up an Antarctic life have been absorbed into components of architectural design, a topic explored more in depth in Chapter 1 of this dissertation. The psychological wisdom of the mid-to-late 20th century has made its way into color schemes,

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1965 issue of the *Halley Comet* that opens with the above-discussed editorial includes on its first page a picture of the station crew labelled "Inmates."

[135] Erving Goffman, *Asylums: Essays on the Social Situation of Mental Patients and Other Inmates* (Garden City, NY: Anchor Books, 1961), 10, 90.

[136] Goffman, *Asylums*, 48.

[137] For more on the language of technics and exteriorization, drawing on Stiegler in particular, see Chapter 1.

[138] Goffman, Asylums, *67*.

[139] An exception is noted towards the end of this section.

[140] Kirmach and Shurley, "Sociopsychological Aspects," 107.

socio-spatial arrangements, window design, and technical objects that live in Antarctic bases alongside human inhabitants. In line with recent critical characterizations of the emergence of "design" as a fixture of contemporary thinking and spatial intervention, this new architectural fold in the exteriorization of lay Antarctic psychological conversations "exercise[s]…*environmental power*: a form of biopower that operates on and through affective atmospheres to construct functional relations that shape desiring capacities, and thus delimit how existents might relate to one another."[141]

Around the same time that the psychological conversation of yore was beginning to be folded into the very environment of Antarctic research itself, made constitutive of an environmental power inhering in the technics of contemporary design, a shift in outwardly stated motivational imperatives was beginning to emerge in the "human sciences" of Antarctic, one that still substantially effects how psychological, physiological, and behavioral researchers and popular accounts of their endeavors are commonly framed. As Roberts puts it, citing a paper co-written in 2000 by one of the long-time most prolific and widely referred to figures in polar psychology, Peter Suedfeld, "Nowadays the importance of Antarctica as a milieu for human habitation derives from its status as a prototypical extreme and unusual environment, important in scientific research because it could serve as an analogue for off-planet journeys and settlements."[142] This claim sits alongside the explicit invocations noted in the previous chapter of Antarctica as a site for thinking through questions of Anthropocenic inhabitance. Antarctica, now not quite a laboratory for studying the adaptive capacities of certain humans to certain kinds of extreme environmental conditions, serves more as a prototype or analog, a generalizable model for the kinds of conditions – isolation, limited sensual environment, prolonged lack of natural light, lack of seasonal regularity, etc. – one might expect to find beyond this world, whether spatially or temporally, in "off-planet journeys and settlement" or in radically divergent futures conditioned by novel disruptions of the planetary environment.

Links, implicit and explicit, between Antarctica and outer space in particular are not altogether knew, and are certainly not confined to a distinct social scientific field of study. Cherry-Garrard in *Worst Journey* cites an 1893 report lamenting that "we knew more about the planet Mars than about a large area of our own globe."[143] If here, the link being made is not that of Antarctica as prototype or stepping stone but rather as a forgotten nether region in the shadow of humanity's ever expansive knowledge investments, the two locales seem nonetheless to exist within a similar symbolic geography, distant arenas to discover and to newly make something of. In an analysis of Ursula K Le Guin's classic 1969 spec-fi novel, *The Left Hand of Darkness*, Fred Jameson points to tropes of icy climate, sensory and material depravation, and arduous extremity as undergirding the novel's exploration of distilled human being, suspended in space and divorced from any environment, the novel's icy planet acting as "an attempt to imagine an experimental landscape in which our being-in-the-world is simplified to the extreme.[144] The 1982 popular science fiction film *Blade Runner* finds protagonist, Rick Deckard, reading a newspaper with the headline, "Farming the Oceans, the Moon and Antarctica," stitching the three together as central arenas of future resource

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[141] Kevin Grove, "Design and Political Geography: Knowing and Governing Complexity," *Political Geography* 74 (October 2019): 2; Brian Massumi, "National Enterprise Emergency: Steps Toward an Ecology of Powers," *Theory, Culture, & Society* 26, is. 6 (November 2009): 168.

[142] Roberts, "Psychology at the End of the World."; Peter Suedfeld and Karine Weiss, "Antarctica: Natural Laboratory and Space Analogue for Psychological Research," *Environment and Behavior* 31, is. 1 (January 2000): 7-17.

[143] Cherry-Garrard, *Worst Journey*, 12.

[144] Fredric Jameson, "World Reduction in Le Guin," in *Archaeologies of the Future: The Desire Called Utopia and Other Science Fictions* (London and New York: Verso, 2005), 269.

extraction.[145] Not quite two decades later, popular indie rock band, Modest Mouse, pulled the latter piece of this conceptual linkage, the Moon & Antarctica, for their album of that title, lyrical references refracting a vision of the then-present through cold, distant, icy, and frozen alter-worlds indexing a turn-of-the-millennium structure of feeling of sorts.[146] And a year after the 1991 release of the edited volume, *From Antarctica to Outer Space: Life in Isolation and Confinement,* one of the earliest efforts to consolidate an emerging conversation treating the Antarctic realm as a kind of test ground for psychic, social, and behavioral problems of long-term space travel, science fiction author Kim Stanley Robinson published the first volume of his highly-regarded *Mars Trilogy*, which itself takes the trilogy's central core of scientists to a remote dwelling in Antarctica for a year before launching them towards the red planet.

From the publication of *From Antarctica to Outer Space* onward, Antarctica has been referred to throughout the psychological and behavioral literature as a "natural laboratory" for human isolation, with the smallest and most remote stations on the continent often singled out for particularly close study.[147] Studies of the psychology of the Antarctic, across American, Australian, French, Chinese, and Japanese stations, almost uniformly forefront isolation and confinement as central conditions for which life on Antarctic research stations offers insight.[148] A number of psychologists, including Lawrence Palinkas and Peter Suedfeld, have published prolifically on the psychological and behavioral alterations that attend Antarctic life and have emerged as key experts in the field. One station in particular, the exceptionally environmentally forbidding French-Italian Concordia station in Antarctica's center, where temperatures fall below -80 C and an equivalent altitude of 3800 meters above sea level, has been nicknamed the "White Mars."[149] Amidst this growing literature, that the isolation and confinement of an Antarctic base is at once exceptional and most explicitly analogous to the problems of long-term space travel is largely taken for granted, though other analogies are increasingly creeping in, analogies in recent years to pandemic life in quarantine,[150] and perhaps more interestingly, to the damaging effects of incarceration and practices of solitary confinement.[151] One sees as well concrete projections of future extreme mining projects, a report in the *From Antarctica to Outer Space* volume, for instance, linking study of Antarctic

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[145] *Blade Runner* of course acutely thematizes private capital and state efforts to at once produce and keep in check an extractive labor force.

[146] One arguably evinced on a range of like and similarly received musical releases, including Radiohead's *Kid A* and Sigur Ros's *Agaetis Byrjun*.

[147] See, for instance, Donna C. Oliver, "Psychological Effects of Isolation and Confinement of a Winter-Over Group at McMurdo Station, Antarctica," in *From Antarctica to Outer Space*, eds. A.A. Harrison, Y.A. Clearwater, and C.P. McKay (New York: Springer-Verlag, 1991): 217-227; Suedfeld and Weiss, "Antarctica: Natural Laboratory"; "Testing space flight missions at Halley," British Antarctic Survey, accessed March 3, 2023, https://www.bas.ac.uk/project/space-flight-simulator/#about.

[148] M. Ikegawa, "Psychological studies of a Japanese Winter-Over Group at Asuka Station, Antarctica," *Aviation, Space, and Environmental Medicine* 69, no. 5 (May 1998): 452-460; Nan Chen, et al., "Different adaptations of Chinese winter-over expeditioners during prolonged Antarctic and sub-Antarctic residence," *International Journal of Biometeorology* 60, is. 5 (May 2016): 737-747; Gro Mjeldheim Sandal, Fons J.R. van deVijver, and Nathan Smith, "Psychological Hibernation in Antarctica," *Frontiers in Psychology* 9 (November 2018).

[149] Alexander Kumar, "Antarctica to Mars: The Loneliest Job in the World," *BBC*, August 7, 2012, https://www.bbc.com/future/article/20120807-the-loneliest-job-in-the-world.

[150] Ruby Buiza, "What working in an Antarctic station taught this researcher about coping with isolation," *CBC Radio*, February 13, 2021, https://www.cbc.ca/radio/whitecoat/prescription-for-resilience-coping-with-covid-1.5892248/what-working-in-an-antarctic-station-taught-this-researcher-about-coping-with-isolation-1.5899320.

[151] Rich Haridy, "The Neuroscience of Isolation: A Trip to Antarctica Can Shrink Your Brain," *New Atlas*, December 9, 2019, https://newatlas.com/science/neuroscience-social-isolation-loneliness-antarctica-brain/.

inhabitance to the maintenance of mining labor in the deep North of Canada and the prospects of 21st century lunar and asteroid mining.[152]

Features of this literature are rather familiar in the larger history of Antarctic psychological research. Nods to the "Antarctic stare" and winter-over syndrome, a symptomology that includes depression, social withdrawal, disrupted sleep, and concerns over the individual qualities that predispose one better or worse for life in the Antarctic all return. Much of the literature acknowledges the now-established observations of determinate problems faced by Antarctic inhabitants and aims to complement and nuance these observations by finer-grained comparisons of average responses to environmental and social differences – differences in light and seasonality, in group size, differences in parts of the year within an over-wintering project, differences that fall along lines of gender, nationality, occupation, experience, etc. – between and within stations. Though the human sciences in Antarctic have long been concerned with physiology and its relation to psychology, new research is emerging within the frameworks of the kind of materialist neuro-pathology that Catherine Malabou argues points us to novel modes of situating the mind and radical alterations in the structuration of one's thought, self-conception, and memory.[153] Prolonged isolation might not just alter or disrupt our psychology but alter the shape and size of our brain[154] – in this sense, confirming Arendt's worries, extended space flight might truly make us other than we are in the very make-up of our neurophysiological being. In that way, the situation in which the Antarctic mind is found in human scientific research is both that of a holistic analog, portable to various instances of the outer reaches of human experience, and newly materialist, holding the very neuropathology of isolation to bear on psychic responses to Antarctic life.

A new language though emerges in certain places. Though "adaptation" still holds rhetorical weight as a way to frame human responses to the Antarctic research station, increasingly psychological and behavioral research speaks in terms of coping and resilience. Winter-over syndrome will happen and what the psychological literature can address are the mechanisms that enable one to cope with it at a reasonable level and the psychological traits that enable resiliency. Coping might look different at different points – energetic activities in certain patches of the year that keep one going, but at other points, particularly around midwinter, the very symptoms themselves are understood as how we cope, a kind of "psychological hibernation" as one report calls it that sacrifices mental and physical energy, as well as sociality, for the capacity to handle stress.[155] Though, psychologists warn as well that leaning into isolation is at the same time dangerous. Tried and true methods have endured to stave off deep social withdrawal and mental lapses – as one psychologist suggested in an interview, "A sense of camaraderie is crucial as well as regular hobbies. Reading and listening to music makes a huge impact."[156] Unstructured leisure again appears as a kind of problem to be worked through, but now indexed to concerns around the physiological havoc caused by disrupted perceptions of time. Or as the psychologist notes further on in the interview, "Living in the Antarctic winter darkness, it is difficult to perceive the passage of time. In situations like this it is very important to maintain a regular busy routine to avoid the risk of 'free-run' – a

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[152] Philip R. Harris, "Personnel Deployment Systems: Managing People in Polar and Outer Space Settings," in *From Antarctica to Outer Space*, eds. A.A. Harrison, Y.A. Clearwater, and C.P. McKay (New York: Springer-Verlag, 1991), 65.
[153] Catherine Malabou, *Ontology of the Accident: An Essay on Destructive Plasticity*, trans. Carolyn Shread (Cambridge, UK: Polity, 2012), 1-6.
[154] Haridy, "The Neuroscience of Isolation."
[155] Sandal, van deVijver, and Smith, "Psychological Hibernation in Antarctica."
[156] Kumar, "Antarctica to Mars." Alongside structured social and occupying leisure activity, a report from 1991 suggests that in mid-winter, individuals may end up drinking upwards of dozens of cups of coffee per day. See Oliver, "Psychological Effects of Isolation and Confinement," 225.

process where internal body clocks disintegrate cycling and resetting continually."[157] Situated materially-physiologically, the Antarctic mind newly demands busy-ness.

The psychological literature continues to think about the composite life that people live in Antarctica, characterizing it in relation to the wider world. For all the hazards, mental and physical, the literature around psychological evaluations of those at the end of Antarctic trips assessing the time they spent down south, going back decades, suggests a remarkably positive response, on average, to the experience of extended remoteness, environmental exceptionality, and isolation.[158] Like past inhabitants asked to reflect on the experience in oral histories or current and more recent inhabitants chatting casually about their time on Antarctic research stations, formal psychological literature has come to highlight an experience of exceptional social bondedness, the frequent beauty and sublimity of the icy environment, and self-perceptions of newfound strength or worth in life. Perhaps unsurprisingly again, a dramatic shake-up in one's life experience, taken on voluntarily and tied to a conscious project, is exciting despite the conditions it entails at times being productive of depressions and other on-base syndromes. And, as if echoing the late-50s anxieties about televisual technologies being brought on-base, at least one psychologist has noted in passing newly engendered psychological effects of networked communications technology as it relates Antarctica to the wider world:

> Nowadays, with heightened technological capability and wide satellite communications access for those overwintering in Antarctica, messages, problems and bad news are transmitted into our minds – whether it is a loved one passing away or salary difficulties. Such news is airdropped into the station by email, telephone, Facebook and video call, sometimes exploding like a bomb. There is no release - you are in a prison of your own mind here.
>
> But being disconnected can bring new unexpected challenges. A fellow crew-member recently described to me how he "felt dead" and "not real". Certainly depersonalization and "derealisation" have been recognized as features of significant psychological stress. He went on to say that when he went on Facebook it was as if his "previous life was continuing whilst his empty body continued on here in the Antarctic wasteland".[159]

This latter comment suggests something like parallel timelines moving through parallel worlds, "depersonalization" an effect of struggles to perceive oneself in one world as the other continues to move forth. One can imagine versions of this in the past: the expedition Shackleton discusses in *South* beginning just as Europe was being jolted into World War I, contact then made once again with the world at large in the first half of 1916. Yet steady networked communication "back home" of course makes perception of an alternate reality one no longer occupies far more continuous and real-time.

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[157] Kumar, "Antarctica to Mars."
[158] Samantha Blight and Kimberley Norris, "Positive psychological outcomes following Antarctic deployment," *The Polar Journal* 8, no. 2 (2018): 351-363.
[159] Kumar, "Antarctica to Mars."

Conclusion: The Collapse of "Human Scientific" Discourse onto a Technics of Antarctic Psychic Being

Gesturing towards futures of space travel, resource extraction, and Anthropocenic dwelling[160] while incorporating responses to materialist neuro-pathology and to the conditions of being amidst globally networked information flows, recent and contemporary conversations in Antarctic psychology overdetermine the situation in which the Antarctic psyche is couched. Like the imaginaries that course through the built space (Ch. 1) and the cultural production (Ch. 3) of contemporary Antarctic life, the problems, conditions, and means of intervening in Antarctic psychic being are multiple, pointing at once to novel, even science fictional, possibilities within a rapidly, socio-ecologically shifting world and to deep-seated anxieties as to what it might mean to psychically cope with and persist through drastic expansions of infrastructural capacities into the outer reaches of habitable space, labor regimes oriented towards accelerated accumulation of resources (including information), and scenarios of environmental collapse. A "human scientific" conversation that seeks to manage and stabilize Antarctic psychology addressed to such an overdetermined situation has plausibly passed through its positivist social-scientific stage, no longer a particular mechanism amidst variable technics of management as a thoroughly technologized medium itself, disparately integrated into ways of artificing forms of life under extreme conditions.

Amidst what might appear as a kind of naturalized technics of being brought under relative control against the backdrop of often exceedingly harsh surroundings, the multiple or overdetermined futures of what's envisioned in psychological literatures as novel modes of being and sociality are not inherently contested in their multiplicity. One way of understanding this is through the very naturalized technics inhering in an integration of psychological discourse, design sensibilities, technological infrastructure sustaining life and data-collection, and presumptions as to the accumulative imperatives of knowledge work, a naturalized technics echoing what Stiegler comes to problematize in terms of the development of a global "cinematic consciousness" in volume 3 of *Technics of Time*. For Stiegler, the cinematic medium enacts the development of a "temporal object," namely film, "that 'coincides' with consciousness as a retential process…"[161] Like other exteriorized technical projections and media, from writing to visual art to mechanical objects of labor, film serves in tertiary retention, the holding of memory in a socio-technical world beyond individual human consciousness that at the same time interacts with and informs consciousness's primary flows and retentions. And yet, at the same time, film comes to mimic or "coincide" with these primary flows and retentions, producing a distinct "reality effect." In thinking through this, pointing back to Adorno and Horkheimer's critique of the culture industry, Stiegler notes that they "accuse cinema of paralyzing the spectator's imagination and, more generally, the spectator's discernment, to the extent that he or she can no longer distinguish between perception and imagination, reality and fiction…"[162] If for Adorno and Horkheimer, this effect works to nullify the workings of a freely reasoning consciousness and transcendental imagination, Stiegler's Husserlian framework of retention draws out slightly different implications of such a "reality effect" in cinema. Crucial to Stiegler's understanding of the relation of technics and time is that exteriorization of human consciousness and memory in technics is at once co-constitutive with interiorized modes of temporal being and perception and in excess of interior consciousness, an excess or gap that allows

[160] This latter future is explored in more depth in Chapter 1 and a hallmark part of the rhetorics of contemporary polar design.
[161] Bernard Stiegler, *Technics and Time, 3: Cinematic Time and the Question of Malaise*, trans. Stephen Barker (Stanford: Stanford University Press, 2011), 38.
[162] Stiegler, *Technics and Time 3*, 38.

for a play of difference and newness. Insofar as cinema and even more so televisual media, facets of a culture industry subject to market forces, work to enhance a "reality effect" among viewers and "coincide" with the free flow of consciousness, they effect a growing continuity between market logics and market-produced desires and consciousness itself.[163] Televisual media moreover situates viewers –tapped into the same "temporal object" pointing to the same "reality" and with the same "reality effect"—in relation to a synchronized global "cinematic consciousness" that thoroughly captures time in all its relations to anticipation, possibility, and ongoing differentiation.[164]

I want to suggest that something analogous is going on in the profusion of psychological discourse into the technical forms of being and objects in Antarctica. The Antarctic "psyche" as it has come to be understood in institutional psychological literatures is increasingly folded into the continent's built space, along with the various other elements germinating in the conversation around the Antarctic "psyche" from elaborations on the conditions of modern life to institutional imperatives to individual and collective desires for particular patterns and rhythms of activity, work, leisure, festivity, etc. Psychology, once an informal conversation meditating on what the mind goes through under conditions of particular stress, acts as a technoscience, directed towards a socio-technical regulation of human mind and activity through and against the impacts of environmental hostility, and even in a stance of ongoing observation always already articulated towards application for further experiments in extreme human inhabitance. It can feel then as though, whether individual or collectively, whether properly coping with a sunless period of months or falling into the eerie "derealisation" produced by incoming streams of networked information from back home, humans simply move through and plug into a socio-technical world that has, ostensibly for their own good, absorbed their psychic being and their minds' relations to hostile territory, humans themselves acting as contingently necessary tools in the processes of data accumulation that drive ongoing Antarctic research. The "reality" of the Antarctic psyche as codified in psychological research exists now within the technological media, from networked information apparatuses to built space itself, through which researchers and laborers in the polar south maneuver even as this "reality" ostensibly coincides with the individual and collective conscious experiences, perceptions, and behaviors of inhabitants. The closing of a gap between media of projection and elaboration—previously landscapes, narratives, jokes, and even formalized research agendas—and the socio-psychic dynamics worked through in that projection or elaboration also risks being the collapse of "human scientific" discourse as itself a site of contested and contestable reflection on the distinct conditions of life and labor in an extreme and remote environment.

[163] Stiegler, *Technics and Time 3*, 84-88.
[164] Stiegler, *Technics and Time 3*, 75-78.

Chapter Three
Literary Narratives from Antarctic Inhabitance

It's a truism in scholarly work on Antarctica to note the long-time treatment of the continent as an empty canvass, a vast, unchanging site of nothingness, without history, society, or culture. Equally common then is the move to recognize the falseness of such a treatment, to see the extent that human histories, geographies, knowledge practices, legal and social institutions, and geopolitical jostling, alongside better understandings of the geophysical features of the continent have undone Antarctica's supposed a-topic and atemporal pristineness and filled in the canvass that once might have been. A narrative of such kind for instance orients the foremost extended study of Antarctic literature, Elizabeth Leane's *Antarctica in Fiction: Imaginary Narratives of the Far South*. Leane points to the older commentary of prominent environmental historian Steven Pyne, who insists on the cultureless-ness of the blank-ice geophysical behemoth, aside from passing and always distanced literary references in the work of certain 19th century masters, Coleridge, Poe, and Verne in particular.[1] Her project becomes then an undoing of this older conception, recognizing just how profuse Antarctic literature really is, from older references, some explicit and central, some marginalized or hard to glimpse but worth taking seriously, to a growing intrigue with the continent by novelists, filmmakers, and cultural theorists, on the one hand and a growing intrigue by the institutions of the continent itself with the value of literary representation, the latter intrigue manifest in the establishment across national Antarctic programs of writer's residencies, art tours, etc., on the other.[2]

In the following chapter, I will look comparatively at two broad archives of Antarctic literary production, chosen for their immanence to particular modalities of inhabiting Antarctica: the creative writings of mid-20th century inhabitants of the hyper-remote British Antarctic Halley research station, found in the station's unique, seasonally produced on-site magazine;[3] and the products of writer's residencies and institutionalized employment between the 1990s and 2000s, for which Kim Stanley Robinson's novel *Antarctica* will be taken as a literary exemplar, put in conversation with the relatively contemporaneous tell-all biographical narrative, *Big Dead Place*, written by Nicolas Johnson, a long-time janitorial worker at the American McMurdo Station. Each of these two broad archives of Antarctic cultural production will be mined for examinations of laboring subjectivity that thematize the simultaneous exceptionality and tedium that underwrites Antarctic inhabitance, which I will tie to matters of genre and narrative strategies. And for each archive, in the backdrop will be questions of organizational imperatives – what function does creative and reflective writing structured into a form of extreme life have and what of the function of funded excursions for the sake of literary representation? How are such organizational imperatives in either case determinative of generic and narrative choices, models of distribution, thematic concerns, and critical perspectives developed within literary materials?

In doing so, this chapter takes for granted that Antarctica is a site of cultural production and sidesteps, to some extent, the question over whether Antarctica has an operative set of histories, canons, and literary or cultural imaginaries. As noted in other chapters, Antarcticans have spent their time amidst the Antarctic landscape reading and producing literature, poetry, music, and festivity

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[1] Elizabeth Leane, *Antarctica in Fiction: Imaginative Narratives of the Far South* (Cambridge, UK: Cambridge University, 2012), 2-3; Steven J. Pyne, *The Ice: A Journey to Antarctica* (New York: Ballantine, 1988), 151-156, 166-168.

[2] Leane, *Antarctica in Fiction*. See, in particular, Chapter 5 on the "Transforming Nature of Antarctic Travel" for Leane's discussion of institutional channels for cultural production in Antarctica.

[3] This chapter's examination of *The Halley Comet* draws extensively on the archival holdings of the British Antarctic Survey. Where specific passages from the magazine are quoted or paraphrased, I will cite as 'BAS archives,' noting the specific record and the page number.

since they first arrived; specific literary reference points drip across historical moments; a rich imaginary implicating works of pop fiction finds its way into the spatial layout of research stations. Antarctic history is built in part intertextually, newer bodies of literature invariably referring themselves back to Scott, Amundsen, Shackleton, Cherry-Garrard, Fredrick Cook and a whole slew of other early explorers who's writerly documentation of life in Antarctica's cold, dark hell have endured as among the continent's literary touchstones. A thematic interest in certain paradoxes and tensions re-emerges from one body of cultural products to the next, most notably for this chapter, the tension between Antarctic sublimity and exceptionality and the tedium and banality of the continent's everyday life and work.

If these themes, intertextual references, and traditions mark a continuity of sorts across what I explore in this chapter, what I ultimately aim to demonstrate is a shift between the two broad archives I analyze, one that's in line with what I call "exteriorization" in the dissertation's introduction and with parallel shifts that I have tracked in the previous two chapters. In either previous chapter, regarding architectural design and psychological discourse respectively, I tracked a movement from highly contingent, impromptu developments functionally and immanently tied to the forms of life and labor and imperatives for reflection of explorers and inhabitants to more recent, conscious, and often externally taken-on productions vested with and serving to propagate established notions of the Antarctic. Here, something similar is happening, as cultural production shifts from an immanent aspect of maintaining a disciplined and socially close-knit existence amid the unusual dynamics and rhythms of life in a remote Antarctic station to an institutionally sponsored act, taken on by professional writers and artists and projecting an image of the continent and its inhabitants out toward a potentially global audience. With this shift in the imperatives and functions of cultural production comes a shift in the thematic exploration of sublimity/exceptionality and tedium/banality. Both an overwintering inhabitant in the 1950s and a professional writer from the 2000s brought down for a short residency might thematize these aspects of Antarctic life in resonant ways. The latter however, does this from something more like the perspective of an outside observer made witness to Antarctica as laboratory of odd, novel, and/or extreme social being. From that, a tension between sublimity and tedium, exceptionality and banality, goes from being a casual, contingent, and easily downplayed expression of the moldable life and subjectivity being collectively cultivated amid the labors of Antarctic inhabitance to a key facet of the codified and projected image that comes to circulate for a wider audience of what it means to work in Antarctica's extreme environment.

Subterranean Cultural Production, or the Fate of the Literary in Antarctica

As noted, Antarctica renders acute linkages between cultural production and collective discipline. From wizened and practiced inhabitants to institutional psychology, reflections on the perils of life in the Antarctic dwell on the benefits of keeping one's mind occupied, with reading, writing, singing, play-acting, and the like, stitched into a collective form of life. Adorno and Horkheimer famously argued that mass culture worked in habituating passive subjects to the rhythms of capitalist work life.[4] As opposed to this, the cultural production of the Antarctic was for much of the history of expeditions to the continent a matter of active and makeshift engagement, rather than passive consumption, but even as such functioned to fill out either empty, freighted, or hardened time, moments of exceptional boredom or grief or hardship, conditioned and exacerbated by unique seasonal patterns and unshakeable environmental volatility. People stayed focused on and

[4] Theodor Adorno and Max Horkheimer, "The Culture Industry: Enlightenment and Mass Deception," in *Dialectic of Enlightenment*, trans. John Cumming (London and New York: Verso, 1997), 120-167.

disciplined towards, it was proposed, the labors of survival when they participated in the raucous and unwieldy cultural productions—sloppily directed and acted plays, oft-humorous, off-color magazines, drunken singalongs—that banded people together and kept their minds from wandering too far.[5]

It's from this vantage point that I aim to read questions of genre, productive output, and even cultural consumption in this chapter. Namely, how does cultural production act as a mechanism of labor discipline? How does both the disciplining function, but also the resistances this comes with, manifest in the play of genre and of narrative strategies that characterizes Antarctic cultural production (from within)? And how is this transposed, reshaped, or in fact lost, as Antarctic cultural production from within expands into writer's residencies and matters of representation? What emerges as the function of Antarctic cultural production in this case and how does this compare to a function more immanently tied to the production and sustaining of collective life in the Antarctic? These are questions specific to the literary and cultural history of the Antarctic, questions indexed to the distinct character that writing from within the Antarctic has taken over the now century-plus of the continent's inhabitance. But they're also, I hope, questions that resonate beyond cultural production in the Antarctic, questions that might offer insights for thinking more generally about, on the one hand, cultural production as integrated into everyday life, and on the other, the extant and possible functions of Anthropocenic cultural production more generally.

This chapter starts from the premise that what I'm calling cultural production (and though I focus on literary production in particular, this includes music, cinematographic and photographic production, play-writing and acting, culinary festivities, and an array of other activities) has acted at certain historical moments, even when critically directed at the conditions of life down south, as an integrated and functional component of Antarctic everyday life. This term "cultural production" recalls the work of Pierre Bourdieu, who in his seminal text, *The Field of Cultural Production*, marks out a kind of paradigm for instituting a sociological study of art and literature. At an abstract level, he characterizes the titular *field* in which culture is produced as such: "the literary or artistic field is a *field of forces*, but it is also a *field of struggles* tending to transform or conserve this field of forces."[6] Within a select world of modern cultural producers, Bourdieu suggests, an array of competing aesthetic positions drive forward the production of aesthetic and literary objects, giving a kind of topography to a marketplace of symbolic capital that individual cultural producers aim to accrue. Aesthetic objects may be produced as literal commodities, but they also act as objects of symbolic exchange within a "field of forces," held together by the struggle between the aesthetic positions staked out at a given moment. The imperative then of a sociology of art and literature for Bourdieu "is a question of understanding works of art as a *manifestation* of the field as a whole, in which all the powers of the field, and all the determinisms inherent in its structure and functioning, are concentrated."[7] This is to say, such a sociology shifts the ground of cultural analysis away from the self-enclosed cultural object, away from its place within any given aesthetic movement, away from the historical conditions that ideologically underpin it, and toward its place within a field of competing aesthetic positions that serve in relating cultural producers to one another.

What this does then is to mark a course of study, not of art, literature, or culture, but of artistic, literary, or cultural production, the processes and functions that tie together a social field implicating particular cultural objects and producers. But the specific relations of that social field, as

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[5] See Chapter 2 for more on the relation between cultural production and psychological stabilization, particularly in the context of pre-institutional Antarctic expeditions in the early 20th century.

[6] Pierre Bourdieu, *The Field of Cultural Production: Essays on Art and Literature* (New York: Columbia University Press, 1993), 30.

[7] Bourdieu, *Field of Cultural* Production, 37.

Bourdieu lays them out, relations that come to reproduce ideas of competition in a marketplace transposed onto notions of symbolic value, hinges on an understanding of the cultural sphere in question as that of high culture separated out from everyday life. In fact, it's the capacity to escape the market-determination of mass cultural production into a relatively autonomous higher social field of cultural production that serves as a kind of precondition, in the sociology Bourdieu lays out, for recreating value as symbolic, as a matter of aesthetic "position-taking."[8] One might very well though seek out a sociological understanding, one attentive to functional determinations within a broader social reality, of the venues of cultural production and the exchange of cultural objects operative below the social field that Bourdieu predominantly characterizes.

Though I don't follow his methodological approach in many ways, Jacques Rancière, in his book *Proletarian Nights*, presents something like a precursor to the kind of excavation from below I'm interested in here. For Rancière, archives of writings – letters, stories, poetry, philosophical reflection, etc. – by artisan French workers in the 1830s, become the basis for a subterranean narrative of proletarian life. What these archives speak to is a world of proletarian experience that's neither disciplined to the regiments of the working day nor to what's invoked as the historical weight hoisted upon the proletariat in the classical Marxist tradition as the bearers of revolutionary possibility. As he puts it in the preface to the 2012 English language re-release of the text, "For the workers of the 1830s, the question was not to demand the impossible, but to realize it themselves, to take back the time that was refused them by educating their perceptions and their thought in order to free themselves in the very exercise of everyday work, or by winning from nightly rest the time to discuss, write, compose verses, or develop philosophies."[9] Time is won, or as he puts it elsewhere, stolen away from moments of rest to take part in the kinds of activities assumed to be reserved for and, as he demonstrates, inspired by or in collaboration with the bourgeoisie. And importantly, this time stolen away is, as Rancière suggests, folded into a continuity maintained between an experience of work itself as a site of (potential) freedom and the intellectual flourishing aimed for and cultivated in stolen moments beyond the workday. Proletarians then, Rancière claims, in their historical recovery in the archives, aren't made to perform a revolutionary fervor rooted in struggle and suffering but given the space to unveil a thinking mind and collection of discourses, however trite or, worse still, bourgeois in character they might be.[10]

My own work here is rooted in an interest in the everyday creative outlets and discourses that have filled out the lives of Antarctic inhabitants. In large part, these creative expressions, cultural products, and circulating discourses are amateurish and consciously so, not genuinely aiming to approximate either highbrow literature, astute cultural analysis, or craft genre fiction and frequently given over to crass silliness. Even the work of Antarctic literature rooted in temporary inhabitance I explore going forward that's authored by an established and esteemed science fiction novelist is, by the accounts of most fans and critics, minor, less riveting and lower stakes than the author's better-known work.[11] Elsewhere, the newspapers, magazines, and more recently blogs, of

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[8] Bourdieu, *Field of Cultural Production*, 30, 38-40, 75-76.

[9] Jacques Rancière, *Proletarian Nights: The Workers' Dream in Nineteenth-Century France*, trans. John Drury (London and New York: Verso, 2012), ix.

[10] "And it was not surprising to find at the outset that this quest for the muffled truth had to wade through so much babbling: the many professions of faith mimicking politicians, verses in the style of the great poets, moral declamations based on bourgeois norms, and screen representations that had to be scratched off" (*Proletarian Nights*, 11).

[11] I have found little scholarly literature on Kim Stanley Robinson's *Antarctica*, outside of the analysis offered by Leane in the above-mentioned *Antarctica in Fiction*, while his *Mars* and *Science in the Capital* trilogies, along with *Aurora, Shaman, The Years of Rice and Salt, New York: 2140,* and *The Ministry for the Future* have all been taken up widely in science fiction studies and other scholarly fields, along with popular literary criticism. Trade reviews of *Antarctica*, even where positive, suggest the novel does "not...read like a thriller" (sfsite.com) or that "his ecoplot seems almost perfunctory" (Kirkus Reviews). And anecdotally, conversations with fans of Robinson's larger body of work seem to hint at the especially slow and

the Antarcticans are rife with inconsequential poetry and flat, dry prose. The works of fiction to be found rely heavily on trite parodies of generic tropes and, like the speculative psychology explored in Chapter 2 – itself among the more intriguing moments of knowledge production in these writings – almost invariably resolve into insular jokes. And plenty of what was produced in the era of all-male research expeditions is grating for the contemporary reader, manifesting a culture of oft-crass post-war, sex-starved, British masculism. For ostensibly scientifically driven research expeditions, so much of these writings have little to do with science or discourses specific to the scientist, or where they do, they show little reverence towards how science is done and even less for how its results are presented and written about. Of course, this was not writing with a wide audience in mind but instead the work of those of a small group of co-inhabitants writing to and for each other. Writing here is a matter of blowing off steam and making fun of each other and oneself, dwelling in lowly daydreams of other places or rendezvous with pin-up girls and the starlets of films shown on base, or parodying whatever genres come into their crosshairs, whether sci-fi, spy thriller, or formal scientific writing.

But, if for Rancière, the time of proletarian cultural production in the 1830s is, as he suggests, stolen away from the disciplinary strictures of, at once, the workday and the expectations imposed by historians and social theorists on the proletarian subject, the acts of discursive elaboration and cultural production in Antarctica have served an oft-avowed disciplinary function. From the early days of Scott and Cherry-Garrard, "leaders" and theorizers of the Antarctic expedition have known that blowing off steam, exploring daydreams, and "stealing time" away from the otherwise imposing facets of a life in the extreme were important for maintaining the psychological stability necessary to face the strenuous conditions of the Antarctic working life. Like Rancière's "proletarians," the Antarcticans were of mixed and interstitial classes, in both background and the structural position of their employment.[12] But cultural production for the Antarcticans has expressly not been divorced from organizational imperatives and chains of command. From insistence by the assumed leaders of the post-Scott Terra Nova-expedition on producing an issue of *The South Polar Times* amidst grief over the loss of the Polar Party to contemporary funding structures tethered to the organizational aims of writer residency programs, the integration of cultural production into everyday life has been functional, rather than stolen. If Nicolas Johnson's *Big Dead Place* stands as arguably the most accomplished work of writing I'll fold into my account of cultural production within the Antarctic, it succeeds in part by lashing out against organizational and disciplinary structures in the context of a post facto expose. Its analysis, rooted in the experience of a frustrated, lowly custodial worker, at best largely disinterested in cross-class interaction with Antarctica's scientists and, in frank terms, fed up with "leaders" and management, comes as close as any Antarctic writing to an expression of downright class struggle or antagonism. It's perhaps the only of these writings that's, in any sense, "stolen away," joking that much of the inside secrets it

meandering character of *Antarctica*, though that is, across fan conversations and trade reviews, sometimes positioned as part of the novel's distinct charm.

[12] Rancière makes this note on a number of occasions, highlighting that he's primarily dealing with artisan laborers who, prior to the generalization of an industrial proletariat, frequently had and at times legitimated aspirations towards mastership, and whose political ideals, identities, and goals were products of inter-class movement and interaction (see Chapter 2, titled "The Gate of Heaven," and in particular pages 27-34). As noted elsewhere in this dissertations, Antarctic research expeditions have pulled together scientists and operational laborers, frequently bringing together more classically proletarian participants with an educated bourgeois and, especially throughout the early era of Antarctic exploration, well-resourced aristocrats.

reveals were stolen, from Raytheon and NSF documents, out of the literal trash bins of US Antarctic stations.[13]

Like Rancière then, I'm interested in thinking about the (in some cases literally) subterranean and unremarkable textuality of those who fail to conform to one's image of them, but precisely in search of the functional character of cultural production. And in this sense, part of the turn in this chapter positions the excavation here away from Leane's already comprehensive work on Antarctica as a site of literary representation. Which is not here to completely disavow what's represented within the texts I'll look at but rather to suggest that the representative stakes of these texts and Antarctic textuality more generally won't hold primacy in this exploration. Rather, in shifting to an examination of textual productions as variably folded into the material cultures of an integrated, disciplined work-life, I draw in part on a set of contemporary currents in literary studies, perhaps the most direct and forceful articulation of which has been brought forth by the literary scholar Sarah Brouillette, herself both informed by and consciously diverging from Bourdieu.[14]

Brouillette's work aims to redefine the "literary" in contemporary global society in terms of its form-determination by capital. "Literary" production, she argues, exists within global circuits of capital accumulation that hold force not just over the marketing and sales of particular literary objects but over the very act of literary writing in the first place. This claim is leveled against older Marxist and post-Marxist conceptions of the literary (as opposed to the cultural more generally) as a relatively autonomous space of creative production,[15] as well as those who argue for literature as "an active power in the making of worlds…a site of processes of worlding and an agent that participates and intervenes in these processes."[16] Brouillette aims instead to cultivate a lens of analysis predicated on a sense, drawn from the rhetoric and activities of publishers themselves, that "the literary" in the contemporary world "is increasingly shorthand for a set of generative values and experiences that are produced to be accessed across all media,"[17] and as such folded into networks of media production and circulation.

Drawing on Brouillette's work, I'm interested in tracing textuality in the Antarctic at a remove from the primacy of the representational stakes of texts themselves. My investigation here doesn't start from questions as to how these texts construct an understanding of the Antarctic or what they can tell us about the personal, autonomous concerns of their writers. Nor am I interested in a sociology, per Bourdieu, of something like aesthetic taste and position-taking coming to build out the lines of struggle and driving forces that make up an autonomous cultural/aesthetic field. Rather, I'm curious how texts act materially in their production and circulation. Even in exploring something like the intertextual and reiterative elements of texts, how they frequently and persistently fold in prior fictions, narratives, and oft-repeated histories of the sites they engage with, my interest

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[13] Nicholas Johnson, *Big Dead Place: Inside the Strange and Menacing World of Antarctica* (Los Angeles: Feral House, Inc., 2005), "Author's Note." ProQuest Ebook.

[14] For exemplary expositions of Brouillette's methodological approach, see Sarah Brouillette, *UNESCO and the Fate of the Literary* (Stanford, CA: Stanford University Press, 2019), cited in more depth below, along with Sarah Brouillette and Christopher Doody, "The Literary as a Cultural Industry," in *The Routledge Companion to the Cultural Industries*, 1st ed. (London and New York: Routledge, 2015), 99-108; and Sarah Brouillette and Christopher Doody, "Literary Markets and Literary Property," *Anglistik: International Journal of English Studies* 26, is. 2 (September 2015): 139-148.

[15] Across Brouillette's work, she cites Terry Eagleton, Bourdieu, and the Warwick Research Collective as exemplary of Marxist and post-Marxist accounts of the literary that maintain the literary as occupying an autonomous or even resistant space from the imperatives of market society. See Brouillette and Doody, "Literary Markets," 139; and Brouillette, *UNESCO*, 2-4.

[16] Brouillette, *UNESCO*, 5; Pheng Cheah, *What Is a World?: On Postcolonial Literature as World Literature* (Durham, NC: Duke University Press, 2016), 2.

[17] Brouillette and Doody, "Literary Markets," 142.

primarily rests with how such intertextuality or iterativity responds to the imperatives that drives the production of texts (a question that will come up in particular in exploring Robinson's *Antarctica*).

In a certain way, this turn to the set of interventions of which Brouillette's work is exemplary, interventions that stress the determinative mediation of culture by markets and market imperatives, might seem counterintuitive. The central focus in the next part of this chapter is a set of stories, embedded in a cultural product, *The Halley Comet*, that sits, narrowly speaking, "outside" the commodity form. Issues of this magazine ran single copies, never circulated beyond Halley and, in certain cases, other FIDS/BAS stations,[18] and were never put on any market. They're presently freely accessible but only through the BAS archives. Which is to say, the site of material mediation of cultural production for what I'm looking at in the next part of the chapter is not global literary and cultural markets. It's rather something more fine-grained, namely the social relations and mechanisms through which cultural production is made a functional aspect of working life. The chapter though will mark a shift in the locus of literary production to works that emerge out of institutional sponsorship as part of an effort to globally circulate and display conscious representations of the Antarctic. It's only at this point, as the locus of activity for cultural production within the Antarctic shifts in the latter decades of the 20th century and into the 21st, from low-stakes, in-station, subterranean creative outlets for functionally stranded inhabitants to cultural production situated within writer and artistic residencies and driven by both institutional and market imperatives that we can register shifts in the function of the "literary" or of cultural production in Antarctica towards something more like what Brouillette, et al.'s work more directly proposes.

Genre and Banality in *The Halley Comet*

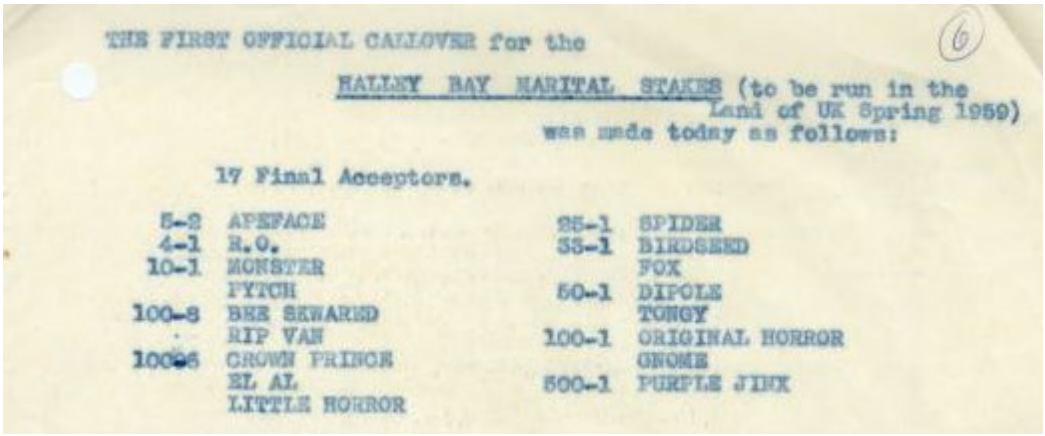
Apsley Cherry-Garrard claimed that for the surviving members of the Terra Nova expedition, producing an issue of *The South Polar Times* for Midwinter's festivities was a matter of life or death in the wake of the loss of Scott and the rest of the polar party. Against the prospects of overwhelming grief and a loss of orientation in their mission, literary production served in cultivating through collective cultural activity a sense of day-to-day normalcy that fed into the maintenance of enduring capacities to tend to life-sustaining labors.[19] For the early institutional inhabitants of the remote Halley station, in the decade that followed its initial establishment, the situation was measurably less dire. *The Halley Comet* still worked in preserving a sense of sanity through the long winter, giving inhabitants something to do, but inhabitants knew they had lifelines otherwise. Ships would cycle to and from Antarctica every summer; communications, however spotty at times, were maintained with the wider world as well as with a network of other bases that inhabitants, during less brutal stretches of the year, might even visit; bases were stocked with games, records, ingredients for cooking and baking, and an array of other equipment for keeping oneself occupied. Though risks of death, serious injury, or prolonged and dangerous disorientation while outside the base remained high in this era, life was considerably more in the hands of these inhabitants.

Literary production in this setting served then as a vehicle for an oft-masculine playfulness among Halley inhabitants amidst information sharing, storytelling, and meditations on the bizarre conditions of their present lives. Inhabitants, mostly between their early 20s and early 30s in age, might ask anxiously after their futures as they anticipate returning to the world at large. An Easter 1958 article, for instance, consists of a table titled "Halley Bay Marital Stakes" listing out odds for

[18] The circulation of *The Halley Comet* to stations other than Halley is suggested by archival references to the magazine in non-Halley base journals and may have been limited to word-of-mouth conversation.

[19] Apsley Cherry-Garrard, *The Worst Journey in the World* (The Narrative Press: 2000), 510, ProQuest Ebook.

each member (all ascribed nicknames) of that year's crew to be the first to marry (see Figure 7), followed up by joking commentary referencing "local bookmakers," and parodying horse betting reportage.[20] An article from midwinter 1961 "offers suggestions for the future employment of FIDS who are soon to leave these shores, for it is assumed that, as is usually the case, their employers will want nothing more to do with them." To this predicament, the article imagines specific crew members returning to become a "Film Star," "Father Christmas at a large (very) dept. store.," a "Card Sharper," and a "Fairground Balloon Salesman," among other goofy possibilities.[21]



THE FIRST OFFICIAL CALLOVER for the (6)

HALLEY BAY MARITAL STAKES (to be run in the Land of UK Spring 1959) was made today as follows:

17 Final Acceptors.

5-2	APEFACE	25-1	SPIDER
4-1	H.O.	33-1	BIRDSEED
10-1	MONSTER		FOX
	FYTCH	50-1	DIPOLE
100-8	BEE SEWARED		TONGY
	RIP VAN	100-1	ORIGINAL HORROR
100-6	CROWN PRINCE		GNOME
	EL AL	500-1	PURPLE JINX
	LITTLE HORROR		

Figure 7. The 1958 "Halley Bay Marital Stakes" Odds Listing. Reproduced courtesy of the British Antarctic Survey Archives Service. Archives ref. AD7/Z/3/1958/3.

Insofar as the *Comet* can be thought to echo the lay conversations, discourses, and forms of play of Halley's on-base community, these entries in the *Comet* seem to offer jokes out of what were quite possibly very real and oft-spoken of concerns for inhabitants, concerns moreover expressly tied to inhabitants' odd working arrangements, namely being contractually extracted out of the world at large for the sake of self-enclosed and standalone employment and research assignments. Shackleton, in his 1919 recounting of the Imperial Trans-Antarctic expedition that took place between 1914 and 1917, famously compared this disastrous expedition to the great war raging unknown to his crewmates in the world they left behind.[22] It was as if there was a need to feel oneself linked to world-historical events as they churned on, even as one occupied what was effectively an atopos in relation to the world of world history. At a more personal scale, as noted in Chapter 2, a contemporary psychologist working in the Antarctic points to the effects of social media and networked connection on the cognitive dissonance involved in a long-term expedition down south, with one subject reporting feelings of "depersonalization" as their "empty body continued on here in the Antarctic wasteland" while social worlds moved forward elsewhere.[23] The speculative gestures in the *Comet* towards future marital and occupational possibilities suggest something not totally dissimilar: a sense of atopic existence under conditions of stasis that leave one in a state of anxiety about the movement of worlds left behind.

[20] BAS archives, ad7_z_3_1958_3, 7.
[21] BAS archives, ad7_z_3_1961_1, 15.
[22] Ernest Henry Shackleton, *South: The Story of Shackleton's Last Expedition*, 1914-1917 (Duke Classics), Dedication.
[23] Alexander Kumar, "Antarctica to Mars: The Loneliest Job in the World," BBC, August 7, 2012, https://www.bbc.com/future/article/20120807-the-loneliest-job-in-the-world.

The *Comet* in these cases serves as a cognitive space to work through this anxiety through both humor and, elsewhere, qualitative remappings of that previous world. Among the most popular genre of *Comet* article are travel guides of a sort, recounting visits to or documenting things to see in a range of places: the Florida Keys, Bristol, the Isle of Skye, and Cape Town. In the case of a lush locale like the Keys, the article narrates the experience of exploring them, situating the reader at a particularly acute experiential remove from the cold, dry Antarctic. Bristol is, on the other hand, presented drolly, the author recalling his home and its self-mythologization derisively. The Isle of Skye's description reads like something in a conventional travel book, weaving together a physical description of the island's features with a mythologizing depiction of its history towards a sense of attractive grandiosity. And the *Comet*'s account of Cape Town addresses inhabitants expressly, suspecting as they were that the city would be their first way station on the way back to wherever they were going after their time in Antarctica. Mapped for the inhabitants across these pieces then are a geography variably situated across home, myth, and an alternative exotic,[24] one at an experientially opposed pole of the Earth's climatic possibilities.

These articles present what might be thought of as a variably jokey and banal inverse to what we call speculative fiction, a generic category that's served, in various guises (horror or gothic fiction, sci- and cli-fi, monster movies, etc.), as a primary vehicle for representing the southern continent. Speculative fiction operates in the imaginative construction of a topos outside the world, most classically a no-place. From such an outside vantage point, speculative fiction then might hold a lens to the world we know as a way of recognizing that world's limits or horizons, its hidden potentials (those both promising and fear-inducing), and the kinds of strangeness to which inhabitants of the world are benumbed. But the Halley inhabitants writing for *The Comet* already recognize themselves as occupying, if neither the utopian no-place nor the dystopian bad-place lurking on the other side of this world, the stagnant place of "atopic nothingness." And rather than affirm this "atopic nothingness" against the world as "a void that ungrounds…complicit logics of unity and totality"[25] and risk falling into the madness of such a void, they dwell in an imaginative space that situates them back in the world. Rather than imaginatively leaping out to and beyond the world's limits, those already at the edge of the world, find cause to take comfort in generically familiar myths, histories, modes of self-deprecation, and fantasies of luxuriance.

This tendency even comes to overwhelm those moments when anonymous Antarctican writers in *The Halley Comet* do gesture towards speculative and generic fiction. One could say that the sense of occupying a stagnant atopia comes into competition with the latent potentialities that would seem to lurk below and around life at the edge of the world. Going forward, I home in on two stories in particular, both short genre fictions set at Halley that prod at life on base. One a science fiction and the other a spy fiction, either lean into an intuition one might reasonably have about Halley: that, as a kind of bunker, composed of a connected network of under-ice cabins, in the far remote reaches of the most mysterious continent on the planet, the station would naturally serve as an arena for exploring the eerie, the dream-like, the secretive, the on-edge and intense, and other extra-normal feelings and phenomena. And yet, the stories oblige themselves to wrestle equally with the blunt mundanity of remote Antarctic life. In fact, to varying degrees the stories make a joke of the genres they ape, imagining extreme encounters with an everyday life too ordinary to

[24] Several contemporary inhabitants have noted, when asked about the imaginary worlds they occupy themselves with when down south, their interest in evocations of lush greenery, tropical beaches, and all that the Antarctic is not.
[25] Kirill Chepurin and Alex Dubilet, "Russia's Atopic Nothingness: Ungrounding the World-Historical Whole with Pyotr Chaadaev," *Angelaki: Journal of the Theoretical Humanities* 24, is. 6 (November 2019), 150. In "Russia's Atopic Nothingness," Chepurin and Dubilet draw on a heterodox reading of the 19th-century philosopher, Pyotr Chaadaev, to theorize "atopia" as an ungrounding temporal category, positioned against both nationalist myth-making and progressive entry into the fold of world-history.

meaningfully register them. The setting of either story, out of which the scenarios either imagines emerge, consists not so much of the Antarctic environment, whether geophysical or infrastructural, itself, as it does of the rote activities of Antarctic researchers. Inhabitants of Halley station in the stories, very plausibly crass stand-ins for the real-life crew occupying the base in the respective years of their writing, perform everyday tasks, matters of scientific observation and station maintenance, tasks to which they are far more attuned than any of the odd happenings of the stories themselves. Against a backdrop that would seem to scream out its own extremity, it's as if the stories, in all likelihood serving primarily as scantly thought through jokes at the expense of other crew mates or of the situation they all find themselves in, implicitly argue that what's strangest about Antarctica is the very fact that people have carved out humdrum routines to which they are, for a time at least, committed.

The first of these stories is titled "Journey Into Space," published in the Easter 1959 edition of *The Halley Comet*. As noted in chapter 2, Antarctic has long been linked to space travel, seen by futurists, science fiction writers, legal scholars, technologists, and psychologists as a kind of testing ground for studying the limits of human capacities in the far reaches of habitable space and the social and infrastructural architectures of extra-territorial life. Antarctica would seem ripe then for stories of alien encounter and human glimpses into space, a notion that runs through some of the key late-20th century fictions of the continent, perhaps most notably *The Thing* and the opening to Kim Stanley Robinson's *Mars*. The impulse to explore this linkage emerges in minor form in "Journey Into Space." The story finds the narrator living out a one-off encounter with a kind of ambassador from an advanced and benevolent alien race making contact with Earth through the Antarctic. As a story, "Journey Into Space" is generic in the strongest sense of the term. A story of alien abduction, the narrative intentionally hovers on the edge of reality and a dream state,[26] even ending with the narrator appearing to awake from a dream while seeing concrete evidence of the real occurrence of the encounter he just experienced in his waking life. The alien communicates through a kind of hypnotic telekinesis. Offering the narrator the opportunity to experience the alien's home

[26] It's worth noting that the story precedes what's widely cited as a kind of originary event in the US historiography of alien abductions, namely the reported abduction of Betty and Barney Hill in 1961. The story of Betty and Barney Hill was originally recounted to a wide audience in John G. Fuller's 1966 work of journalistic non-fiction, *The Interrupted Journey: Two Lost Hours Aboard a Flying Saucer*, part of a wider popularization of alien abduction narratives in the 1960s. As Bridget Brown notes in *They Know Us Better than We Know Ourselves: The History and Politics of Alien Abduction*, widespread popular narratives around UFO sightings in the US extended well back into the 1950s at least, with major psychological reports on the phenomenon published by Leon Festinger in 1954 and Carl Jung in 1959 (7-8). And as the historian Karl Guthke traces, speculation regarding possibilities of alien life and even human-alien encounter extends back centuries, though early modern imaginaries of alien encounter come with their own package of tropes, valences, and anxieties that don't cleanly align with the readings that have been extended to the alien abduction stories emanating from the 1960s and onward, for which the racial contours of the Hills' story play a substantial role. See William Ross, "Extraterrestrials in the Stacks: An Archivist's Journey with Alien Abduction, A Stained Blue Dress, and the Betty and Barney Hill Collection," *The Journal of Popular Culture* 53, is. 6 (December 2020): 1393-1416; Bridget Brown, *They Know Us Better Than We Know Ourselves: the History and Politics of Alien Abduction* (New York and London: New York University Press, 2007); Karl S. Guthke, "Nightmare and Utopia: Extraterrestrial Worlds from Galileo to Goethe," *Early Science and Medicine* 8, is. 3 (January 2003): 173-195; Jonathan Jacob Moore, "Starships and Slave Ships: Black Ontology and the UFO Abduction Phenomenon," *Qui Parle* 31, is. 1 (June 2022): 143-158. For my own purposes here, I take "Journey Into Space" to be mobilizing what were likely generically familiar tropes running through US and UK popular culture in the 1950s that were then cohered around a distinct alien abduction narrative and phenomenon that gained particular cultural currency in the 1960s. One can also note the possible influence of alien encounter and invasion stories, set in or mobilizing the Antarctic, that were a commonality in 1920s-1930s pulp magazines. See Leane, *Antarctica in Fiction*, 42.

world, we come to understand that the alien represents a far advanced intelligent being, part of a race of beings that have long observed humanity.[27]

A function of the short, off-hand, unprofessional nature of the creative and editorial writing in *The Halley Comet*, "Journey Into Space" is sparse in terms of world-building and imaginative leaps. The plot starts with a man conducting an observation just outside Halley spotting a unique object: "To my amazement I saw not the moon but a large sphere shining very brightly with a blue-white light." This "large sphere shining very brightly" is as much as we see of the UFO, met by the narrator with "wonder and then fright," before he quickly runs back to the hatch door to get inside the station, at which point a generically familiar "shaft of light" shoots from the UFO carrying the narrator on board before he knows it. Of his initial moments on board the alien spacecraft, the narrator says:

> "My foot came down, but not on snow! In that fraction of a second I had somehow been taken inside the sphere, and where one moment there had been snow there was now a floor and walls of what appeared to be a type of grey plastic. The sudden transition robbed me of all feeling and I just sat down on the floor. No sooner had I done this than the wall facing me became lighter in colour and increasingly transparent until I was able to discern a shadowy figure standing behind what seemed to be an old type of plate camera."

With this passage, the reader is given a limited purview into the alien ship that the narrator is brought onto, populated with little hints of what to imagine: "a type of grey plastic," walls shifting colors, "an old type of plate camera." When one considers the makeup and appearance of the first Halley station itself, this description starts to recall, as much as anything else, a slightly more ethereally odd version of the station and its equipment, something that would be legible to on-base readers living there alongside the anonymous author. Those who would be able to fill in the blanks left to the imagination by the description's relative bareness are precisely the fellow Halley crew members who were the piece's actual, anticipated readers (rather than the future-alien grad student descending into the archives to resuscitate an almost certainly long-forgotten ad hoc bit of goofery).

There's likely relatively little in the way of physical description of the alien itself, described first as a "shadowy figure," then as a "figure [that] emitted a soft light," and finally brought into slightly greater focus in a single sentence: "The figure approached me and I saw that it was a man, a man that I now know was not of this Earth." Again, much is left to the imagination, though the imaginations of the on-base readers were especially ripe for the task, rife with images of shadowy figures weathered by Antarctica's harsh exterior conditions returning back into the dim-lighted enclaves of an underground network of huts and tunnels in full winter gear. As the story progresses, not much is put into the unique technologies the alien has access to ["the light beam from the sphere had been a system of Telekinesis and the 'camera' machine"], the long history of the alien race's existence ["He spoke of the centuries of observation that had been carried out on our earth, and the intensification of these observations owing to the surprising technological advances that had been made in the last fifty of our earth years. He also spoke of his own science which was far ahead of ours…"], or any number of vehicles for science fictional inventiveness. At the level of both physical description and species-societal background, the alien that's encountered becomes a vehicle for rehearsing recognizable generic tropes, more than an opportunity to elaborate on forms of speculative alterity and their means of critically reflecting back on the writer/reader's own world.

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[27] BAS archives, ad7_z_3_1959_1, 6-7. The full length of "Journey Into Space" covers the two pages of *The Halley Comet* cited here. For all of the quoted material from "Journey Into Space," refer back to this citation.

The low-grade quality of the story's speculative horizons though plays into a dynamic the author of the story seems keen on drawing out, a kind of downplaying of the encounter itself that serves to make it continuous with the situation in which the narrator in the story finds himself. Namely, he's carrying out a perhaps undesirable late-night observation shift, as set up in the story's opening: "It has all the texture and unreality of a dream, and yet; but let me start at the beginning. It happened just as I was on my way to do the 3 A.M. observation." This opening situates the story within the context of mainstay aspects of Antarctic life and science. Night shifts to maintain steady streams of weather and atmospheric observations were a signature part of early institutional Antarctic life and comparable rhythms of work and observation continue into the relatively recent past (see for instance discussions of night shifts or 24-hour observation cycles in the latter portion of Chapter 4). The story then makes use of the odd rhythms of everyday Antarctic life, the condition of waking alone in the deep night at the far reaches of the world already feeding a sense of "unreality" or of openings onto experiences of otherworldly possibility.

The freighted time of solitary, late-night work continues to hover over the story, as heavily as the alien ship itself that the narrator witnesses. The reader is only just introduced to "centuries of observation," telekinesis, and an advanced "camera machine" used for telepathic communication before a sudden shift back down to earth: "I realised suddenly that I was tired and wondered what the time was. I was worried also in case it had been noticed that I was not in the Base." He's weighed on by drowsiness and a concern for how late in the morning it might be getting, even a sense that he must still mind his observational task as that's what justifies him being awake at such an hour in the first place. The joke of the story comes to be the feeling that the seemingly exceptional encounter at its core is qualitatively akin to any given curiosity of one's experience during a solo late-night shift. Aliens or not, there are norms and routines of the Antarctic base that need tending to. To an offer to travel with the alien to its home world, the narrator notes, "It was tempting but I felt that in his advanced civilization I would be out of place and time." The narrative's only briefly drawn to a world beyond before restoring itself to the place and time to which the narrator sees himself as belonging, a place and time that's quaintly banal, even in its extraordinariness. As a story, "Journey into Space" operates on the balance of banality, measured in oft-mindless, rote working tasks, and the sublimity inherent to the Antarctic's near-otherworldly oddness.

A similar dynamic runs through a four-page short story in the 1964 edition of *The Halley Comet*, among the longest fiction pieces in any of the early runs of the magazine. Titled "South with Caution", the story presents a stiff parody of a James Bond-style spy thriller, following the bravura FBI agent Lemmy Caution as he carries out a mission staged within the Halley base.[28] In setting a crassly over-the-top tone, the story plays around with exaggerated spy tropes: Caution, an Americanized James Bond, has all of the tough guy braggadocio of the famed British secret agent with none of the grace or eloquence. Told from his vantage point, we get a sense of tone immediately with the story's opening sentences: "Maybe some of you bozos have heard of me. My name is Lemanuel H. Caution – Lemmy Caution to you – an' I carry a Federal Bureau ticket and a whole goddam load of trouble." He kills indiscriminately, and at will for the sake of his mission, a rescue effort directed at saving Miss Olivia Hammond, a young, beautiful femme fatale secreted down to Halley on a cargo ship that left from Montevideo. From the beginning, the story's telos is a steamy encounter between Caution and Hammond, Caution's prize for braving the horrific conditions of an under-ice Antarctic base.

[28] BAS archives, ad7_z_3_1964_1, 36-39. The full length of "South with Caution" covers a bit over three pages of the *Halley Comet* issue cited here. For all of the quoted material from "South with Caution," refer back to this citation.

Resonant with "Journey Into Space", much of the joke of the story emerges out of the perhaps surprising incongruity between genre and setting. An Antarctic base might seem a ripe setting for a science fiction of alien encounter but "Journey Into Space" suggests otherwise, the nighttime observation routine of Halley staff at once eerie enough in and of itself and entirely mundane in its actuality to deflate the thrust of such a premise. Likewise, a sparsely-manned, underground research base at the edge of the Earth has all the makings of an action-packed spy locale full of secret traps and intrigue. The story itself implies as much about the distinctness of the setting: "This latest job looks like the craziest yet. One thing this, this dump's under thirty foot of ice…" James Bond in fact often finds himself in hidden and secret technoscientific settings, scientists frequently caught in the cross-fire of the geopolitical machinations that resolve in Bond novels and films into shootouts, bombings, and other capers.

But Caution's brute force approach in "South with Caution" is easily recognized as being highly misapplied. The first of Caution's encounters that the reader sees is a laughably unnecessary scuffle with the base cook at breakfast: "…I have just finished my breakfast by 9 o'clock, after an argument with the cook, who said I should have been earlier." Within three sentences the cook is laid out on the floor, Caution narrating the events as such: "This palooka is a dangerous sort with bulging forearms and over developed shoulder muscles. But maybe he bulges in some of the wrong places – an' I reckon one or two jabs to the midriff will freeze him. I leave him gaspin' on the floor and ease along the corridor…" As with the details of "Journey into Space," something of the in-crowd audience of the story can be elaborated from this initial moment of action. Perhaps on-base scuffles over getting to breakfast on time were part of the daily routine of life there, registers of the effort to discipline the unwieldy lives of isolated base inhabitants to get going promptly on the work that needed to be done. It seems likely that the on-base cook himself was the target of the comments about the story cook's "bulging forearms and over developed shoulder muscles," though the over-the-top brashness of the story suggests these comments are meant entirely in jest. If anything, as with the story as a whole, the real butt of the joke is a broad caricature of a macho American agent, identified by his use of the term "palooka," a popular early- to mid-century US slang term for a big oaf, derived from 1920s boxing culture and popularized by a Ham Fisher comic strip, titled *Joe Palooka*, that was adapted into a 1930s comedy film.[29] This story plays for its audience of fellow base members, largely coming from Britain, as a kind of riff on quaint British-ness as measured against and perceived by a gaudy, ego-inflated American.

A similar run-in, ending in an unprovoked attack follows, as Caution comes face to face with one of the base scientists. Standing by "a lot of dials which tell you what the weather's like outside," Caution spots "a pair of trousers with a head sticking out of the top." A sequence of even more laughably unnecessary violence immediately ensues:

> "It's staring myopically at one of these dials an' I ask what the wind speed is. '100 knots with gusts up to 120' says Trousers. I don't like geezers takin' the mick, so I gave him the cold slab treatment. Just then this small thickset fella comes in and he is holdin' a stop watch in his hand and, as he couldn't care less, moves over to a miniature grandfather clock screwed to the wall. This punk seems quite cool an' iI (sic) think that it's gonna be safer with him outa the way, so I rip the clock from it's (sic) moorings an' bring it down sharpish on his pate."

[29] "Palooka," *Merriam-Webster*, https://www.merriam-webster.com/dictionary/palooka; "Palooka," *IMDB*, https://www.imdb.com/title/tt0025619/.

Again, one can pick apart what's going on here in terms of on-base audience. Though somewhat inscrutable, it's easy to imagine the description of Trousers as rooted in everyday practices of Halley inhabitants making fun of one another. Either meteorologist in this sequence, Trousers or the one who comes into what appears to be a weather observatory subsequently, may very well be direct and recognizable stand-ins for the meteorologists on base at the time. The joke at the expense of the second of the two acts in part at the expense of a particular scientific disposition characterized by obliviousness to the goings-on of the world around one and hyper-focused instead on the work of scientific observation. The setting of the scene comes with a few familiar objects, a grandfather clock and some dials that intended readers would presumably be intimately familiar with, repurposed in the story for kicks as the material instruments provoking or propelling the story's action.

Of course, these action sequences read as brashly over-the-top, almost nonsensical. The joke of making the base and its inhabitants into the setting and participants of an action thriller is precisely that the base seems little suited to meaningfully propel the action of the spy story forward. At best, the extreme winds on the surface of the ice serve as a backdrop for aims towards projecting high-wire intensity, Caution proclaiming when he gets out on the ice, "If I tell you guys that it was windy, you'll think of some day you had to hold your hat on walking down fifth Avenue. This is different. The wind is liftin' the ice particles an' blowin' them horizontally at the speed of an express train, straight at my face like I was a human dart board." Against this extreme description, the two inhabitants Caution espies atop the ice appear themselves to be carrying out the kind of basic and banal construction tasks that were a central part of base life, year-after-year, in Halley's first decade: "A few yards away two geezers is hammering away on the roof of a new hut. One of these geezers looks like the original Humpty Dumpty and the other geezer who has red hair, is givin' directions to an old grey headed boy leanin' against a muskeg. These boys must be nuts." Just enough physical details are projected onto the various figures in this encounter to make them recognizable as particular members of the Halley crew, engaged like the others who've come into the story in some aspect of the everyday labors of the station. The high-wire intensity of Caution's own description of the exterior conditions is brought into discord with the quotidian qualities of the situation, to which Caution can only imagine that the "boys" he's running into are nuts. Ultimately, what we see, again and again, is a boorish American recklessly crashing through a quaint British research station, a stand-in for spy fiction's action-adventure acting as too blunt and brute a generic instrument to meaningfully interact with the staid and oft-dull everyday life of worker inhabitants at Halley.

Either of these stories is conditioned by how *The Halley Comet* functions as an imaginative space for the station's inhabitants. The wish to make minor everyday labors and dramas or the infrastructures that sustain Antarctic life – from a night shift to standard fare daytime observations to the logistical links between cities in the southern hemisphere and Antarctic research stations – into the bases for intrigue, adventure, and speculative possibility clashes with the ease of devolving back into the crass humor and petty concerns that sustain social life on the base. Unlike trade speculative fictions, those of mid-20th century pulp magazines[30] or of late 20th-century prestige sci-fi writers, these texts only take the representative stakes and potentialities of Earth's most harsh and mysterious continent so far. The texts, in that sense, rather than delving into a sense of adventure or mystery, dwell within the atopic stagnancy of life in an Antarctic research station, the author's thoughts seemingly pulled back into the banality of the familiar. The writing itself is in certain ways

[30] For more on Antarctic short stories in early pulp magazines, see Leane, *Antarctica in Fiction*, 25, 42, 47, 64, 66, 72, 79, 152, 168, 180-181. As Leane makes clear throughout her account of fictions of Antarctica, pulp magazine short stories from the 1920s through the 1950s play an especially large role in that era in representing Antarctica to a sci-fi fan audience, touching on, accentuating, and even establishing tropes, from polar vortexes to ancient, ice-preserved monsters and gothic horror to scientist encounters with aliens, that have carried through Antarctic literature.

undisciplined in its appeal to genre and its construction of narratives, "Journey Into Space" for instance reading more like Kepler's anachronistic foray into proto-science fiction as a speculative extension of the work of astronomical science itself than like the renowned canon of sci-fi, known to many of the era's Antarcticans, from Wells and Verne to Asimov. But this loose, undisciplined quality emerges precisely out of the role cultural production plays as a disciplining mechanism on base. Writing isn't directed towards the cultivation of professional, writerly habits but rather towards the cultivation of an integrated, holistic, and collective life, socializing on-base inhabitants through shared jokes and observational practices and giving imaginative space for the unruly thoughts that emerge out of a simultaneously bizarre and banal work life to play out.

Antarctic Inhabitant Literature Projecting out to the Wider World

The Halley Comet ran, albeit inconsistently, between the late 1950s and the mid-1990s. When asked about its discontinuation, a long-time Halley inhabitant, whose tenure on base spread across Halley V and VI, extending from shortly after the *Comet*'s run ended until the mid-2010s, presented a picture not unlike what's characteristic of print journalism the world over. Namely, she said:

> A lot of that stuff – *The Halley Comet* – died with the introduction of the internet down there. We were still trying, when I started, to do magazines, but then it became hard and became easier to just do blogging. We used to write every month a blog to go out among the BAS website – that was hard to do – everyone started making videos, photos, etc., just do all of that. It became so digital, all of that element of that has disappeared.[31]

While other factors may have weighted on the print magazine as well, what this comment suggests is that growing opportunities for networked communication and digital production of writing and other media appeared to render the long-running print magazine obsolete. As the same interviewee noted later, evidence of that past material culture, from copies of the magazine to photographs, remains available in the base, but primarily as a kind of preservation of British Antarctic history, akin to the preservation near the American MacMurdo station of the original hut that Robert Scott and crewmates used when they first made landfall on the Antarctic continent in 1902. But the idea that shared cultural production represents a constitutive, functional part of the form of life at the base has, if not dissipated, shifted. And the forms of on-base literary production that have emerged in the wake of *The Halley Comet* appear different in kind, less matters of a shared and consistent project, and more the at times uneven, scattershot, and frequently atomized hallmark of writerly production in the digital age.

Blogposts in this case, or at least those in evidence on BAS's website, are the province of individuals and pretty much always serve a primarily informational purpose.[32] They document, in short diaristic write-ups and myriad digital photos presented to a public audience, the processes that make up a trip down to the Antarctic, noting elements of the experience of air and maritime travel, equipment brought down for a particular scientific project, experiments run within the Antarctic laboratories or in the Antarctic field, and minor curiosities of Antarctic life. *The Halley Comet* was made to be read and shared among inhabitants within a particular season, part of the construction of a minor and ephemeral public within the base for the duration of collective stays down south. Blogs call back to an anonymous global "public" elsewhere. In a book chapter titled "Inhabiting the Extreme or Making Antarctica Familiar," Annick Bureaud notes that the internet can serve in the

[31] A. Fryckowska (former Halley Station manager) in discussion with the author, April 2022.
[32] See chapters 1 and 4 for representative samples of contemporary blogging exhibited on BAS's website.

present to demarcate the bounds of the world - if the internet is available somewhere, it's within "our world" and thus Antarctica increasingly exists within that "our world" bounded by the reaches of the internet.[33] She notes in particular, regarding blogging, that, unlike travel diaries, another form that blogging predominantly substitutes for, blogs "can be read in real time and that this reading takes place in the topological and semantic unity of the screen, placing their subjects at the same level and no longer in the realm of the extraordinary:… Their writing style, which authorizes informality, and their content, which blends different types of information, lead to a form of normality."[34] If the informal genre-aping of the *Comet*'s amateurish short stories expressed a kind of tension, collapsing the bizarre and extraordinary into the banal, blogs, Bureaud's comments suggest, displace the extraordinary elements of Antarctic experience altogether, formally and stylistically occupying the register of bland normalcy or of the kind of familiarity alluded to in the title of Bureaud's chapter.

The project of literary writing addressing Antarctica – even where those thematic strains hinging on tensions between sublimity and banality or on the effort to extend into writing the laboring subjectivity of ordinary Antarcticans endure – in turn has been displaced, developed elsewhere than the minor print productions of Antarctic expeditions and bases. Antarctic inhabitant literary production, at least in the Anglophone context, has shifted, I would argue, from serving primarily as a functional form, integrated into the distinct forms of life that emerge in Antarctic bases to serving as a primarily representational form, conscripted through specific institutional channels to give representational status to the continent more broadly.

In making this claim, it's important to note that I'm thinking not so much about "Antarctic literature" in a general sense but about Antarctic "literary production," or more specifically, culturally-oriented, creative, writerly production of texts, indexed to the distinct ways and means of real life in Antarctica. As Leane makes obvious, literature and culture about Antarctica has come to exceed efforts to provide exhaustive accounts of it, even if just staying within the Anglophone sphere. Plenty of published fictions have implicitly or explicitly invoked the Antarctic, alongside a continual stream of first-hand accounts from polar inhabitants. Much of the work Leane looks at can be found in long forgotten pulp genre magazines, many short science fiction and horror stories from the 1920s-1950s set among the at-the-time still popular and resonant myths of early 20th century polar exploration. More recently, paperback thrillers have gone south, while Antarctic oddities have even entered into the fray of contemporary literary fiction, Mat Johnson's *Pym* for example starting out as a conventional university novel, before metamorphosizing into a genre hybrid set in the underground world of Antarctic monsters.[35] Which is to say, there has been Antarctic literature of different sorts going back to Edgar Allan Poe and proliferating Antarctic literature from well before the emergence and eventual discontinuation of *The Halley Comet*.

There has also been continuing and oft-communal cultural consumption within the Antarctic. Numerous interviewees I've spoken to, working out of British Antarctic Survey ships and bases, have indicated they rarely read books about Antarctica, suggesting they get enough of the continent in their lived experience and in certain cases, don't feel satisfied in seeing its various representations. Others manifest a fair degree of familiarity with Antarctic history, pointing to favorite historical and recent travel narratives and suggesting some amount of on-base chatter about well-trodden histories and the texts and cultural objects they're associated with. The closest thing I

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[33] Annick Bureaud, "Inhabiting the Extreme or Making Antarctica Familiar," in *Far Field: Digital Culture, Climate Change and the Poles*, eds. Jane Marshing and Andrea Polli (Bristol, UK: Intellect Books, Ltd., 2011), 193. Proquest Ebook Central.

[34] Bureaud, "Inhabiting the Extreme," 192.

[35] Mat Johnson, *Pym* (New York: Spiegel & Grau, 2011).

could identify in interviews to a widely shared object of cultural consumption, specifically indexed to the Antarctic, was John Carpenter's 1982 film *The Thing*, which most interviewees operating out of Halley station specifically highlighted as something station inhabitants would watch together on an annual basis.

But "literary production," as I've highlighted above, reflects in this chapter conscious efforts to weave creative writing, as part of a broader arena of generated culture, into the fabric of Antarctic social life and as a product of direct experiences of and within the continent. And these efforts, I'm claiming, are no longer largely or even primarily the domain of long-term (i.e. seasonal, annual, or multi-year) inhabitants as part of the forms of life they're situated in and developing in Antarctic research bases. Nor is it the primary domain of a prior predominant and oft-recurring literary genre of the Antarctic, retrospective travel literature, which, like productions such as *The Halley Comet*, emerged out of long-term direct experience with the continent, in most cases even folding in excerpts from real-time travel diaries, but ultimately were assembled as retrospective documents to narrate and, in doing so, come to terms with the brutality of life (and death) amid an Antarctic expedition.[36] The predominant channel through which Antarctic "literary production" has happened between the 1990s and 2019 is, instead, the residency program, which consists of relatively short-term (less than a full summer season) stays for an established cultural producer for the express purposes of developing the material to produce a wide-audience work thematizing the Antarctic.

For nearly the full lifespan of McMurdo Station, the largest US Antarctic base and primary hub for US Antarctic research, creatives of various kinds have been brought down to the southern continent as part of what's currently referred to as the Antarctic Artists & Writers Program. The program, funded by the National Science Foundation, provides a summer residency of on average 6 weeks, through which selected artists and writers are granted free travel, lodging, and meals and granted the opportunity to experience base life and field work amidst US Antarctic researchers.[37] As per NSF application documentation, "The Antarctic Artists and Writers Program was established to facilitate writing and artistic projects designed to increase the public's understanding and appreciation of the Antarctic and human endeavors on the southernmost continent. The Artist and Writers Program gives priority to projects that focus on interpreting and representing the scientific activities being conducted in the unique Antarctic region."[38]

Starting in 1957, with the artist and environmentalist, Leland Curtis, the program expanded each decade between the 1950s and the 2010s, with the significant majority of participants dating from the 1990s onward.[39] The earliest participants, over the latter years of the 1950s, tended towards the visual arts, including painting and photography. Since then, a mix of participants have been brought down spanning across a range of mediums and disciplines, including music, film, painting, sculpture, a range of literary forms, and humanities scholarship. The last few decades also correspond to an increasing expansion towards works with a broadly critical character toward the express aims of the NSF of facilitating public outreach regarding Antarctica and the science done there.[40] The program has counted among its ranks the preeminent environmental historian of the Antarctic, Steven Pyne, who went down in 1982 before writing his classic, *The Ice: A Journey to*

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[36] See chapter 2 for more on the travel narrative as an early medium for psychological research and theorizing in the Antarctic.

[37] The American program is by far the largest and longest-running one for bringing down artists, writers, and humanists. The closest comparable program otherwise is Australia's Antarctic Arts Fellowship.

[38] "Antarctic Artists and Writers Program (AAW)," National Science Foundation, https://www.nsf.gov/pubs/2019/nsf19568/nsf19568.pdf.

[39] As of August 2022, the program remains indefinitely disrupted starting from the onset of the COVID-19 pandemic.

[40] Lisa E. Bloom, *Climate Change and the New Polar Aesthetics: Artists Reimagine the Arctic and Antarctic* (Durham, NC: Duke University Press, 2022), 27.

Antarctica; the preeminent cultural theorist of the Antarctic, Elena Glasberg, whose oft-cited *Antarctica as Cultural Critique* followed a 2004 Antarctic stint; and the popular documentarian, Werner Herzog, who collected footage during his 2006 residency that became the basis for the 2007 film, *Encounters at the End of the World*.

Each of these interpret and wrestle with the terms of the NSF's above-stated purpose for sponsoring residencies, and specifically with the balance between capturing "the Antarctic" and capturing the "human endeavors" that take place there. For Pyne, the former, understood in anti-humanist terms as a kind of pure nature, overwhelms the latter, Antarctica's icy sublimity far out-scaling the scientific activities that aim to represent it.[41] Glasberg's work lends legitimacy to the Antarctic as a site of cultural theorization, theorizing specifically in the terms of a kind of post-humanist tension between various competing modes of mediating the Antarctic to the wider world, the excessive Real of the Antarctic landscape both ripe for and the condition of possibility to work against capture by transnational corporate interests.[42] Herzog leans into his distinct humanist sensibilities, deliberately downplaying the Antarctic sublime, highlighting a view of MacMurdo as not dissimilar from any given stripped-bare mining town before focusing in on a kaleidoscopic picture of MacMurdo's working people, bringing together the lives, stories, and perspectives of safety trainer, bus driver, and glaciologist alike.[43]

It's in the context of this kind of institutionally-sponsored project, one that aims to facilitate the cultural representation of Antarctica in all of its geophysical magnificence and in all of the good, earnest toil that makes science possible across the continent, through which we can understand Kim Stanley Robinson's 1997 science fiction novel *Antarctica*. An established and highly acclaimed science fiction writer already, Robinson was a 1995 program resident, after Antarctica featured prominently in his magnum opus novel series, *The Mars Trilogy*. And though numerous writers of various kinds, from scholars to poets to graphic novelists, have been accepted into the program, Robinson is one of only three participants to produce a non-graphic and non-children's novelized account of the continent drawing on the experiences of his residency, and far and away the most popular and widely read among these three.[44]

Robinson's ambition in *Antarctica* appears to be that of producing a kind of definitive novel of the continent, one that captures something like the totality of a nascent community of Antarcticans stitched together by a shared investment in life on the ice and one that, following the above-noted aims of the NSF, fixates on the central role of scientific activity to this emergent "national" enterprise. Elements of Pyne's icy sublime; of Glasberg's posthuman amalgam of ecology, digitized mediatic representation, technological infrastructure, and novel ways of being human; and of Herzog's warmblooded humanism, attentive to the basic and essentially human thoughts, feelings, and labors of Antarctic life all find expression in Robinson's novel. The novel's momentum, texture, and sense of intrigue though, relative to his other work, emerges as flatter, more austere, even humdrum.

Much of Robinson's work could be accused of indulgently lavishing in the details of scientific insight or political wonkery, while slowly and ploddingly moving characters through personal or historical arcs that in their length and texture nearly fail to register the revolutionary

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[41] Pyne, *The Ice*. See the opening pages of the "Prologue," analyzed in more depth in chapter 4, for an especially stark annunciation of Pyne's anti-humanist sentiments.

[42] Elena Glasberg, *Antarctica as Cultural Critique: The Gendered Politics of Scientific Exploration and Climate Change* (New York: Springer, 2012).

[43] *Encounters at the End of the World*, directed by Werner Herzog (Discovery Films, 2008).

[44] Robinson's novel has between 10 and 20 times as much engagement on Goodreads as the other two novels, Sarah Andrews's 2007 mystery thriller, *In Cold Pursuit: A Mystery from the Last Continent* and Elizabeth Arthur's 1995 novel, *Antarctic Navigation*.

shifts they come to represent. For Fredric Jameson, this quality ties back to a "literary realist" strain that Robinson stages. Jameson's reading of the *Mars Trilogy* in particular points to an accumulation of scientific claims and facts (analogized as well to an accumulation of political tendencies, disputes, and proposals) that, with a kind of "reality effect," index for the reader a reality that the narrative comes to through "observation" and "social documentation."[45] What defines this "reality" as such for Jameson and what characterizes then "literary realism" more generally is the existence of "reality" as a limit, a point of resistance up against which efforts toward producing and resolving situations (scientific, political, social, etc.) run: "it is very precisely this kind of "resistance" of a phenomenon posited as external and independent which defines the situation of literary realisms."[46] Characters are pressed up against the resistance "reality" gives to the agential construction of history in a narrative that sees a vast ensemble work through said "reality" as a complex and evolving problem. With this in mind, perhaps the trap of the Antarctic sublime in *Antarctica* is to out-scale and therefore swallow up the contingency held within the human dramas unfolding below it. Or perhaps *Antarctica*'s reality is in and of itself too austere.

For even within Robinson's oeuvre, the indulgences of documentary observation and the story they, in composite, amount to, at moments, feel as dry as the Antarctic air itself.[47] Part of this is a matter of stakes. Robinson's best-known and most beloved work, the *Mars Trilogy*, tells the story of interplanetary colonization, planet-wide geoengineering, and successive political revolutions that culminate in the emancipation of a Martian society initially constituting itself over the sweep of a couple hundred years. If the third volume in the trilogy eschews the kind of inter-territorial political conflict that comes to characterize the first two volumes, it makes use of a landscape of generalized and growing collective emancipation to explore the kinds of lives people lead and the problems they come to encounter when given all the time in the world.[48] Robinson received renewed attention in recent years for his *Ministry for the Future*, a globe-spanning account of interconnected social and technical solutions to catastrophic climate change.[49] *Antarctica*, for all the mysteries and points of excitement it tries to set up, culminates in little more than modest political and legal re-jiggering of the Antarctic Treaty System and a tentative worker-led cooperative takeover of the logistics side of the US Antarctic program, both neat victories for the characters involved but neither holding the kind of world-historical weight and sweep that Robinson's speculative futures are known for. It's as if the primary means the text has to make readers concerned with these developments beyond simply as points of modest narrative interest is to insist on Antarctica's metonymic relation to the wider world.[50]

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[45] Fredric Jameson, "'If I Can Find One Good City, I Will Spare the Man': Realism and Utopia in Kim Stanley Robinson's Mars Trilogy," in *Archaeologies of the Future: The Desire Called Utopia and Other Science Fictions* (London and New York: Verso, 2005), 397-399

[46] Jameson, "Realism and Utopia," 398.

[47] Antarctica consists almost entirely of desert and is recognized as the driest continent on the planet.

[48] See Kim Stanley Robinson, *Blue Mars* (New York: Bantam Books, 1996). Among the conceits of the *Mars Trilogy*, allowing it to fold interpersonal character dramas together with world-historical social transformations, is the development of anti-aging treatments that allow humans to live decades and even centuries longer than a standard contemporary human lifespan. By the trilogy's third volume, this kind of emancipation from the strictures of human biological time comes to be articulated alongside a generalized, post-revolutionary emancipation of society more widely, the third volume then taking up the niche social forms, habits, and pleasures that emerge in such a situation.

[49] Kim Stanley Robinson, *The Ministry for the Future* (New York: Orbit Books, 2020). Combining narrative science fiction depicting Earth's near-term future under conditions of changing climates with diatribes, thought experiments, and even policy prescription attempting to lay out a heterogenous set of socio-technical and political prescriptions for preserving Earth's habitability for human societies *sans* widespread collapse and immiseration, Robinson's *Ministry for the Future* has been widely reviewed by mainstream press outlets, taken up in academic settings, and even catapulted Robinson to something like the status of a leading public intellectual on matters related to climate change.

[50] Kim Stanley Robinson, *Antarctica* (New York: Bantam Books, 1998), 62, 628.

The relatively flat, dry quality of the narrative comes to echo what often emerges as part of the structure of Antarctic experience. A sense of intrigue developed out of mysterious, unexplained acts of eco-sabotage, networks of underground tunnels rife with water slides and whirlpools,[51] and the relatively vast and unexplored quality of the least inhabited continent runs up against the limits of Antarctica's provincialism. The narrative grasps at something major while being confined to minor experiences of adventure at best and tedium at worst. Other popular narratives of the Antarctic have broken through those limits by investing in the mystery of the continent the possibility of paranormal and monstrous occurrences – the discovery of unknown and untamed communities of people registering and invoking oft-racist fears as in Poe's *Adventures of Arthur Gordon Pym*[52] and the narratives by Verne and Lovecraft this inspired; aliens frozen for eons under the ice as in John Carpenter's *The Thing*; overnight "turning point" climate events shifting masses of Antarctic snow and ice across the globe as in the early cli-fi film, *The Day After Tomorrow*. But Robinson's realist sensibility forces him into the continent's limits and in this way, he reproduces a dialectic of sublime spectacle and dry blankness, in an area of the Earth where the characteristic ice in its force and immensity can come to take on god-like qualities for certain commentators,[53] while others will note the relative dearth of variation and things to see.[54]

Echoing this environmental quality in the social terrain of the narrative, *Antarctica* consciously aims, from its opening, to bring this sense of sublimity and tedium to bear on the immediate experience of the daily grind of Antarctic life. The narrator opens, "First you fall in love with Antarctica, an then it breaks your heart."[55] Two long paragraphs that follow, working to establish, through the vantage point of the frustrated, Antarctic custodial worker, X, the structure of feeling in which much of the remainder of the novel will proceed, echo this opening premise in reverse. The narrator proceeds, "Breaks it first in all the usual sorry ways of the world, sure—as for instance when you go down to ice to do something unusual and exciting and romantic, only to find that your job there is in fact more tedious than anything you have ever done, janitorial in its best moments but usually much less interesting than that."[56] Our first vantage point as readers then is one that allies the perspective of the narrator with that of a commentator like Nicolas Johnson, someone who urges us to shift our focus away from Antarctic spectacle and towards the extreme mundanity of low-level Antarctic labor. By the end of this opening interlude, as the narrative reaches its first page break, things shift back to a romanticized feeling of sublimity:

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[51] Leane takes stock, in particular in her reading of *Antarctica*, of a moment in the novel when a character visiting the continent is brought down into a mysterious, unlit, underground hot bath, carved out below the South Pole station by the station's inhabitants and made into a sight of euphoric, collective pleasure through the seemingly ritualized practice of generating a whirlpool. As Leane claims, Robinson here is invoking and re-imagining a trope of speculative renderings of the Antarctic from centuries prior which imagined abyssal whirlpools spinning around either of the Earth's geographic poles. See Leane, *Antarctica in Fiction*, 51-52.

[52] On the place of Poe's *Arthur Gordon Pym* in 19th century US racial imaginaries, see Toni Morrison, *Playing in the Dark: Whiteness and the Literary Imagination* (New York: Vintage Books, 1992), 31-33.

[53] As per Stephen Pyne in *The Ice*, "Ice creates more ice, and ice defines ice. Everything else is suppressed. This is a world derived from a single substance, water, in a single crystalline state, snow, transformed into a lithosphere composed of a single mineral, ice. This is earthscape transfigured into icescape. Here is a world informed by ice: ice that welds together a continent: ice on such a scale that it shapes and defines itself: ice that is both substance and style: ice that is both landscape and allegory. The berg is a microcosm of this world" (2).

[54] Whether held up as a point of fascination or frustration, inhabitants at Halley frequently note the flat, featureless surroundings that the base looks out upon.

[55] Robinson, *Antarctica*, 1.

[56] Robinson, *Antarctica*, 1.

> And so there you are riding in the enclosed cab of a giant transport vehicle, still thinking about that girlfriend, ten thousand feet above sea level, in the dark of the long night; and as you sit there looking out the cab windows, the sky gradually lightens to the day's one hour of twilight, shifting in invisible stages from a star-cluttered black pool to a dome of glowing indigo lying close overhead; and in that pure transparent indigo floats the thinnest new moon imaginable, a mere sliver of a crescent, which nevertheless illuminates very clearly the great ocean of ice rolling to the horizon in all directions, the moonlight glittering on the snow, gleaming on the ice, and all of it tinted the same vivid indigo as the sky; everything still and motionless; the clarity of the light unlike anything you've ever seen, like nothing on Earth, and you all alone in it, the only witness, the sole inhabitant of the planet it seems; and the uncanny beauty of the scene rises in you and clamps your chest tight, and your heart breaks then simply because it is squeezed so hard, because the world is so spacious and pure and beautiful, and because moments like this one are so transient—impossible to imagine beforehand, impossible to remember afterward, and never to be returned to, never ever. That's heartbreak as well, yes—happening at the very same moment you realize you've fallen in love with the place, despite all.[57]

An exaggeratedly long sentence, like the stream-of-consciousness diary writing of a first-time resident seeking to capture their initial impressions in grandiose terms, aims to evoke the ephemeral and eye-grabbing details of the Antarctic landscape, this so as to create the effect for the reader of occupying the perspective of the lowly janitorial worker at the moment when the continent appears sublimely irresistible. Mediated through writing, this passage strives for the kind of cinematic sweep that characterizes the full gamut of commercial films shot in Antarctica, *Encounters at the End of the World* perhaps the most emblematic. For Herzog, this cinematic sweep is a feint, made to be undercut by the proceeding shots that cast McMurdo Station as an unsightly locale of mucky, extractive labor. For Robinson, on the other hand, it's the culmination: the narrative hits the note of grinding tedium, toil, and numbing familiarity to start, gets going further with the various moments of being demeaned that characterize coming to and working in Antarctica for X, and then, as if by accident, builds to the above, the "caught-off-guard" moment of surprise awe, that collapses personal frustrations and poor conditions of life into the transfixing details of sheer sense experience.

This opening interlude serves to lay out a dialectic of sublimity and tedium in brief, one that recurs over the course of the text. In that sense, *Antarctica* plays into the traditions of writing by Antarctic residents established in the annals of on-base newspapers and magazines and exemplified by the genre short stories discussed in the prior section of this chapter. Scrutinized more closely though, the earlier short stories stand in stark relief to this opening interlude and the narrative that follows. As discussed above, the short stories ultimately involve straightforwardly crass, silly devolutions into jokes and gimmicks. In them, the sublime, along with the extra-worldly, the mysterious, the loaded with potential, etc., fail in the face of daily tedium. That failure is precisely what the parodic quality of these stories registers. In Robinson's opening interlude, on the other hand, the sublime succeeds and succeeds in a kind of balanced tension with the tedium of work life. A dialectic between sublimity and tedium has come to the fore of literary production as a central theme rather than a kind of symptom, a theme that sets the terms for the conscious, outward-directed representation of human activity and social relations in Antarctica.

This dialectic marks the vantage point that Robinson opens with, that of an American Antarctic janitorial worker. Commenting on roughly the same era out of which Robinson's novel

[57] Robinson, *Antarctica*, 2-3.

emerges, Nicolas Johnson's *Big Dead Place* serves as a further point of comparison. Johnson's book is among the favorite contemporary narratives of Antarctic life by someone with substantial on-ice experience. For Johnson, with regard to questions of Antarctic sublimity and of the singular and heroic activities of Antarctic scientists, one can say resoundingly that the aim is demystification. Johnson, who spent several years across the McMurdo and South Pole American stations, working season- or year-long contracts as an "Antarctic garbageman" under the defense contractor Raytheon, which logistically administered the US Antarctic program in the late 1990s and 2000s, takes aim at any number of cliches of journalistic writing on the continent. As he notes,

> …we read in the paper that science in Antarctica is the end rather than the means, and because of this generous pursuit, everything, very soon, is going to be even better than it is now. When the NSF-sponsored journalists step from the plane, Antarctica's beauty speaks for itself, and the psychedelic vastness hobbles the critical faculties. Their stories recount the "howling wilderness" and the "galeforce winds" on "the highest, driest, coldest" and most "desolate" continent, which is "pristine" and "remote" and "isolated."[58]

Against this picture, Johnson evokes workaday frustration and settings that "might as well have been in Nebraska."[59] Presuppositions as to the sublime character of the continent give way in Johnson's unfettered narrative to the mind-numbing banalities of underpaid, over-managed work. For an average resident, he suggests, the continent is thoroughly disenchanted, characterized as much by mealy-mouthed HR reps and wage theft as the environmentally extreme conditions. To the image of the continent as one great hub for science and scientists, he makes the point over and over that on any given American Antarctic base, at any given time, the majority of residents are non-scientific operational laborers of some kind or another. In one especially telling moment, he transcribes a message sent to the South Pole station overwintering staff by then-president George W. Bush, lauding the work of the base's scientific researchers, only to note that no formally-trained or credentialed scientist counted themselves among the base's winter residents that year, the closest thing to a "researcher" on base being the technician in charge of maintaining data collection apparatuses until the return of scientific staff the coming summer.

In that sense, Johnson's writing feels allied with that of the anonymous crafters of stories and polemics in *The Halley Comet*. What the genre short stories of the earlier magazine playfully imply, Johnson directly states. As noted, Robinson, in *Antarctica*, seems well aware of the subjective position occupied by a commentator like Johnson. The novel's opening interlude highlights the demeaning banality of Antarctic labor first, setting up echoes that ring throughout. Though the novel pans out to an ensemble cast of core characters and narrative vantage points, X stays central to both the narrative movement and the novel's documentary observations regarding Antarctic life. And he's mobilized repeatedly to render a picture of the continent stratified by class divides and shot through by corporate and financial interests. Through X we find that "Back in the world the overwhelming flood of information clouded the certainty of analysis…But here they were living in a stripped-down microcosm…the global class system in miniature, clearly laid out…"[60] In its reduced form, from X's vantage point, this "global class system" comes to be expressed through a stark division between operational laborers and scientists, derisively referred to as Beakers. X in one moment says to a policymaker that McMurdo appeared as "Beaker utopia. And the rest of the people down here making nice things for them, freeing up their time, but just making wages for

[58] Johnson, *Big Dead Place*, 94.
[59] Johnson, *Big Dead Place*, 4.
[60] Robinson, *Antarctica*, 62.

themselves."[61] X makes this comment in support of a picture of an emergent social cosmos in which a reified technocratic class commands the work of a layer of infrastructurally undergirding laborers.[62]

For Robinson though, the opening interlude's movement from demeaning tedium to earnest sublimity prefigures the novel's movement from X's reified and reifying picture of a social cosmos expressed in pure form in Antarctica to a dynamic social totality. The main scientific dispute that the novel delves into comes to metaphorically structure the narrative's perception of the continent. Indexing the continent's emerging position as a key contingency in global climate projections (and drawing on actual histories of glaciological science), the primary scientific discourse brought into *Antarctica* hovers around the "battle of the stabilists and dynamicists,"[63] a battle between scientific accounts of the Antarctic ice sheet that see it stably persisting over many millions of years and those that see it having a much more dynamic history of emergence and retreat. This is also, as recognized by the novel, a "battle" over the scale and rapidity of future, human-induced changes to the composition of the ice sheet and the implications therefrom for global sea levels. Robinson positions the narrative on the side of the emerging dynamicist paradigm, linking the claim of geophysical Antarctic dynamism to a social dynamism on the continent that would dispel the necessity of any seemingly rigid class divides, legal orders, or ideological presumptions about the makeup of life on the continent. The "beakers" that Robinson presents are certainly types, whose position within a socially stratified class hierarchy in Antarctic research stations seems relatively fixed and secured, but none of this is fully inherent. In writing through the rote, determined, physically intensive quality of the scientific work that happens in Antarctica, Robinson's gesturing towards a certain continuity between X's industrial toil and the scientists themselves. And by the end of the novel, the experiments in worker self-management that represent the relatively utopian ending to the narrative are pitched squarely to the reasoned sensibilities of scientific agencies,[64] an argument at the level of narrative for the capacity of historical transformation to involve a kind of deconstruction of seemingly impassable bridges between head and hand. We come to understand that one of X's core talking points in favor of the co-op system is a situation in which workers would "not have their lives fatally split between their love of the place and the whim of the one boss in town."[65] As banal a framing of the benefits of cooperative social and industrial organization as it is, this claim harkens back to the dialectic that structures the novel's opening interlude and suggests a means of resolving that dialectic in some way other than the sheer demystifying negation of the sublime.

This is the notion of history, we get the sense by the end of the narrative, that Robinson wants to claim for the novel: history as the dynamism inherent to a social totality driven by the self-organized drive of subjects conscious of themselves as collective historical actors. At the same time, this dynamic sense of history comes to compete in the narrative with elements of the continent's historical oversaturation by early Antarctic exploration stories and their reiteration time and again through each new generation of Antarcticans. Robinson imbues *Antarctica* with historical details: all the major early expeditions are rehashed in depth,[66] place-names and monumentalized locales from these expeditions and the history of Antarctic research to follow are mapped out,[67] noted images and

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[61] Robinson, *Antarctica*, 347.
[62] See Martín Arboleda's *Planetary Mine*, examined in more detail in chapter 4, for a contemporary analysis of this kind of social totality.
[63] Robinson, *Antarctica*, 172.
[64] Robinson, *Antarctica*, 619.
[65] Robinson, *Antarctica*, 580.
[66] Robinson, *Antarctica*, 20-21, 35-38, 205-210, 227-231, 397-401.
[67] Robinson, *Antarctica*, 229-230, 533-534.

imaginaries of the continent—from early photographs[68] to more recent speculative fictions[69]—are alluded to. In comparison to *Mars*, as read by Jameson, or to the clear ambitions of *Antarctica itself*, this isn't history as collective creativity, as movement, rupture, and transition, interacting with *reality*'s resistance. It's not, in that sense, taken to its harshest extreme, history as "what hurts"[70]: because what hurts in the narrative is the hard ice and the cold, dry air. It's rather history as provincial monument, a collection of now long-past curiosities scattered across the landscape, interesting or not as a matter of taste, and perhaps initiation into the world of Antarctic imaginaries.

There's a certain self-awareness here. Val, an expedition leader in the novel who guides tourists through the Antarctic wilderness, notes, "Everyone who joined a Footsteps expedition was an expert; it only took a half-dozen books to fill you in on the entire history of Antarctica, and after that everyone had an opinion."[71] There are a very select number of texts, works of historical scholarship and travelogues, that have formed the basis for telling competing stories of the continent. These texts frequently tread the same or similar ground, refer back and forth to each other, and set the terms of tired arguments over noted matters of historical contingency. Who was at fault for certain catastrophes? Was Scott a noble leader or a dangerous megalomaniac? Why did specific events play out the way they did?[72] These arguments and the canonized details of the historical events they dwell on are instantly recognizable to fans of Antarctic history, and, in turn, tend to hold little cultural resonance for others. In this way, much of what informs the texture of *Antarctica*'s narrative is a sense of history that's for the die-hards and foreboding to casual readers. From the vantage point of its historical sensibility, *Antarctica*'s version of being a novel emblematic of the continent, rests to a significant degree on the monumental, echoing the way history has been woven into Antarctica's built space.

Val treats this historical sensibility with an air of tired frustration: the monumental history of the continent has become its own tedium, akin to the banal toil of X's custodial work. And that makes sense, as what Val oversees is one of the core, critically positioned, speculative conceits of the novel. The Footsteps expeditions noted above, for which Val works as a field guide, are part of a global industry of extreme backpacking tours that consciously retrace the paths of famed historical journeys. Characters in the novel are reproducing the steps of the first expeditions to the south pole and this serves as the novel's mechanism for itself rehashing and re-narrating these early expedition histories. As the narrator notes, this is less a matter of genuinely retracing earlier expeditions and more a kind of postmodern remediation of tired stories that have come to be structured into the (novel's) contemporary mappings of the continent. Footsteps expeditions are guided by professional experts and protected through the oversight of channels of communication and information media

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[68] Robinson, *Antarctica*, 33-34.

[69] Robinson, *Antarctica*, 24-25.

[70] Here, I'm referring back to Fredric Jameson's oft-quoted pronunciation in *The Political Unconscious: Narrative as a Socially Symbolic Act* (London and New York: Routledge, 1983): "…history is what hurts. It is what refuses desire and sets inexorable limits to individual as well as collective praxis, which its "ruses" turn into grisly and ironic reversals of their overt intention" (88).

[71] Robinson, *Antarctica*, 248.

[72] Apsley Cherry-Garrard's *The Worst Journey in the World*, Robert Falcon Scott's collected journals, and Ernest Shackleton's *South*, discussed in more detail in chapter 2, along with Roald Amundsen's *Race to the South Pole* and the 1930's Robert Byrd travelogue, *Alone*, form a kind of early canon of Antarctic historical texts. These are accompanied by a range of works within the classic historiography of the continent, recounting the exploration era and setting the terms of, while litigating, debates over how to assign praise and blame in recounting major early expeditions. These works include Roland Huntford's *Scott and Amundsen: The Last Place on Earth*, Peter Brent's *Captain Scott and the Antarctic Tragedy*, Lennard Bickel's *Mawson's Will: The Greatest Survival Story Ever Written*, Alfred Lansing's *Endurance: Shackleton's Incredible Voyage*, and, more recently, Ranulph Fiennes's *Race to the Pole: Tragedy, Heroism, and Scott's Antarctic Quest*.

that ensure up-to-date streams of weather information, comprehensive topographical knowledge of the terrain, and emergency links with rescue squads.[73]

What the narrative builds to is an effort at un-mediating these re-tracings. Compounding acts of eco-sabotage lead to the novel's greatest moments of suspense and intrigue, temporarily downing the mediated oversight of the Footsteps expedition that Val is guiding, just as the expedition finds itself dealing with a sudden injury and mired in an unforeseen blizzard.[74] Part of the novel's own re-purposing of the monumental lore it refers back to, both the injury and the blizzard allude to the doomed Scott polar party, the injury a clear echo of the undiagnosed head trauma that caused an unexpectedly rapid deterioration in the condition of Edgar Evans, the first of the five polar party members to die, while the blizzard serves as a clear re-staging of the conditions that did in Scott and the other two final members of the party. [75] Val and the Footsteps expedition she leads come to have recourse to a deus ex machina: a faction of the unknown and underground nomadic communities that have established themselves in the Antarctic (another of the novel's core speculative conceits) emerges to save the group in the narrative's initial movement towards resolution.[76]

What's interesting here is the recourse the novel itself has to Antarctica's monumental history in establishing narrative strategies for creating a sense of suspense and movement. There are curiosities littered across the continent, features of a surprisingly familiar infrastructure of contemporary work, postmodern efforts to recall and remediate long-dead histories, emerging geo-political intrigue as the Antarctic Treaties near their expiration date and the prospect of extractive enterprise grows on the continent. But each of these only lend themselves to a kind of slow, grinding movement through a landscape whose texture is most interesting to the already initiated, a grinding movement that has to wade through the apparent blankness of much of the continent. To wring out the sort of fear, tension, and pathos that was available in the earliest canonical writing emanating from the continent, the famed travelogues of the Heroic Age, the narrative goes out of its way to consciously and pointedly reproduce for its characters the precise conditions of that writing, the narrative's various plot points culminating in an unexpected resuscitation of the monumental history that had seemed, as a function of the continent's saturation with technological mediation, long dead and buried. The monumental, in that sense, becomes the initial motor in the narrative for movement back towards the kind of world-historical transformation, the potentiality for which the novel clearly has ambitions to exhibit.

As a point of comparison, one might examine how Johnson, in *Big Dead Place*, weaves the monumental history of the continent into his story of contemporary Antarctic disfunction. Johnson, throughout a narrative primarily focused on the conditions of contemporary Antarctic life, attends to the same names, moments, and stories as any of the array of Antarctic texts that pointedly delve into the continent's history. He employs though a particular method of splicing this recall into the narrative he tells, one that can be seen for instance in a discussion of Scott and Shackleton's experiences with scurvy. As he notes,

> Unbeknownst to Scott and Markham, in the 1600s Britain's East India Company had administered to sailors a spoonful of lemon juice a day to ward off scurvy, and in 1753 the Royal Navy surgeon Lind had proven that scurvy, now attributed to Vitamin C deficiency, could be prevented and cured with oranges and lemons. Because of Lind's studies, which

[73] Robinson, *Antarctica*, 13-14, 365-366.
[74] Robinson, *Antarctica*, 402-426, 460-477.
[75] For more on the Scott expedition polar party, see chapter 2.
[76] Robinson, *Antarctica*, 476-479.

> were later successfully applied by Captain Cook, in 1795 the Royal Navy began supplying vessels with lemon juice, and scurvy became, after a few decades, a medical rarity. The respite lasted until lemons were replaced with limes, which were cheaper, but lower in Vitamin C, so that scurvy once again began decimating ships' crews. Lime juice was dropped as ineffective. With detail-oriented efficiency, the blackened and stinking flesh of scurvy had been managed back into existence, the cure forgotten by the time Scott and company went on their polar quest.[77]

In a narrative centered around organizational failure, cost-cutting, and the immiseration such organizational features metes out, this story of scurvy being "managed back into existence" with "detail-oriented efficiency" is told for its clear and deliberate resonance. Impressionistically interwoven with the tell-all expose of McMurdo hijinks, rancid janitorial labor, and the spirit-crushing disciplinary mechanisms of a Raytheon-administered logistical-organizational apparatus, these tales, drawn out of the monumental history of the continent, are dispelled as long-dead monuments and made instead into the early genealogical seeds of persistent social relations.

In comparison to Johnson, Robinson, in the narrative of *Antarctica*, risks letting "the tradition of all dead generations [weigh] like a nightmare on the brain of the living."[78] The ambitions in Robinson's novel toward the world-historical seem to crash up against the impulse towards retread. If sublimity overwhelms rational description, leaving one at a loss for words, what comes after the Antarctic sublime wears off, Robinson's novel suggests, tends towards an emptiness or absence that needs to be filled in. As if it can't help doing so, *Antarctica* maintains the sense that the best material for filling in this absence is what already weighs heavy on the landscape, reprised monuments resuscitated, however artificially.

In a way then, *Antarctica* runs into a problem analogous to that of the *Halley Comet*'s genre short stories: Antarctica, seemingly so ripe a locale for mystery, possibility, and intrigue, emerges as in fact too dry and, perhaps counterintuitively, oversaturated to satisfy the needs of the best generic fiction (in this case, the kind of literary sci-fi represented by Robinson's own work elsewhere in his oeuvre). For an earlier generation of inhabitant-writers, the banal familiarity of the Antarctic scene and the everyday habits of life within it overwhelmed the stories people could tell, leading short story writers to indulge back in the forms of playful joking and prodding that served as a primary substrate for the on-base written medium writ large. For Robinson, the empty Antarctic landscape is not so wide open as say Mars, oversaturated as it is with relics of an over-remembered historical past. Overwhelming the narrative possibilities of his novel, monuments of past Antarctic life become sources of playful tinkering and reproduction amidst a collection of interesting and curious forays into the lives, habits, and institutions that dot the southern continent. At its most exciting, the novel reads something like the third volume of *The Mars Trilogy*, once the sweep of the trilogy's overarching narrative has created the conditions of post-revolutionary, open-ended freedom and given those conditions like a sandbox to its characters to play in for their own sake and on their own time. Though this quality is frequently tempered in *Antarctica*, mindfully so on the one hand by attention to the frustrations of the character's day-to-day employment, and, perhaps less mindfully on the other hand, for the kind of reader for whom Antarctic traditions and history are only an obscure afterthought. It's for this reason—the novel's yearning towards the sublime and world-historical that devolves so often into a kind of familiar Antarctico-nostalgia—that *Antarctica* does in fact compellingly dwell in the continent itself as a lived world.

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[77] Johnson, *Big Dead Place*, 49.

[78] Karl Marx, "The Eighteenth Brumaire of Louis Bonaparte," in *The Marx-Engels Reader*, 2nd ed., ed. Robert C. Tucker (New York and London: W.W. Norton & Company, 1978), 595.

Conclusion: Some Notes on Contemporary Cultural Production in the Antarctic Realm

This chapter started with a set of questions about the institutional imperatives lying behind Antarctic literary production and how they have, at various moments, informed the kind of writerly works that have emerged out of the experience of Antarctic inhabitance. Following specific archives and exemplary works in the history of Antarctic literary production, the chapter has culminated in a striking sense of resonance: both the conscious thematic concerns and the perhaps implicit or symptomatic formal and generic failures and disappointments of the short fiction of anonymous inhabitants of the first durable Antarctic research stations seem to be reproduced, to a degree, by the clearest instance of a novel suited to capturing Antarctica as a social totality. So what though of the vastly different contexts out of which these disparate literary archives and objects emerged?

Robinson's novel might be said to sit at a turning point in the relation of literary and cultural production to the forms of life cultivated on base in Antarctica, a fulcrum between early inhabitant literary production and the later resident media and artistic objects that have circulated globally. His work was sponsored by the NSF and ostensibly guided by their aims to represent the sublime Antarctic landscape and the scientific activities therein to a mass audience. His residency in Antarctica though corresponded with an initial push to critically assess and respond to this representational imperative. In this context, Robinson's novel clearly understands itself as allied not so much with a heroic picture of life and capital-S Science in Antarctica as with the toil that makes up the everyday efforts to sustain life and perform scientific research amid Antarctic conditions: allied then with someone like Johnson, an operational labor dealing with alienation from their work, sense of place, and institutional setting, and allied as well with a scientific staff that operates to a degree independently from Science as the supposed driving force behind Antarctic life. That he repeats and consciously works through a tension between tedium and exceptionality and that his work finds itself falling into the limits of generic possibility is a reflection of an earnest effort to situate himself in relation to Antarctic lifeways and labors and to the intertextual construction of Antarctic culture and subjectivity. It's not quite writing as an integrated part of a collective form of life but it's attentive enough to said form of life to exude resonant concerns and writerly impulses. And like this earlier writing, Robinson's novel, though sold and marketed as a trade science fiction, has had limited reach, at least relative to much of Robinson's other work.[79] One can still imagine with *Antarctica* a primary reader base of those who might position themselves in an imagined community of Antarcticans.

At the same time, *Antarctica* prefigures a quickly expanding cultural space marked by efforts towards a critical and critically distanced representation of Antarctic life and histories. Such a space is perhaps especially visible in the work of the art historian Lisa E. Bloom, who highlights, in her recent monograph *Climate Change and the New Polar Aesthetics: Artists Reimagine the Arctic and Antarctic*, a number of recent works that have come out of Antarctic artist residences. As she states, the monograph "investigates the way contemporary artists and activists are devising a new polar aesthetics that challenges the dominant narrative of mainstream media, which equates climate change with apocalyptic spectacles of melting ice and desperate polar bears, and green capitalism with masculinist imagery of sublime wilderness and imperial heroics."[80] For Bloom then,

[79] *Antarctica* ranks #13 on goodreads.com in terms of reader interaction, as measured by ratings, with roughly 25 times fewer ratings than *Red Mars*, the most widely reviewed novel of Robinson's on the website.
[80] Bloom, *Climate Change*, 2.

contemporary, institutionally-sponsored cultural production through artist (and writer) residencies works to critically intervene in the representational politics of the continent, unsettling dominant narratives and tropes. Among the artists of the Antarctic she examines, Connie Samaras's work from the mid-2000s in particular thematically echoes moves made by the Antarctican writers read throughout this chapter: "combin[ing] the everyday with the uncanny" so as to restore the sense of ordinariness that redounds through the "built environments" that Samaras focuses on;[81] zooming in on anonymous workers in settings that scan as banal despite their outer extremity.[82] An initial exemplar of this kind of cultural impulse, Robinson's novel likewise self-consciously lays out and works through thematic poles—humdrum toil/banal familiarity leveraged against intrigue, exceptionality, and sublimity—that appear in earlier archival stories and writings more as implicit, constitutive features.

Robinson's work can be read then within the larger contribution of the Antarctic Artists & Writers Program to a body of both literatures and cultural practices that extend a critical, reflexive representation of the continent to a non-inhabitant audience. Major works of cultural theory, film, and art, by or in conversation with program residents over the course of the 2000s and 2010s, some of which have been exhibited globally and to mass audiences, critically engage and deconstruct images of the Antarctic sublime, of Antarctica as global signifier of forthcoming climate change, and of the supposedly heroic, enterprising people who have lived and worked on the continent,[83] or these works have sought to speculatively represent Antarctica otherwise, with an eye towards future inhabitance and future myth-making in the context of planetary climate change.[84] This space of critical representation is what and *how* literary and cultural production emanating from Antarctica have come to mean, namely as a body of works that link Antarctica and the Anthropocene, while aiming to deconstruct the overladen myths and histories that have occupied the continent. Echoing this, Bloom ends a chapter of her monograph on the contemporary arts of the Antarctic and their effort to forge a "new polar aesthetics," by enjoining artists to bring a "transformed aesthetic sensibility to other contemporary sites undergoing environmental degradation to examine how—often—history, aesthetics, and climate politics intersect and collide in the spaces we do not see or know."[85] And Artistic visions of the kind circulate, an Antarctic Pavilion at the Venice Biennale initiated in 2014 featuring ice sheet art and a model interior of the futurist Halley VI station,[86] standing as a particularly notable instance thereof. Here, Antarctica comes to stand in for what's at stake in a global community of Anthropocene dwellers.

Such literary and cultural work happens though at something of a distance from the older project of writing integrated into a distinctly Antarctic form of life, where works of literary and cultural production were made with a limited audience in mind and folded into an ongoing process of play, psychic relief, and self-reflection. As with projects of architectural design and psychological assessment and experimentation, literary and cultural production have been exteriorized to a degree, shifted in their primary occurrence and functioning out of the hands of relatively long-term

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[81] Bloom, *Climate Change*, 45.
[82] Bloom, *Climate Change*, 46.
[83] With regard to visual art in particular, that a "new polar aesthetic" serves in deconstructing notions of Antarctic sublimity and heroism stands as among the core claims of Bloom's book.
[84] See, in particular, Chilean anthropologist Juan Francisco Salazar's 2015 ethnographic documentary, *Nightfall on Gaia*, discussed in detail in Juan Francisco Salazar, "Speculative Fabulation: Researching Worlds to Come in Antarctica," in *Anthropologies and Futures: Researching Emerging and Uncertain Worlds*, eds. Juan Francisco Salazar, et al. (London: Bloomsbury, 2017): 151-169.
[85] Bloom, *Climate Change*, 53.
[86] Oliver Wainwright, "Venice Architecture Biennale: the Top 10 Pavilions," *The Guardian*, June 6, 2014, https://www.theguardian.com/artanddesign/2014/jun/06/venice-architecture-biennale-2014-best-pavilions.

Antarctic inhabitants in their interactions and projects of social reproduction and into those of disciplined professionals, absorbing consolidated knowledges, including those brimming with prior inhabitant wisdom, and folding those knowledges into a projected vision of ongoing and possible Antarctic life. This exteriorization marks a subtle shift in the texture in which primary thematic concerns, most notably the interplay of sublimity and tedium in the constitution of laboring subjectivity in the Antarctic, are treated. As this chapter has shown, there's a continuity here between the spec-fi writings of *The Halley Comet* and the work of contemporary artists. But where, for the former, a sublimity/tedium dialectic or interplay was not so much a consciously named or invoked concern as a kind of inherent expression of the subjectivity and forms of life themselves out of which on-base short stories and other writings were emerging, for the latter, this thematic concern has become visible, something to be consciously invoked and made into a critical intervention into how the world at large perceives a rarely-experienced locale. In some cases, this exteriorization, at the level of both institutional conditions and thematic concerns, goes hand in hand with the evident diminishing and disappearance of habitual and collective literary and cultural production among long-term inhabitants. At Halley, where access has come to be dramatically limited in the last decade, the pressing demands of research projects amidst the need to cut the winter season, has effectively negated the prospect of anything like *The Halley Comet*, or even a regular practice of consistent blogging, from re-emerging.

Johnson's *Big Dead Place*, on the other hand, suggests that an impulse toward reflective writing and cultural production still exists in pockets of the Antarctic landscape, not only in the production of his book but in the amateur movies he notes having made with friends and colleagues in time off from janitorial toil.[87] Even a relatively successful book of the kind he wrote exists, to a large extent, away from the emergent space of critical representation that acts as the primary locus of visible literary and cultural production over the last couple of decades. What pervades Johnson's account of Antarctica is a lived frustration with the organization of life and work. His "Author's Note" ends, in parody of more expressly scholarly tomes on the continent of science, "In my menial position as an Antarctic garbageman, I was exposed to a wide array of unusual official documents that had been discarded in the White Paper category. My deep research in this area (sometimes to the bottom of the bin) would not have been possible without the conscientious recycling program of the National Science Foundation, for which I am grateful." This sets the tone for Johnson's relationship to the NSF, alongside Raytheon part of the core US Antarctic bureaucratic strata, a relationship namely of ongoing irreverence bordering at moments on a desire for sabotage. Johnson's narrative functions primarily as a juicy tell-all, an update on the genre of lived, on-ice accounts of Antarctic inhabitance for readers imagining that more than meets the eye when it comes to the generically conventional sublime, adventurous, and overwrought representations of ice life. The narrative though as well is addressed acutely to the bureaucratic apparatuses it bemoans.[88] Though it found a larger audience, an audience that Johnson certainly wrote toward, *Big Dead Place* comes across as expressly addressed to his colleagues, a form of accounting for so as to intervene in the conditions of Antarctic existence akin to aspects of earlier generations of Antarctic literary products, of which the *Halley Comet* acts as the clearest exemplar.

In that sense, Johnson's book indexes a kind of alternative, or perhaps complementary, stream of both cultural production and its critical analysis than that hovering around the products of contemporary residency programs. For a scholar like Bloom, what we see emerging out of the polar regions, including Antarctica, is an aesthetic reconfiguration going on in the representational space projected out from the regions themselves, a "new polar aesthetics," though one that seems, in part

[87] Johnson, *Big Dead Place*, 51.
[88] Johnson, *Big Dead Place*, x.

at least, to echo the thematic concerns, deconstructions, and demystifications characteristic of a subterranean field of cultural production going back to some of Antarctica's earliest institutional inhabitants. Johnson offers a glimpse of the legacy of that subterranean field in the present, and in doing so, suggests the possibility of attending to, not so much the primacy of aesthetic reconfiguration, as that of ongoing configurations and reconfigurations of the social relations of cultural production in extreme locales, asking if and how cultural production emerges out of and in turn addresses and folds into the conditions of social life and labor in the built and institutional environments of a place like Antarctica.

Chapter Four
Global Socio-Ecological Reproduction and the Labors of Climate Science

I feel like the climate scientists have kind of done our job…We've laid it out pretty clearly, but nobody's doing anything. So now it's kind of up to the social scientists.

- Peter Kalmus, Climate Scientist, NASA Jet Propulsion Laboratory[1]

Kalmus's claim here invokes the implicit role that climate scientists are understood to play in narratives of the Anthropocene. Within a global struggle to wrest the planet away from the hold of fossil capital and the effects of continued fossil fuel use, popular and scholarly discussions of climate change situate climate scientists as watch tower guards, though this role is largely couched in the past tense: climate scientists, we know, have "rung the alarm bells."[2] In this situation, climate change speaks for itself. Critical scholars of climate science have been suggesting as much going back over a decade.[3] No representational form offers the same urgency as the felt effects of heat waves, droughts, fires, floods, and various other testaments to encroaching catastrophe. We sense already that we can assimilate these disparate symptoms to the clear overarching picture that climate scientists have provided.

Yet climate science still proceeds, still organizes oft-punishing and expensive global efforts, still works to fill in gaps, refine degrees of certainty around particular predictions, and generate ever starker warnings.[4] Climate science exists within the disjuncture between physical bodies that have an elemental hold on people's lives and the virtual space of models, simulations, and projections. This disjuncture, we might suggest, manifests as a growing disjuncture between climate change as a world-historically registered social and political problem and climate science as a knowledge-producing apparatus that frames its own role as one of granular understanding in the midst of global changes that are already firmly taking course.[5] If climate scientists were once central figures in consolidating knowledge into a systematic account of climate change, they now appear increasingly peripheral, as Kalmus's claim above implies.

I take this disjuncture as a point of departure in this chapter. Within much of the theoretical literature on climate change, climate scientists appear as harbingers of planetary doom that forces certain epistemological leaps, leaps towards Gaia,[6] towards a reconciling of human and geological

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[1] John Branch and Brad Plumer, "Climate Disruption Is Now Locked In. The Next Moves Will Be Crucial," *The New York Times*, September 22, 2020, https://www.nytimes.com/2020/09/22/climate/climate-change-future.html?smtyp=cur&smid=tw-nytimes.

[2] For an acute instance of this kind of formulation, See Isabelle Stengers, *In Catastrophic Times: Resisting the Coming Barbarism*, trans. Andrew Goffey (Open Humanities Press, 2015), 48.

[3] See Brian Wynne, "Strange Weather, Again: Climate Science as Political Art," *Theory, Culture, & Society* 27, is. 2-3 (March 2010): 289-305; Kathryn Yusoff, "Excess, Catastrophe, and Climate Change," *Environment and Planning D: Society and Space* 27, is. 6 (December 2009): 1010-1029.

[4] Each IPCC report for instance comes with a starker account of what to expect over the coming decades.

[5] This characterization of climate change is something I've seen in conversations with scientists, but also can be noted, as I will elaborate more fully in the first section of this chapter, in the most recent IPCC reporting.

[6] Stengers, *In Catastrophic Times*, 43-50; Bruno Latour, *Facing Gaia: Eight Lectures on the New Climatic Regime*, trans. Catherine Porter (Cambridge, UK and Medford, MA: Polity Press, 2017), 75-110.

time,[7] towards new forms of dwelling and inhabitance,[8] towards new forms of kinship[9] -- leaps necessary to bring human life into accord with catastrophic global or planetary dynamics. These accounts of climate change start from the point of climate science's reception and assimilation into larger knowledge structures. They play on Anthropocenic alterations in temporal and spatial sensibilities. Climate change, a scientific object of analysis that encroaches on and registers everyday human life, tells us things about who we are, how we fit into extra-historical time scales, the marks we leave on the earth and how they travel, and the spatio-temporal relations that we have too long ignored.

These narratives offer valuable tools for a shared, subjective working through of the stakes and implications of climate change, but in and of themselves they risk de-materializing the integration of climate science activity into the world climate change threatens, treating climate science as simply knowledge we have and not as a persistently rooted part of how people, communities, and institutions interact with the world. For this reason, I aim in this chapter to place my focus on another side of the disjuncture between *climate science* and *climate change*. That is to say, I wish to think about climate science as an active rather than an epistemologically accomplished process, to better understand the conditions that produce a seeming disjuncture between institutional scientific knowledge of climate and a reckoning with the political, social, existential, and even epistemological stakes of climate upheaval. I wish to recognize climate science, climate models, and climate scientists not foremost in their conceptual tethering to the perils and politics of climate change, but as occupying a space within global divisions of labor that organize laboring subjects in the here and now in sometimes novel and sometimes banal, recognizable ways. I will attempt then in various ways and for various reasons to complicate the narrative, implied above, of climate science as "ringing the alarm bells" that might call global humanity into action against its own internal threats. Climate science, articulated at a global scale, as I will argue, operates with its own implicit visions of social organization and its own implicit, conflicted, and at times contradictory expectations around how laboring subjects the world over might come to effect a comprehensive response. These visions of social organization and climate response aren't determinate though they at times figure a future that roughly maintains the stability of a global, socio-ecological totality and the forms of commodity circulation and value generation that underwrite said totality. And climate science can't be understood, moreover, apart from the often automaticized and thus naturalized modes of dividing and organizing its own labors and tasks, caught up in extant global divisions of labor and tendential social, political, and economic processes.

This effort shares an affinity with the work of those characterizing the infrastructure of climate science. Paul Edwards, in particular, lays out the story, from 19th century meteorology and climatology to networked climate science in the present, of the interlocking social, technological, and legal infrastructures, a "vast machine" as he labels it, that have rendered climate and climate change

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[7] Dipesh Chakrabarty, "Anthropocene Time," *History & Theory: Studies in the Philosophy of History* 57, is. 1 (March 2018): 5-32.

[8] A range of materials across a range of orientations invoke a kind of Anthropocenic dwelling. In the first chapter of this dissertation, I discuss this in the context of the rhetorical couching of Halley VI in architectural exhibits. One sees arguments about how to inhabit or dwell in the Anthropocene as well in work by Bruno Latour that calls for new relations to terrestrial being against both globalizing progressivism and reactionary nationalist attachments to the soil. And within certain Tiqquinist and neo-romantic left imaginaries, present crises invite a consideration of new modes of immanent dwelling, either in or below the world. See, in particular, Marcello Tari, "Destituent Strike IV: The Nomos of the Commune," in *There Is No Unhappy Revolution: The Communism of Destitution*, trans. Richard Braude (Brooklyn: Common Notions, 2021), 89-110; Alex Dubilet, "An Immanence Without the World: On Dispossession, Nothingness, and Secularity," *qui parle* 30, is. 1 (June 2021): 51-86.

[9] Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016).

visible at a global scale.[10] In characterizing his use of a "knowledge infrastructure" approach, Edwards marks a resemblance between this framework and others familiar to the history of STS: paradigms, technoscience, "epistemic cultures," all of which present specific ways of approaching science as an apparatus of knowledge production, tied up with concrete practices, social and technical systems, modes of disciplining, etc. For Edwards though, "the language of infrastructure…brings home fundamental qualities of endurance, reliability, and the taken-for-grantedness of a technical and institutional base supporting everyday work and action."[11] Contemporary science is recognized through an infrastructural framework in its continuity and embeddedness across social institutions and technical interventions, yet at the same time, the infrastructural framework he brings to the story of climate science necessitates a certain assumed and historically growing intransigence or fixity to the operations of climate science, an intransigence echoed potently in the characterization of climate modelling infrastructure as "a vast machine." I aim here to push against this assumed infrastructural intransigence by working to reframe an exploration of climate science through the contested labors that undergird it. What I wish to ask here is as follows: what is uniquely revealed by treating climate science as a global labor process that organizes people, materials, and activities?

In posing this question and reframing the constitution of climate science around a global labor process, I have several concerns immediately in mind that I aim to bring into focus. The first involves recognizing that scientific knowledge and the infrastructures, cultures, and practices tied up with it are produced in a global class society, and one that, in socially and historically shifting and contingent ways, operationalize in the production of class relations, among other things, distinctions between "skilled-" or "knowledge-based-" and "unskilled-" work, distinctions between intellectual and manual labor, the racialization and gendering of distinct labor regimes, etc.. Second then is an effort to think about the taken-for-grantedness of scientific infrastructure, sociality, and the like as also a site of, at least hypothetical if not in significant ways actual, conflict, struggle, and contention, both within the formal operations of the sciences and in their relation to other groups and activities. For individual knowledge workers (and plausibly across collectivities), social and technical infrastructure—funding streams, dictates over the organization of tasks, restructurings of knowledge production operations, power relations across divisions and hierarchies of labor, etc.—can be real, if often relatively mutely expressed, sources of frustration and even antagonism. Third, as a global labor process that hinges on the circulation of information, of people and things in time, that hinges on oft-exceptional measures to ensure the health, well-being, and safety of people placed under oft-extreme conditions, climate science interfaces with an array of other labor processes that ought not be analytically stripped away from the sciences. And finally, as a labor process, the activity of climate science is at once subject to the banal aspects of capitalist-organized labor (as I will get into below) but also reflects, for those involved, a uniquely enriching, satisfying, exhilarating escape from the everyday rhythms of the wage, and as such becomes a site to think about possible constructions of life and labor in an Anthropocenic era.

To address these concerns in any comprehensive way falls far beyond what would be possible in this chapter, but in beginning to lay out some lines of thought, the following chapter is broken down into three larger sections, the first two largely conceptual and the third largely grounded in testimonies speaking to the character of scientific labor. The first section gestures towards a conceptual characterization of how climate science fits into global divisions of labor and operationalizes localized divisions of labor, with a particular attention to the concept of social

[10] Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge, MA: The MIT Press, 2010).
[11] Edwards, *Vast Machine*, 19.

reproduction. Climate in its deterioration has become and increasingly will become central to the material organization of the contemporary world, at a social, economic, and infrastructural level [a quick look at the Financial Times for instance shows "Climate" situated alongside "Companies," "Tech," and "Markets" as among the organizing categories in the paper's coverage of bourgeois political economy]. As such, scientific workers of various stripes, including scientists themselves, are increasingly centrally located within a central site of global social reproduction. In making this claim though, I work across different valences and scales of reproduction, a term originally used by Marx to account in generic terms for the conditions allowing the "continuity of the production process" across cycles of investment and commodity production,[12] before being taken up by Marxist feminists who sought to theorize the feminized and mostly unwaged domestic labors that subtend what Marxist theorists more traditionally recognized as waged, productive labor. Thinking across tensions between these major valences, I track how climate science understands its own role in reproducing the conditions of the contemporary world through the volatility of climate change and the concrete forms of social reproduction at play in arenas of climate science activity.

Social reproduction ultimately deals with the conditions that allow both individuals to continue working within a socialized labor process and that labor process to continue functioning as such. With this in mind, I turn in the second section of the chapter to a conceptual characterization of the individual and social experience of knowledge work, drawing on key critical theoretical accounts of scientific knowledge. This section is framed around the concepts of alienation and automaticity, drawing specifically on the Frankfurt School and Alfred Sohn-Rethel respectively to think either concept. As even the most extreme and remote climate research activities become increasingly subject to machinic automation, this section is an effort in thinking about the social automaticity of climate science as a labor process as a way of situating the alienation that critical STS accounts of climate science frequently invoke, an alienation founded in large part in the disjuncture I opened with between climate science and climate change.

The final part of the chapter turns towards a kind of story-telling practice, drawing on the accounts of scientists who've worked in or on Antarctica. If the first two sections of the chapter attempt to offer a conceptual characterization of the labors of climate science, the third asks, at a bare, concrete level, what these labors look like. In doing so, I also wish to ask in what ways these labors offer a picture in excess of conceptual concerns around alienation, automaticity, and the sheer maintenance and reproduction of the contemporary world system. The stories of Antarctic science show people engaged in activity that's both increasingly subsumed under the conditions of capitalist waged labor and stands in a kind of extraordinary, exhilarating excess to that subsumption.

This is part of what motivates the particular attention to Antarctic science. What people venture to do in the unique, remote conditions of an ice shelf or the Antarctic wilderness is, quite often, at a blunt level, incredible. At the same time, Antarctic climate research is and has throughout its history been indexed specifically to the global – one goes to Antarctica because of its distinct conditions for carrying out "global" research and observing "global" climate. Unlike, say, a hydro-climate scientist in California, the research of Antarctic climate scientists isn't already from the beginning tied into particular apparatuses of localized policy prescription, but rather delivered to wider national and international political actors and policy arenas after the fact and as a proxy for global concerns. Antarctic science acts then as a particularly stark site for thinking about the disjuncture between climate science and climate change insofar as one sees in Antarctic science an exceptionally acute organization of people through divisions between knowledge production and the management and application of knowledge. Scientists are scientists, activists are activists, and technocrats are technocrats, and there's a preference for maintaining these distinctions to a large

[12] Karl Marx, *Capital Volume 1*, trans. Ben Fowkes (London and New York: Penguin Books, 1976), 715.

extent. In that sense, Antarctica here offers the chance to dip into the belly of the mechanical, automaticized beast of climate science's "vast machine," a site of a uniquely acute internalization of what's frequently critiqued as climate science's alienation from place and politics.

Climate Science's Articulations of Global Divisions of Labor

On Social Reproduction

At the most general level, climate science characterizes shifting geophysical and environmental dynamics. Driving this research is the recognition that these shifting dynamics represent threats to present ecologies and social relations. Climate science then articulates a vision of global divisions of labor, situating itself within those divisions of labor and offering a framework for understanding what I will note as Anthropocenic labors of social production and reproduction. Focusing in particular on the latter, this section frames climate science in terms of an effort to facilitate the reproduction of a social-ecological totality,[13] against that totality's potential collapse and through an epoch of growing volatility. In starting to think through this effort, I wish to dwell on the notion of *social reproduction*, which will guide the remaining section's exploration.

Across *Capital*, Marx brings in the concept of reproduction to theorize the conditions for reproducing the totality of capitalist social relations through cyclical patterns of production and circulation of commodities. Marx's exploration of this reproduction comes to a head in the second volume in the form of reproduction schema, tables that divide the "total social capital" in a capitalist society into a set of distinct departments and sub-departments, broadly covering the producers of the means of production and the producers of the means of subsistence and luxury. These schema trace the movement of money and commodities between the capitalists and workers situated across these departments, pointing to the ideal conditions of circulation that hold together the ongoing reproduction, including accumulative potentials, of the total social capital.[14] This represents one key valence and scale of social reproduction, one seen in the present as the effort to reproduce a global social totality. It's within this valence that I aim to conceptualize the labors of adaptation and ongoing knowledge production that climate science implicitly figures as labors of *global social reproduction*, insofar as these are labors that aim to maintain the stability of commodity circulation in a traditional sense but also more generally the stability of a totality of social relations recognized as facing the risks of being torn apart by the conditions of ecological degradation.

Within this valence of social reproduction though, operating at the scale of a social totality, is a nested, scalar valence that resolves onto the specific reproduction of the worker and the worker's bodily subsistence. Marx speaks to this most pointedly in the first volume, where he first theorizes what he labels as "simple reproduction" (simple in this sense meaning the reproduction of cycles of production before factoring in the ongoing accumulation of capital). Here, he argues,

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[13] Though I will bracket here a deeper exploration of these conceptual tools, thinking in terms of a social-ecological totality is to a significant extend indebted to a growing body of Marxist ecological scholarship, particularly the works of John Bellamy Foster and Kohei Saito, which treat a latent ecologism in *Capital* and Marx's later writings on various sciences. At a broad level, these thinkers see in Marx's thought a central concern with an ongoing metabolic exchange between human societies and nature or what in the early Marx is called the human's "inorganic body." Though such metabolic interaction has a transhistorical existence for Marx, it takes specific forms indexed to distinct modes of production, and in this sense they see in Marx's writing a theorization of what's termed a "metabolic rift" under capitalist production, a squeezing/exploitation of the natural or ecological in service of human societies to the point of exhaustion. For more, see John Bellamy Foster, "Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology," *American Journal of Sociology* 105, no. 2 (September 1999): 366-405; and Kohei Saito, *Karl Marx's Ecosocialism: Capital, Nature, and the Unfinished Critique of Political Economy* (New York: Monthly Review Press, 2017).
[14] Karl Marx, *Capital Volume II*, trans. David Fernbach (London and New York: Penguin Books, 1978), 586-595.

> …the worker himself constantly produces objective wealth, in the form of capital, an alien power that dominates and exploits him; and the capitalist just as constantly produces labour-power, in the form of a subjective source of wealth which is abstract, exists merely in the physical body of the worker, and is separated from its own means of objectification and realization; in short, the capitalist produces the worker as a wage-labourer. This incessant reproduction, this perpetuation of the worker, is the absolutely necessary condition for capitalist production.[15]

For Marx then, the bodily reproduction of the worker is primarily mediated through the wage, the capitalist's purchase of labor-power.

It's this scale and sense of reproduction, located at the level of the body, that Marxist feminists took up and resituated beyond access to the wage in theorizing social reproductive labors, the labors that underpin the reproduction of the worker as a source of labor-power. Selma James and Mariorosa Dalla Costa in their foundational tract, *The Power of Women and the Subversion of Community*, famously argue that the working class housewife's domestic labors, from cooking and cleaning to sexual reproduction, are essential to the generation of surplus value insofar as they create the conditions for the waged worker to return to the productive process from day to day and across generations.[16] And since then, theorists have sought to complicate and expand this argument, looking at the composite of labors that even beyond the postwar industrial working class household reproduce the working classes, as well as a resource-rich material world, as sites of ongoing exploitation.[17]

What I want to note in starting is that across these valences are overlapping analytical tensions and material contradictions. The scale at which one considers the process of reproduction marks an analytical tension between attention to the kinds of high-level circulatory processes that Marx himself highlights and the granular labors, most often relegated to the private sphere, that reproduce individual bodies. And this overlaps with what James and Dalla Costa note as the oft-ignored contradiction between waged work as the sphere that defines what's thought of as "productive labor" and the unwaged "reproductive labor" that waged work relies on and yet remains abjected from the sphere of production, a contradiction around which an array of social relations, including a relation of exploitation between husband and wife in the working class family, comes to crystallize. As reproductive labor is increasingly brought under the wage, scholars note that it's most often feminized and racialized, an extension of the governing contradiction that James and Dalla Costa highlight. In my own effort to think with these categories, I would note the use of reproductive labor in efforts to maintain the health and productivity of material environments, but

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[15] Marx, *Capital 1*, 716

[16] Mariarosa Dalla Costa and Selma James, *The Power of Women and the Subversion of Community*, Accessed as PDF from https://libcom.org/files/Dalla%20Costa%20and%20James%20-%20Women%20and%20the%20Subversion%20of%20the%20Community.pdf, 17-22.

[17] It would be impossible to present an exhaustive list of such recent literatures, but beyond the well-cited work by Nancy Fraser and Tithi Bhattacharya, recent interventions that aim to expand an understanding of sites of social reproduction include the 2020 special issue of *Comparative Literature and Culture* edited by Cinzia Arruzza and Kelly Gawel, titled "The Politics of Social Reproduction" and the 2021 special issue of *Society and Space* edited by Harry Pettit titled "Hope, Labour, Disconnection," which specifically examines the "labors of hope" that "are both enabling and challenging the reproduction of capitalist relations in the contemporary moment" with a particular eye towards those "who share a structural and spatial disconnection from dominant localised circulations of capital and value" including the homeless, the unemployed, and others on the margins of contemporary capitalist value-generation. See also, Beverly Best, "Wages for Housework Redux: Social Reproduction and the Utopian Dialectic of the Value-Form," *Theory & Event* 24, no. 4 (October 2021): 896-921.

this will also come to mark a further contradiction between the social and the ecological as they come to make up a social-ecological totality. In thinking about how climate science imagines global divisions of labor and articulates its own place within these global divisions of labor, I aim to capture these sets of contradictions at various levels and as they play out in various arenas.

Labor in the Climate Science Imaginary

Perhaps the clearest overarching climate scientific projection of a global social-ecological totality into the future comes in the form of the IPCC report. The IPCC emerged early on and remains, as attested to by a wide swath of literature on climate science,[18] the core vehicle for translating global knowledge about climate change into socially and politically-inflected accounts of climate futures that national and international bodies might act on. Offering reports every five to seven years since the beginning of the 1990s, the IPCC, a voluntary association primarily consisting of climate scientists,[19] makes what become the standard projections of how key determinants of climate, from global temperature and atmospheric carbon saturation to oceanic circulation and sea ice coverage at the poles, will shift as a function of possible emissions scenarios. These projections predominantly highlight geophysical changes, their impacts on and risks for human and non-human ecosystems, and mitigation and adaptations strategies. Insofar as geophysical changes hinge on and in turn threaten to dramatically impact human activity, IPCC reports lay out certain broad prescriptions, largely though not exclusively targeting carbon emissions and pathways towards net zero emissions, and frameworks, ranging across questions of mitigation, risk management, and adaptation, for thinking about the forms that social reconstitution under changing climate conditions will take going forward.

Embedded necessarily, though often only implicitly, within these projections are expectations as to the tasks at hand that would enable relatively stable human social relations to stay intact, both through mitigation of the direst projections of climate futures and through attending to the guaranteed impacts of already locked-in climate change scenarios. I aim here to read pieces of the IPCC 2021 report[20] to register how the projected labors of mitigation, risk management, and adaptation are structured into a global vision of social organization transitioning through ecological crisis. This will entail what I am calling a speculative reading practice that searches for implied social conditions and regimes of labor within accounts of geophysical change. I use the term speculative insofar as I'm aiming to initiate a narration, focused on laboring activities, of a future extrapolated out from the description of climate change, its coming impacts, and the mitigation and adaptation strategies responding to it laid out in the 2021 report. Noting instances where this vision demarcates a place for the enduring practice of climate science itself, I'll turn in the latter part of this section to extant divisions of labor appealed to by climate scientists and operational laborers who work in and around Antarctica, one crucial site of contemporary global climate research.

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[18] Wynne, "Strange Weather," 293; Edwards, *Vast Machine*, xvi-xvii; Edmond A. Mathez and Jason E. Smerdon, *Climate Change: The Science of Global Warming and Our Energy Future*, 2nd. Ed (New York: Columbia University Press, 2018), 176.
[19] Edwards, *Vast Machine*, 398.
[20] The 2021 report, subtitled "The Physical Science Basis," was one of three such full reports released between 2021 and 2022, each taken on by one of the IPCC's three working groups. At the time of this chapter's writing, the 2021 report was the only one of the three reports available. If the two more recent reports, on impacts/vulnerability and on mitigation strategies, more directly touch on questions of employment and job impacts, as a result either of direct harm to social and infrastructural systems from climate change or of mitigation and adaptation efforts, they still leave much to the imagination in terms of extrapolating the wider conditions and labors necessary for socio-ecological reproduction at a wide scale.

In outlining the subsequent 3000+ pages of the 2021 IPCC report, the first chapter offers a breakdown of the report's trajectory into the present of climate change ('Where are we?'), the desired future ('Where do we want to go?'), and the work entailed in stitching these together ('How do we get there?').[21] Attaining an even remotely desirable future, as the report makes clear, rests on substantial measures for mitigation of the worst possible climate outcomes. Within the sketch of how the report projects "where…we want to go" are indications of what present core concerns in climate modelling practices suggest as emissions limits and target timelines for reaching net zero carbon emissions globally.[22] Mitigation, as the report suggests, happens at a global scale and thus acts as the purview of cooperative national and international legislative bodies directing a massive energy transition. The labors of such a transition of course fold in engineers and infrastructural laborers to design, implement, and build the transitions, as well as extractive and manufacturing laborers to access and work the materials necessary to effect such a transition.[23] These labors are couched within the language of decarbonization used within the report, as the report itself doesn't specify the social or technical terms for transition away from fossil fuel use, focusing instead on the measurable links between particular human activities and the concentration of carbon and aerosols that result from those activities. The report does then breakdown the climatic impacts of specific human activities—agriculture, transportation (further broken down into aviation, shipping, and land transportation), heating and cooking[24]—locating in a sense then acute sites of mitigation that large-scale climate targets must act on.

Broadly speaking, mitigation through the construction of the conditions of possibility for energy transition signal what we might think of as the labors of Anthropocenic *social production*, insofar as they involve the mass-scale production of a transformed energy infrastructure. What's difficult about this characterization and among the core contradictions that inhibits ongoing responses to climate change is that this "social production," though crucial in building out ecological conditions of futurity, doesn't reliably do what's at the very core of "social production" under capitalist social relations, the production of surplus value. Eco-Marxist scholar, Andreas Malm, argues in his *Fossil Capital* that elemental characters of energy sources including water, wind, and solar power predicated on resource flow, make them, for various reasons, resistant to extraction towards surplus value generation, as opposed to energy sources, like coal, gas, and oil, that have the elemental character of a resource "stock." [25] I bracket for now a deeper investigation of these labors, for which substantial work already attests.[26]

Mitigation though increasingly doesn't and can't exhaust speculations about transition through conditions of climate change. An array of climatic shifts that mitigation efforts can at best attenuate surges through the latest iteration of the IPCC report. We see for instance that "global-mean sea level (GMSL) keeps rising, even in the lowest scenarios and is not halted when warming is halted,"[27] "Future urbanization will amplify the projected air temperature change in cities regardless of the characteristics of the background climate,"[28] and of course the targets themselves of the Paris

[21] IPCC, *Climate Change 2021: The Physical Science Basis*, Public Report, Available at https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf, 163.
[22] IPCC, *Climate Change 2021*, 165.
[23] See, for instance, Jasper Bernes, "Between the Devil and a Green New Deal," *Commune*, April 25, 2019, https://communemag.com/between-the-devil-and-the-green-new-deal/.
[24] IPCC, *Climate Change* 2021, 866-868.
[25] Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London and New York: Verso, 2016), 38-42, 371-372.
[26] In some sense, much of the literature and political prescription around a Green New Deal wrestles directly with the labors of Anthropocenic social production.
[27] IPCC, *Climate Change 2021*, 166.
[28] IPCC, *Climate Change 2021*, 1368

accords to which the report most commonly refers as the enduring framework for mitigation, between 1.5 and 2 degrees Celsius of global temperature rise, entail continued exacerbations of extant weather extremes tied to climate change. Throughout the report then, wrestling with what's to be expected in best-case scenario projections (let alone what could be expected in more dire projections) involves what the report frames as strategies for adaptation.

As with mitigation, invocations of the "how" of adaptation hover largely at the geophysical level. In thinking through sites of extrapolation towards the labors of adaptation, I offer here a reading of chapter 10, part 6 of the IPCC report, which gives a set of example scenarios for calibrating the effectiveness of extant regional climate information for addressing regional climate shifts. The specific example scenarios given involve the 2015-2017 severe drought in Cape Town, the Indian Monsoon, and heat waves across the Mediterranean region. In laying out the conditions and studies of drought in Cape Town, the report directly offers the following interpretative and statistical information: drought cut agricultural production by roughly 20%, from which roughly 30,000 agricultural workers lost their jobs; drought put substantial stress on water supply infrastructure in the city to an extent recognizable by global media outlets and in ways demanding water-saving actions and investments that cut substantially into revenue "for companies of all sizes"; celebrated efforts stemming from an early 2000s drought to develop substantial water-saving actions throughout the city may also have had the side effect of delaying "the expansion of water supply infrastructure"; observational issues pertaining to granular understanding of the drought had to do with inconsistent weather observation, particularly in the mountain regions that hold water catchments which supply most of the city's water; future drying, though by no means certain, is likely given available (though again inconsistent) evidence filtered through regional and global precipitation models.[29] This information, as presented in the report, is, relatively speaking, rich in human faces, bringing into focus both the laid-off agricultural worker and the "water-resource planner who has to deal with potential drought like the 2015-2017 event."[30]

What though can we speculatively extrapolate further, thinking through the conditions of possibility and necessary labors subtending the narratives of adaptation found in the IPCC report? Perhaps a range of things, from necessary infrastructural labor, as well as constructive and informational labor to create the monitoring apparatuses for gauging mountain precipitation levels with greater acuity and thus foreseeing drought conditions as they arise going forward. One can imagine then social and psychological services for those shed from productive industries, including perhaps most acutely agriculture, as a function of revenue losses and the kind of land fallowing that has followed substantial droughts in other regions;[31] healthcare services to deal with the effects of systemic water deprivation; water planners and couriers to fill in gaps where water-supply infrastructure runs dry.[32] Informal and non-institutionalized efforts might be key – the casualization of South African labor is already a substantial issue for which oft-informal and decentralized precarious workers' councils and forums have arisen over the past decade, including the Casual Worker's Advice Office and the Simunye Workers' Forum.[33] Add to the efforts to secure survival-

[29] IPCC, *Climate Change 2021*, 1439-1443.
[30] IPCC, *Climate Change 2021*, 1443.
[31] See, for instance, Ruth Wilson Gilmore on land fallowing after the late-70s drought in California, in *Golden Gulag: Prisons, Surplus, Crisis, and Opposition in Globalizing California* (Berkeley: University of California Press, 2007), 65-69.
[32] For more on the specific labors to manage the use of, advocate for, and directly provide water to communities that face economic and ecological barriers to steady water supplies, see Andrea Ballestero, *A Future History of Water* (Durham, NC: Duke University Press, 2019).
[33] Shawn Hattingh and Dale T. McKinley, "Self-Organizing is Breathing Life into Workers' Struggles in South Africa," in *Workers' Inquiry and Global Class Struggle: Strategies, Tactics, Objectives*, ed. Robert Ovetz (London: Pluto Press, 2021), 232-233.

oriented militancy among workers precaritized by the effects of shifting ecological conditions, non-institutionalized healing practices that offer means to reckon with forms of loss and pain tied to drought.

One could work through a similar exercise in thinking about the climatic information laid out for a shifting Indian monsoon or for increasing heat waves across the Mediterranean. Projective evidence suggests an overall growth (as well as regional re-patterning) of Indian Monsoon rainfall,[34] as well as long-lasting, more frequent, and more extreme Mediterranean heat waves.[35] From the more imaginative infrastructural adaptations – architectural maneuvers to create indoor insulation from heat sans air conditioning for instance;[36] city planning initiatives to develop heat or heavy rain absorbing city park spaces[37] – to efforts analogous to the aforementioned labors indexed to drought in Cape Town—institutional and non-institutional care work of various kinds; worker organization to deal with the impacts on employment of productive losses resulting from extreme weather—one can see in the IPCC's geophysical projections extrapolations into the necessary labors of adaptation. Broadly speaking, I refer to these as the labors of Anthropocenic *social reproduction*. They function to stably reproduce the conditions of Anthropocenic life and labor through (and to a certain degree, ideally, in advance of) periods of ecological degradation and climatic volatility.

What I'm suggesting in these readings is that there's a speculative vision immanent to the climate sciences that makes claims on how and to what ends labors of the near and distant future ought to be organized. Looking specifically at the projections in the most recent IPCC report, one finds myriad indications of the problems that will need to be addressed and at a granular scale. A projection of how regional coastal climate change as a function of shifting sea breeze dynamics that emerge out of disruptions of hitherto normative oceanic circulation is implicitly a claim about likely adaptation measures that will need to be taken, which will hinge on labor. Immanent to climate science then is a set of *ideal* parameters for demarcating the labors of the future, ones that we might problematize to the extent they effect a reproduction of colonial relations and extant global divisions between centers and peripheries, North and South, urban and rural, but ones that offer a starting point nonetheless for envisioning a collective laboring response to a climate that we know is changing and will further and to greater extremes, even under the best scenarios. Which is to say, a starting point for asking, what labors ought to be performed going forward, and for struggling towards 1) collective ownership of the means of performing these and not other labors and 2) ensuring therefrom a fair distribution of such labors across global mediations of class.

Plainly though, these are a set of *ideal* parameters. Bracketed out of these implicit projections are questions about the politicization of various labors and their capacity to generate or infringe on the production of surplus value,[38] as well as the various problematics noted above. And here I return to the questions that guide the 2021 IPCC report ('Where are we?'; 'Where do we want to go?'; 'How do we get there?'). As the report notes about guiding questions and the structuring principles resulting therefrom, "These sections and their order align with the three questions of the Talanoa dialogue, launched during COP23 based on the Pacific concept of talanoa."[39] The report's authors then tie the structure of the report to a dialogue framed around Talanoa, an indigenous Pacific concept that here purports to ground how the geophysical facts and projections of global climate

[34] IPCC, *Climate Change 2021*, 1447.
[35] IPCC, *Climate Change 2021*, 1452-1453.
[36] Paul Miles, "Building Homes for a Heating Planet," *Financial Times*, September 24, 2021, https://www.ft.com/content/b3855b41-6476-44b8-a17c-8a5448fe13a0.
[37] See Ashley Dawson, *Extreme Cities: The Peril and Promise of Urban Life in the Age of Climate Change* (London and New York: Verso, 2017).
[38] Malm, *Fossil Capital*, 371-372.
[39] IPCC, *Climate Change 2021*, 163.

come to be narrated in stories of present and future human and planetary being. Documents written up from COP23, the 2017 United Nations Climate Change Conference in Bonn, Germany, note the following characteristics of Talanoa: "Talanoa is a traditional approach used in Fiji and the Pacific to engage in an inclusive, participatory and transparent dialogue; The purpose of Talanoa is to share stories, build empathy and trust; During the process, participants advance their knowledge through common understanding; It creates a platform of dialogue, which results in better decision-making for the collective good; By focusing on the benefits of collective action, this process will inform decision-making and move the global climate agenda forward."[40] Together, these principles suggest a constructive and collective dialogue that, as the IPCC report questions suggest, build towards the telling of a shared story.

It's worth pausing on this conceptual translation. Positioned as a traditional practice among indigenous Pacific Islander communities, Talanoa entered into international governance discourse in the early 2000s through Pacific Islander representatives of the US-established East-West Center—a non-profit set up to facilitate diplomacy and cultural exchange across the US, Asia, and the Pacific Islands—as part of the mediation between political opponents in the aftermath of a violent coup in Fiji.[41] The stated aim of this diplomatic mediation of the concept, as per one of its most prominent proponents, Tongan politician Sitiveni Halapua, has been to build up structures of democratic governance across the Pacific Islands amidst various forms of civil conflict. Alongside the Fiji coup, Talanoa dialogues served in the easing, for instance, of tensions between workers and government officials during a civil servant strike in Tonga in 2005.[42] To the extent we might make sense of Talanoa through its state-mediated uses, we should see in it a process founded and constituted through conflict: the content and activity of conflict between various actors brought into such dialogues, but also the form of the dialogues themselves as facilitating an open-ended discursive manifestation of ongoing conflict. Talanoa, as put forth by Halapua, asks its participants, representatives, in the case of Fiji, of competing factions in the nation's civil conflict, such as "political opponents, religious leaders, former hostages and coup sympathizers,"[43] to retreat from ideological and structural positionings towards a free and open discourse, self-consciously resting on and even drawing upon what emerges as the conflict between individual imperatives, needs, and opinions and the "noa" or sense of shared belonging that's preconditional to entering into such a dialogue.[44] And even as Talanoa here serves in the non-violent mediation of initially antagonistic relations ostensibly towards an easing of conflict and tensions albeit not towards a specific fixed outcome, it's also understood by both observers and proponents to be made up of "critical oratory"[45] and the sharing of "opposing views without any predetermined expectations for agreement."[46]

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[40] United Nations Framework Convention on Climate Change, "Preparations for the Implementation of the Paris Agreement and the First Session of the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement," Document, Conference of the Parties: 23rd Session, Bonn, November 6-17, 2017, https://unfccc.int/resource/docs/2017/cop23/eng/l13.pdf.

[41] Sitiveni Halapua, "'Talanoa' Helps Rebuild Unity in Fiji," East-West Center, June 14, 2002, https://scholarspace.manoa.hawaii.edu/html/10125/19486/113.html.

[42] Sitiveni Halapua, "Talanoa in Building Democracy and Governance," Future Leaders of the Pacific Conference, Pago Pago, American Samoa, February 4-7, 2013. Conference Paper. http://talanoa.org/Home_files/Talanoa%20in%20Building%20Democracy%20and%20Governance.pdf.

[43] Halapua, "'Talanoa' Helps Rebuild Unity."

[44] Halapua, "Talanoa in Building."

[45] Arcia Tecun (Daniel Hernandez) et al., "Talanoa: Tongan Epistemology and Indigenous Research Method," *AlterNative: An International Journal of Indigenous Peoples* 14, is. 2 (June 2018): 156.

[46] Halapua, "'Talanoa' Helps Rebuild."

If the Talanoa dialogue calls upon the concept to tell stories of present crisis and ongoing and future crisis-resolution, the stories told in the IPCC report, and the idealities of labors of social production and reproduction implicitly embedded within them, are tellingly emptied of structural antagonism and contradiction. The IPCC Talanoa dialogue, as evidenced by their description given above, translates the concept so as to push it away from these conflictual sinews. Even in its contemporary usage throughout the Pacific Islands, one might read into Talanoa, at times, a state-mediated effort to quell class conflict and work around social contradictions. But certainly in serving to tie together a shared understanding, and a teleological one at that ("where do we want to go?"), the concept, as taken up in climate dialogues, comes to dissolve the contexts from which its translated, writing out of it the stark structural and political antagonisms that pit opponents on either side of a coup or workers and bosses against each other. At the level of international negotiation, these dialogues, held across national stakeholders between 2017's COP 23 and 2018's COP 24 international climate change conferences, ran into, among other things, US reassertion of gas and coal energy industry interests and rejection of efforts to negotiate sharper emission reduction targets.[47] And at the level of stories of social production and reproduction embedded within the IPCC report itself, a product of negotiations across gradations of difference between the focuses, levels of caution, and projections of climate scientists, these stories remain idealities. Social production and reproduction as founded in the organization of laboring subjects are inherently sites of class conflict, situated in contradictions over how and to what end to organize socially taken-up laboring activity.

Labors in the Sphere of Climate Science

I turn in the latter part of this section to the work of climate science itself. As against the epigraph that opens this chapter, recognizable as hyperbole, the IPCC report figures the ongoing role of climate-centered knowledge work amidst the projected labors of Anthropocenic social production and reproduction. As is suggested in the report, "Projections of future weather and climate extreme events and their regional occurrence, including at different global warming levels, are important for adaptation and disaster risk reduction."[48] A reliable projective stream of information becomes then a core feature of ongoing adaptation and risk reduction efforts, efforts that will and must continue to follow the pace of ecological shifts themselves. With a greater degree of specificity, this claim is echoed in an exemplary statement such as: "There is high confidence that climate models with sufficiently high resolution are necessary for realistically simulating lake and coastal weather including coastal low-level jets, lake and sea breezes, as well as lake effects on rainfall and snow."[49] What such a claim suggests moreover is the necessity of "high resolution" and in that sense locally and regionally specific climate modelling. Across the aforementioned discussion of regional climate patters pertinent to Cape Town drought, Mediterranean heat waves, and the Indian Monsoon, a relative lack of reliable granular climate monitoring apparatuses presented itself as a

[47] This along vast differentials in perceived urgency of the climate crisis. Mohamed Nasheed, the former president of the Maldives, an island nation that faces rising sea levels as an extremely imminent existential threat, has, among regular COP attendees has been especially critical of the whole process, saying in 2019, "They've made an industry out of it…Some of these people have children who are born into the COP. They've made a whole consultation industry — people running around with files and university degrees and being extremely clever and articulate. It's surreal to see it. They are spending $100m on any of these conferences." See Simon Mundy, "My Two-Year, 26-Country Journey to the Frontlines of the Climate Battle," *Financial Times*, October 28, 2021, https://www.ft.com/content/e3bfb91d-2273-4da9-a7a7-eecf396f8d33.

[48] IPCC, *Climate Change 2021*, 166.

[49] IPCC, *Climate Change 2021*, 1400.

recurrent feature, problematic for gaining the granular understanding of ongoing climate dynamics necessary to gauge the onset of crisis-level conditions and make sense of the necessary adaptation measures. It becomes evident that insofar as we understand climate science, through IPCC's projections, to be crucial to ongoing social reproductive processes, the knowledge work entailed is necessarily place-bound, articulated at regional and local level geographic scales rather than inherently indexed to the globality through which so much climate science understands itself.

One site of struggle then for the conditions of global social reproduction might in fact be the global divisions of labor that position climatic information as a site of extraction from afar. The urban theorist Martín Arboleda proposes the notion of a "planetary mine" to situate contemporary capitalism's divisions of labor and attendant territorializations amidst a prevailing extractive logic, a logic directly applicable to primary-commodity production and with wider valences for how labor processes, including those working primarily with information, are understood and imagined. Drawing on the work of Alfred Sohn-Rethel, he ties a distinction between intellectual and manual labor[50] in the present to the labors distributed across the Global North and Global South within the planetary-scale mine of extraction spanning both direct material resources and streams of information. The picture he paints is one of a racialized workforce in the Global South working the mines, while a privileged intellectual workforce builds out the techno-scientific apparatus of extraction and, from afar, increasingly takes over "the core operations of the mine [which] tend to be carried out by a clique of well-remunerated and skilled wage-laborers."[51] As he argues, "It is therefore not possible to think about the degraded productive subjectivity of workers in a coltan mine or Foxconn assembly plant without intellectual wage-earners at other points of the supply chain codifying the knowledge to be incorporated in the former's instruments of production."[52]

These such global divisions of labor, explicitly utilized in the Anthropocenic social production of green technologies,[53] act as internal contradictions within the projections of climate science as social reproductive labor in the IPCC report, these projections resting as they do on distributions of the labors of knowledge work that penetrate the granular-scale that regional and local climate dynamics and conditions demand. One might think of this as among the clearest manifestations of the contradiction between the social and the ecological in global climate science's aims to reproduce a social-ecological totality. The social totality, resting as it does on global divisions of labor that reproduce dependency relations between Global North and South[54] comes into conflict with an ecological totality that demands new distributions of labor and resources. As much has been noted on the international stage going back to Bolivia's 2010 World People's Conference on Climate Change and the Rights of Mother Earth, which aimed at, among other things, developing an international vision of climate response from the vantage point of the Global South.[55]

These kinds of considerations ask after the position of climate science in toto amidst global divisions of labor. But within the labors of climate science, as presently practiced, an array of divisions separates particular sub-groups of knowledge workers and situate what's formally identified

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[50] I will return to Sohn-Rethel's distinction between intellectual and manual labor in much more detail later in this chapter.

[51] Martín Arboleda, *Planetary Mine: Territories of Extraction Under Late Capitalism* (London and New York: Verso, 2020), 91.

[52] Arboleda, *Planetary Mine*, 86.

[53] Bernes, "Between the Devil."

[54] For the intersection of dependency theory and sociological studies of science, see Paulin Hountondji, "Scientific Dependence in Africa Today," *Research in African Literatures* 21, no. 3 (Autumn 2020): 5-15. Though published more than 30 years ago, Hountondji's article offers echoes of concerns expressed over distributions of "green development" infrastructure across different regions of the planet.

[55] Vijay Prashad, "I Awakened Here When the Earth Was New: The Thirty-Fourth Newsletter," *tricontinental*, August 26, 2021, https://thetricontinental.org/newsletterissue/34-climate-crisis/.

as knowledge work in ways that interface directly with various kinds of social reproductive labor. It's to these divisions and labors that I turn in rounding out this section, drawing specifically upon materials taken from interviews, blog reports, and other testimonies to the labor apparatus of which Antarctic climate science is composed.

Social reproductive labors, at the scale of the body, undergird the composite of activity that makes up climate science, though these labors are the most readily demarcated away from what's formally understood as knowledge work. On Antarctic expeditions, facets of social reproductive labor are evident, usually in the present situated among particular waged roles, though the presence of these social reproductive labors in materials documenting the work of climate science in Antarctica comes largely only in shreds. British Antarctic Survey bases employ chefs, for instance, brought down in the case of the Rothera base for up to 18 months (inhabitants at Halley VI at this point stay on base only for the summer season). Though hired as chefs, those in this role are expected to take on an array of tasks, all broadly operational and extending the gamut of social reproductive labor on base to include logistical support for field site research, first aid, cleaning, and food safety training. Salaries for the position start at roughly 24,000 pounds/years (presently the equivalent of USD 33,000), alongside room and board for the duration of the 6-18 month contract.[56]

Insofar as Antarctic bases themselves are understood as autonomous units consolidating the means of knowledge production,[57] their reproduction as functional systems and bodies becomes a central concern of Antarctic research endeavors. And so, alongside the chefs who serve to facilitate the reproduction of the individual bodies of Antarctic inhabitants, plumbers and electricians play a substantial role in the overarching reproduction of the conditions of life on the ice. Like the chef, the workdays and duties of these on-base laborers quickly become expansive. Jimmy Hendry, the first Halley VI plumber, describes on-base plumbing as a 24/7 job before noting "but that's what we're here for. It's a good job."[58] The British Antarctic Survey put out a wide, even attention-grabbing call for plumbing and electrical labor in 2008, at the time listing starting salaries at 22,340 pounds/year, noted as a potential drawback in at least one newspaper article.[59] Evident in media coverage of the job listing, as well as in the archival records of polar expeditionary work more generally, is the even further distanced social reproductive labor that allows individuals to leave home for .5 to 1.5 year stints at a time.[60]

Materials on oceanographic cruises in the Southern Ocean allude, usually briefly, to an on-ship wait staff. The BAS's James Clark Ross research and logistics ship, as noted by oceanographer Paul Holland, contains a 24 hour/day bar. Scientists, engineers, and ship officers "are served…4-course meals at the table by the hard-working stewards," while aboard.[61] Another oceanographer who takes part in research cruises in either the polar north or south nearly every year, briefly alludes as well to the "catering staff, chefs, [and] stewards," clustered in his discussion together with the various members of the typically 20-30 person crew of a research vessel. These crew members appear in the commentary of scientists and technicians at a relative distance from research

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[56] "Chef – Antarctica," British Antarctic Survey, Job Description, Accessed January 14, 2022, https://www.bas.ac.uk/wp-content/uploads/2018/02/Chef-%E2%80%93-Antarctica.pdf.

[57] For more on this, see Chapter 1 of this dissertation.

[58] "Halley Research Station - being there," Youtube, video, accessed January 14, 2022, https://www.youtube.com/watch?v=dgPqyCvjDxg.

[59] Victoria Richards, "Daring Plumber Wanted (Must Like Penguins and the Cold)," *The Independent*, September 8, 2018, https://www.independent.co.uk/news/uk/this-britain/daring-plumber-wanted-must-like-penguins-and-the-cold-922490.html.

[60] Jon Kelly, "Antarctic Plumber – Frozen Pipes…Again," *BBC*, December 27, 2010, https://www.bbc.com/news/magazine-11949857.

[61] Paul Holland, "Wandering Albatross," *The Adventures of Half-Hitch Holland: A Voyage to the Bottom of the Bellingshausen Sea*, Blog, March 2, 2007, https://scurvyseadog.travellerspoint.com/archive/032007/s7/.

operations. Those more explicitly integrated together with the scientists and engineers in their day-to-day activities are the officers working the bridge, performing the navigational and watch-keeping work, as it's in conversation with them that determinations as to what kinds of scientific activities can be performed where happen.[62]

On-base social reproductive labors, at least within the workings of the contemporary BAS, aren't expressly feminized, perhaps for a couple of reasons. Among the most significant of these, the plumbing and electrical labor, reflects an arena of domestic labor that even in traditional imaginaries of the household and family unit tended to be reserved for men. Perhaps more importantly, the BAS only employed men into the early 1990s such that those assigned to cooking, cleaning, service, and care-based roles (this usually at most a matter of medical labor) were, for decades, by necessity, men. Throughout this history and into the present, there exist, on the other hand, various shreds of evidence that these positions have frequently been classed. Some of this is gestural, class markers at play across differences in accent, manner of dress, tattooing. Some of the evidence is quite literal, salary postings across different positions indicating a hierarchy across different kinds of labor – service (chef work, stewarding), plumbing, and electrical labor standing significantly below scientific labor which stands below certain kinds of managerial, operational, and engineering labor.[63]

Oral histories of early Antarctic inhabitants give indication that the roles of polar expeditioners were in the past very often mappable onto class background. A mechanic and vehicle driver in the 50s and 60s, like William Etchels, was far more likely to come from a working-class background than the well-educated geologists, surveyors, and atmospheric scientists going down to Antarctica at the time.[64] The part Irish Catholic, working-class cook for the 1965 expedition, Patrick John Haynes, even suggests the possibility of extant class consciousness being brought into early Antarctic base life,[65] something echoed occasionally in base journal allusions to on-base political discussions.[66] More than anything perhaps, distinctions between labors understood as integral to the knowledge production process, whether scientific and operational, and labors understood to primarily serve in the reproduction of the bodies of individual inhabitants and of the base as autonomous unit of operation, distinctions that fall roughly along the lines, within the work of climate science, of social production and social reproduction, serve in the demarcation of what's legible as knowledge work itself, juxtaposed then to the array of activities that stand adjacent to but are not seen to be an incorporated part of scientific research activities.

One can imagine a similar dynamic emerging within the speculative image of the Anthropocenic labors of climate adaptation briefly put forth above. To say that these speculative images are idealities, and as such evacuate the myriad contradictions both implied therein and blocking much of what constitutes these speculative images in the first place is then in part a call to draw back in these contradictions, ones that involve relations of feminization, classing, and racialization of particular labors, of relations between Global North and South, and of the waging, unwaging, and informalization that positions such labors in hierarchical relation to one another. Informal activities, labors, organizational forms, etc. that serve in reproducing at the bodily and

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[62] P. Abrahamsen (oceanographer) in discussion with the author, August 2021.
[63] "Vacancies," British Antarctic Survey, Accessed January 14, 2022, https://www.bas.ac.uk/jobs/vacancies/.
[64] William Alan Etchells, interview by Christopher Eldon Lee, British Antarctic Survey Oral Histories, AD6-24-1-35, June 15, 2009, audio, https://basclub.org/oral-history/index/AD6-24-1-35/.
[65] Haynes speaks, for instance, of budding interests in unionism and socialist politics carrying him through the years immediately preceding his trip down to Antarctica. See Patrick John Haynes, interview by Patricia Levido, British Antarctic Survey Oral Histories, AD6-24-3-39, November 7, 2011, audio, 59:49-1:00:30, https://basclub.org/oral-history/index/AD6-24-3-39/.
[66] May 18th Entry from Adelaide Island Base (Base T) Journal 1960, AD6/2T/1960/b, British Antarctic Survey Archives, Cambridge, United Kingdom.

psychic scale the collective activity of reproducing social relations at the scale of a social-ecological totality will be less clearly legible as labor that reconstructs and reproduces worlds amidst changing climate conditions. Yet, they're necessarily elements of the composite of activity that, in its entirety, constitutes knowledge work.

This composite of knowledge work that makes up climate science, even as it consists of contradictions between ostensibly productive and ostensibly reproductive labor, has, as a composite, its own social reproductive role to play, one that risks overdetermination by the social totality that organizes it. It's to this that I turn in the next section, drawing out a set of conceptual tools for thinking about the labor process that sits behind the most visible and widely commented upon product of climate science, the climate model.

Climate Models as Alienated Tools/Climate Science as Automatic Machine

The Critique of Alienated Reason

As echoes and copies of the polar futurism described in Chapter 1 proliferate across the Southern Continent, efforts to architecturally direct the sightlines of Antarctic researchers towards the ice in all of its sublime force and presence mark the built space of contemporary Antarctica. But within the relative comfort of a contemporary research base, knowledge workers sit as often as not with streams of data, perceiving the ice, air, and oceans through digital channels that neutralize as they represent the elemental force of and distinctions between life-affirming or threatening physical bodies. Registers of this perceptual gap abound, from architectural interventions to artistic works.

When the environmental historian, Steven Pyne, went down to Antarctica for what became the now-canonical environmental history of the continent, he titled this work simply, *The Ice*, and began with the following: "It appears out of the fog and low clouds, like a white comet in the twilight. To enter Greater Antarctica is to be drawn into a slow maelstrom of ice. Ice is the beginning of Antarctica and ice is its end."[67] As this opening suggests, much of Pyne's book is a project in finding the narrative and formal capacities through which to let the unyielding perception of an otherworldly mass of ice speak. He notes in the preface however,

> …*The Ice* has been exceptional. That had not been my intention. I thought it would continue themes in the history of science and exploration that I had studied in graduate school at the University of Texas at Austin… I began sketching the contours of a Third Age, an era propelled by the revelations of remote sensing, which probed the inhuman geography of the deep oceans, interplanetary space, and Antarctica… And I failed. The longer I was on The Ice, the more perplexing the scene appeared; the more problematic it became to place Antarctica within a context outside itself; the more the experience became one of things missing; the more I realized—and reluctantly admitted—that I would have to write a very different kind of book, one centered in Antarctica and on the properties that made The Ice what it was. The book would be about ice. Ice was the essential Antarctica.[68]

From afar, Antarctica appeared couched within wider histories and problematics of science but being there produced a cognitive rupture out of the quasi-theological draw of ice itself that made science, and even human presence more generally, appear alien, secondary to the immensity and

[67] Stephen J. Pyne, *The Ice: A Journey to Antarctica* (Seattle: University of Washington Press, 1986), 2.
[68] Pyne, *The Ice*, x.

particularity of place. This draw to the ice in and as itself in Pyne's work participates here in a trope of icy sublimity that enters into nearly every extended narrative of the Antarctic.

In this context, it seems only obvious that doing science in Antarctica, especially the more science occupies a virtual space aside from the field, is a sensually alienated experience of the immediately surrounding elemental geography. To look at a virtual representation—whether a graph, a visual model, or a proxy-constructed image—of an atom, a distant galaxy, a DNA strand, ecologies of the deep sea, or the like, brings into view otherwise invisible or inaccessible facets of physical reality.[69] To look at a virtual representation of the ice sheet one rests atop of is to see what's already there in degraded form. Though such a characterization is perhaps especially pertinent to ice itself, analogous claims might be made of Antarctic oceanographers travelling on one of the myriad oceanic research ships, or even an atmospheric scientist looking up into the Antarctic sky. A climate model is not bone-chillingly cold nor mind-erasingly white, it doesn't induce motion sickness or peer up at you like a blue abyss, it isn't felt (at least obviously or immediately) in the air one breathes.

Speaking in this way of scientific climate modelling practices harkens back to an array of critical categories that were brought to bear on scientific ways of knowing and engaging with the world across the 20th century critique of science, particularly within German traditions of sociology, phenomenology, and critical theory. Scientific reason was disenchanting,[70] inauthentic,[71] divorced from the contexts of its arisal, and from direct ways of perceiving the world, and displaced onto an abstract formalism.[72] Science increasingly produced knowledge at a remove from shared language and a common sense of the world and sought to operate from a dis-placed and disembodied Archimedean point that could view worlds in their totality.[73]

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[69] Significant research in Science and Technology Studies over the last decade has unfolded and probed scientific strategies for visualization. For an overview of some of the major aspects of this discussion, see Götz Hoeppe, "Representing Representation," *Science, Technology, & Human Values* 40, is. 6 (November 2015): 1077-1092. Hoeppe's article specifically reviews two edited volumes, *Representation in Scientific Practice Revisited*, from 2014, and *Visualization in the Age of Computerization*, from 2015. See also, Janet Vernesi, *Seeing Like a Rover: How Robots, Teams, and Images Craft Knowledge of Mars* (Chicago: University of Chicago Press, 2015), an ethnography of NASA visualization practices for the surface of Mars.

[70] Narratives of scientific disenchantment are especially closely associated with the work of Max Weber. See Max Weber, "Science as a Vocation," trans. H. H. Gerth and C. Wright Mills, in *Science and the Modern* World, special issue of *Daedalus* 87, no. 1 (Winter 1958): 111-134.

[71] If the language of the "authentic" and "inauthentic" comes into play in Heidegger's work most acutely in *Being and Time*, in distinctions for instance that are drawn between the primordial temporality of Dasein's authentic being and the running clock time that holds Dasein's attention in their everyday, inauthentic existence, a like distinction holds in the critique of scientific reason that Heidegger presents in "The Age of the World Picture." Here, Heidegger identifies science with a relationship to beings that gives them over to an objectification in the form of precise, representative characterizations that amalgamate into a total picture of the world, a picture aside from the world as, drawing on Pheng Cheah's exegesis of Heidegger, "the totality of useful things and their disposability for us…grounded in a total context of meaningful connections in which we exist with others" (97). See, Martin Heidegger, *Being and Time*, tr. Joan Stambaugh (Albany, NY: State University of New York Press, 1996), 385-391; Martin Heidegger, "The Age of the World Picture," in *Off the Beaten Track*, ed. Julian Young and Kenneth Haynes (Cambridge, UK: Cambridge University Press, 2002): 64-67; Pheng Cheah, "Worlding: The Phenomenological Concept of Worldliness and the Loss of World in Modernity," in *What Is a World: On Postcolonial Literature as World Literature* (Durham, NC: Duke University Press, 2016): 95-130.

[72] This describes in particular the phenomenological critique of science in Husserl's work, prompting the need for a transcendental phenomenology that would bracket the overlain objective-logical world that science characterizes and (re)-attend to a life-world of experience that sits subjectively (and historically) prior to that scientific overlay. See, in particular, Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology: An Introduction to Phenomenological Philosophy*, tr. David Carr (Evanston, Il: Northwestern University Press, 1970).

[73] Here, I refer particularly to the critique of science found in Hannah Arendt's work. See, in particular, Hannah Arendt, *The Human Condition*, 2nd Ed. (Chicago: University of Chicago Press, 1998), "Prologue," "The Human Condition," and

Perhaps most powerfully, Frankfurt School critics Theodor Adorno and Max Horkheimer argued that Enlightenment entailed the development of scientific reason as itself an alienated tool or instrument, one that took the place of self-reflective critical thought and that left itself open to appropriation. Insofar as this theorization is both grounded in Marxian notions of the alienation of labor under capitalism and specifically directed at scientific ways of experiencing, knowing, and engaging with the world, it offers a helpful entry point for beginning to think about what alienation offers conceptually across either of these valences as they're brought together in an understanding of scientific labor itself.

Couched in a story of the world-historical unfolding of Enlightenment as a transformation of human reason into a machinic apparatus for making use of objects of knowledge, driven by an impulse towards domination, Adorno and Horkheimer claim, "Human beings purchase the increase in their power with estrangement [Entfremdung] from that over which it is exerted… The man of science knows things to the extent that he can make them. Their 'in-itself' becomes 'for him.'"[74] *Entfremdung*, what's translated here as "estrangement" is conceptually linked to the elaboration of what's widely translated as alienation in characterizing the labor process out of Marx's *1844 Manuscripts*, as well as to later invocations in Adorno and Horkheimer's text of "alienated reason" (entfremdete Ratio)[75] as a machinic rationality inhering explicitly within machinic apparatuses of calculation. "Estrangement" maintains the sense of making-strange though what's being described, at least in the quote above, is a making-strange that at once separates and reduces (for the purposes of capturing instrumentally), a making-strange that then alienates an object out from the subject comprehending it and out as well from itself.

Here, we are closest to the sense of alienation alluded to above, the one that Steven Pyne recognized as the alienation of science out from the sublimity of Antarctic ice itself. To do science is, in this sense, to perform oneself as separate from cold air, immense ice, and the like, to perform these objects of interest as separate from themselves and to occupy a separate space from objects of knowledge, cognitive but also the concrete, sensually insulated, architectural spaces that Antarctic research stations tend towards. It's then as well to make what speaks for itself at a vast, extra-human scale into an instrumental reduction of itself. For Pyne, the answer to this alienated and alienating engagement with the ice was to attempt an environmental history that gave voice to that ice.

And I would suggest a similar set of moves characterizes the 21st century critique of climate modelling practices, especially in Antarctica, a critique that looks for alternatives to the alienation engendered by subject/object separation and instrumental reduction. Influential critiques by critical geographers, STS scholars, and environmental historians, including Mike Hulme, Shannon O'Lear, and Bryan Wynne all point to the reductive effects of making technoscientific, data-driven climate modelling practices stand in for other ways of knowing and experience climate change. For Hulme, mathematical climate models participate in what he terms a "climate reductionism" that "offers a future written in the unyielding language of mathematics and computer code."[76] The future, processed by climate models, for Hulme then is separated out from forms of human agency and shifts in cultural, social, and political practices and values and re-written in the strange guise of data-driven calculation. O'Lear argues that Global Circulation Models through which climate change is

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"The Vita Activa and the Modern Age." It should be noted that each of the critiques ascribed here to Husserl, Heidegger, and Arendt are thoroughly interrelated.

[74] Max Horkheimer and Theodor W. Adorno, *Dialectic of Enlightenment: Philosophical Fragments*, trans. Edmund Jephcott (Stanford, CA: Stanford University Press, 2002), 6; Max Horkheimer and Theodor W. Adorno, *Dialektik der Aufklärung: Philosophische Fragmente* (Frankfurt: S. Fischer Verlage, 1988), 21-22.

[75] Horkheimer and Adorno, *Dialectic of Enlightenment*, 29; Horkheimer and Adorno, *Dialektik der Aufklärung*, 55.

[76] Mike Hulme, "Reducing the Future to Climate: A Story of Climate Determinism and Reduction," *Osiris* 26, no. 1 (2011): 256.

made techno-scientifically legible "stabilize a discourse of climate change" that sets the terms (state-mediated, territorialized, technocratic) of a political sphere suited to respond.[77] Both the models themselves and the forms of political response they help facilitate, O'Lear suggests, are estranged, separated out, from the forms of "slow violence" that changing climates and ecological degradation carry out.[78]

Wynne, whose work on climate modelling dates back to early efforts at articulating a global vision of climate change and its possible outcomes and effects, explicitly ties a similar critique directly to the language of alienation. Speaking of the consolidation of IPCC reports and the predictive climate modelling practices they draw on as a primary mediating force in tying the social, political, and climatic together around climate change, Wynne suggests, "[the lack of sufficient political responses to global climate trends] invites us to ask ourselves whether the intensely scientific primary framing of the issue, combined as this is with an intensely economistic imagination and framing of the appropriate responses, may engender profound alienation of ordinary human subjects around the globe from 'owning the issue' and thus from taking responsibility for it."[79] Here, Wynne posits a separation out of, on the one hand, the circuits running from the expertise manifested in climate models and the technocratic policy mechanisms understood to follow from that expertise, and, on the other, the possibilities for constructing a collective political will against climate change that might broadly implicate "ordinary human subjects": a scientistic alienation, in a sense, of epistemology from politics (as opposed to the technocratic management endemic to "policy"). And for Wynne, this alienation makes for worse knowledge claims drawing on the insights embedded in climate modelling practices, knowledge claims in, for instance, the IPCC reports on climate change, that persistently understate likely climatic developments over the 21st century so as to couch climate change and its management within extant institutional mechanisms unable to accommodate possibilities for discontinuity and abrupt climatic shifts, knowledge claims that in that sense reduce climate change to a quantifiable and thus graspable version of itself.[80]

Across these critiques, there's a constructive dimension to the alienation that climate modelling practices effect, alongside the reductive shedding of particular violences, possibilities of agency and response, and the like from what climate change science frames. Climate models construct a delimited political sphere, a sensibility (however reduced) towards the future, even a kind of aesthetic release associated with witnessing distanced catastrophe. The subject carrying out scientific labor, the object of that scientific labor, and their relations to one another are all refashioned in the midst of such constructive alienation from place, from politics, from catastrophe as an experienced phenomenon, and from climate as a kind of force of nature. Climate change, its effect, and its particular textures, are refashioned as the set of phenomena happening within the space that science delimits for itself.

And scientists, as revealed in conversation, write-ups, and the like, cathect to that space however enclosed or at a remove it may be from nature as sensually encountered. In a conversation with a glaciologist working out of Halley VI, I asked about his own consciousness of space, place, and particularly the rapid changes that pose imminent threats to Halley VI's locale. As I asked the question, I had hoped to draw out something about being perhaps uniquely alert to local threats to the ice shelf he studies, about attachments to place induced in the scientific visualization of that place's ongoing shifts and possible forthcoming ruptures. I had in my mind that the glaciologist,

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[77] Shannon O'Lear, "Climate Science and Slow Violence: A View from Political Geography and STS on Mobilizing Technoscientific Ontologies of Climate Change," *Political Geography* 52 (May 2016): 8

[78] O'Lear, "Climate Science and Slow Violence," 4-13.

[79] Wynne, "Strange Weather," 291.

[80] Wynne, "Strange Weather," 295-296.

whose research specifically examines ongoing changes to the make-up of the Brunt Ice Shelf, was especially well-suited to take up this question. His research is acutely place-bound, giving him unique insight into the immediate, surrounding landscape of the Antarctic "home" that Halley VI residents occupy.[81] That immediate, surrounding landscape moreover faces threats operative at an unusually short time-horizon (a major calving event on the Brunt Ice Shelf in February of 2021 came about due to a crack that was initially only spotted in November the previous year). What indeed is the science of the Brunt Ice Shelf if not a particular attention to place?

Tellingly, he responded as such: "I guess I'm more attached to the science (most scientists are driven by the science they're doing) rather than the place."[82] Rather than elaborate on the place-boundedness of glaciological research, he appealed, as if naturally to an understanding of scientific research, to the sharp distinction between science, the ongoing acquisition of ostensibly universal knowledge, and the particularity of place, even if it's that particularity that his specific science focuses in on. Of course, the above quote doesn't exhaust the answer he gave. He did feel a certain attachment to Antarctica as a whole, having gone down many years running, both to Halley and to other research bases across the continent, and he expressed a certain disappointment at the prospect of not, for the first time in years, heading down to the ice in the midst of the COVID-19 pandemic. He moreover suggested he's "gotten quite attached to the Brunt Ice Shelf, having worked with it for a couple of years, having looked over the archives of records. I feel quite a strong knowledge of its behavior."[83] If not totally as place, he nonetheless maintains a certain investment in the ice shelf as an object of knowledge to which archives of previous characterizations give testament. At the core of his response though was a distinction between science and place, a separation of sorts of science out from the context both that science captures and that it's produced within. Science itself acts in the above statement as the dominant locus of affective attachment that drives the subject of science forward in their pursuits.

Exactly what constitutes the delimited space of science is not necessarily uniform across researchers. An Antarctic researcher, for instance, in a blog post titled "Journey to the Polar Plateau," concludes after a detailed discussion of the various legs of the journey down to the polar plateau in Antarctica to drill ice core samples, "Then, we can start our science!"[84] Science comes after the journey, arising only once in place at the particular field site of concern. In this sense, the delimited space of science is place-bound, but curiously so, the place (in this case, the polar plateau which provides key ice samples) a source of proxies for atmospheric conditions going back upwards of a millennium. Among the last legs of the journey described involves being airlifted to the polar plateau by Twin Otter aircraft. Perhaps ironically, the atmospheric chemist qua scientist is closer to the atmosphere once she's drilled deep into the ice than as the Twin Otter trip through the air takes course.

If the delimited space of science across these remarks appears alienated from place and from natural object (not to mention from the political, social, and experiential dimensions of ecological degradation), this space is of course on the other hand a space resonant with the processes involved in knowledge work around climate. Which is to say, the delimited space of science is that space constructed out of science's alienation, its at times reductive estrangement from objects of study.

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[81] Historical studies show scientists attending to place-boundedness in carrying out research in extreme locales, even reflecting on the inflections of methodology that projects bound to specific, extreme sites, produce. See, for instance, Philip W. Clements, *Science in an Extreme Environment*: *The 1963 American Mount Everest Expedition* (Pittsburgh, University of Pittsburgh Press: 2018), 20.

[82] O. Marsh (glaciologist) in discussion with the author, July 2020.

[83] Marsh.

[84] Holly Winton, "ANTARCTIC BLOG: Journey to the Polar Plateau," British Antarctic Survey, December 20, 2016, https://www.bas.ac.uk/blogpost/journey-from-uk-to-polar-plateau/.

And the most potent extant tools therein are the models, simulations, proxies, and data sets that populate that space.

That we can speak of climate modelling practices as constructive hinges in fact on understanding climate models not merely as representational forms but as tools or apparatuses employed in the performance of certain kinds of work. And here then, I wish to point to invocations of alienation in Adorno and Horkheimer that extend beyond separations of subject/object and man/nature and estranging reductions of objects of knowledge. Adorno and Horkheimer claim,

> …the more heavily the process of self-preservation is based on the bourgeois division of labor, the more it enforces the self-alienation [Selbstentäusserung] of individuals, who must mold themselves to the technical apparatus body and soul… Reason [Vernunft] serves as a universal tool [Werkzeug] for the fabrication of all other tools, rigidly purpose-directed and as calamitous as the precisely calculated operations of material production, the results of which for human beings escape all calculation.[85]

Subjects of enlightenment, Adorno and Horkheimer suggest, maintain themselves at all cost, doing so through what's being translated here as "self-alienation." But in this case, Adorno and Horkheimer use the term *Selbstentäusserung* rather than (*Selbst*)*entfremdung*, suggesting not so much a making-strange as a relinquishing of the self and specifically a relinquishing of the self onto technical apparatuses. The enlightenment self, in this account, the self of a transcendental subject endowed with the faculty to reason is split off from itself, given over to a reason transformed into a directly purposive, calculating apparatus, the universal "tool" or *Werkzeuge* that Adorno and Horkheimer here invoke. Later in this essay, they refer to an "alienated reason [entfremdete Ratio]" that takes "the form of machines."[86] Here, this relinquishing has gone a step further as reason made into a technical, calculating apparatus has been handed over to an external body, that of the machine itself. And reinforcing this sense is the use of *Ratio* rather than *Vernunft*, reason no longer a faculty within the transcendental subject (however technically re-constituted) but a generalized rationality inhering in the operations of computing machinery.

It's in these moments that Adorno and Horkheiemer most explicitly restore to concepts of alienation and estrangement their explicitly Marxian content. For the Marx of *The 1844 Manuscripts*, the capitalist labor process alienates the laborer in various ways – the laborer is alienated from others (both other laborers and the bourgeois class as a whole) through the capitalist division of labor, they are existentially alienated from what Marx terms their species-being,[87] they become alienated from the products of their labor insofar as these products no longer emerge as a direct result of their labor process but as the bourgeois-appropriated end result of an overall labor process in which they play only a particular role, and they become alienated from the labor process itself, increasingly determined by an apparatus (technical and organizational) under which they become conditioned subjects.[88] Across Marx's discussion of alienation here, he uses *Entfremdung* and *Entäussering* together,

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[85] Horkheimer and Adorno, *Dialectic of* Enlightenment, 23; Horkheimer and Adorno, *Dialektik der Aufklärung*, 45-46.
[86] Horkheimer and Adorno, *Dialectic of* Enlightenment, 29; Horkheimer and Adorno, *Dialektik der Aufklärung*, 55.
[87] This sense of alienation I largely ignore going forward, as it stands at a relative remove from the larger concerns of this chapter. It likewise mostly drops out of Marxian thought altogether in Marx's later writings, where traces of the other dimensions of alienation are evident in the description of the capitalist production process elsewhere, especially in *Capital Vol. 1*. That being said, recourse to Stiegler might offer interesting lines of thought around the relationship of reason's exteriorization into apparatuses facilitating scientific labor and the alienation of human species-being.
[88] Karl Marx, *Economic & Philosophic Manuscripts of 1844*, trans. Martin Milligan and Dirk J. Struik, 29-32, accessed January 20, 2022 at https://www.marxists.org/archive/marx/works/download/pdf/Economic-Philosophic-Manuscripts-

and to an extent interchangeably, the former emphasizing the sense of being made into a strange or unfamiliar being in the estranging process of capitalist labor, the latter emphasizing an externality, something outside of the laborer with a "a power on its own [selbständige Macht] confronting him."[89]

As is now well-known in the history of Marxist thought, for many, Marx's appeal to alienation here reflects a humanist philosophical leaning in the early Marx that was stripped away in his latter writings developing the critique of political economy, particularly *Capital*.[90] The influential value-theorist, Michael Heinrich, for instance, notes, "In [*The German Ideology*], as in the Theses on Feuerbach…Marx and Engels criticized in particular the philosophical conception of a 'human essence' and of 'alienation.' The really existing social relations under which people live and work became the object of investigation. Subsequently, the concept of a human species-being or essence no longer surfaces in Marx's work, and he only rarely and vaguely speaks of alienation."[91] To the extent alienation or associated concepts are found at all conceptually in *Capital*, Heinrich later suggests, the concept points to the overarching force of value as a totality, a kind of generalized self-manufacturing factory apparatus to which all subjects of capital, bourgeois and proletarian alike, become beholden.[92] To some extent though, this is what the notion of relinquishing as tied to the alienation of the tools and products of a labor process already gestures towards in the *Manuscripts*, the engendering of external apparatuses onto which human capacity comes to be re-produced and to which humans in their labors are in turn re-molded. Echoes of the *Entäusserung* characterized in the early Marx are vividly captured in his discussions in *Capital* of the monstrous factory apparatuses that overpower industrial laborers.[93] And across these discussions, Marx traces a movement from a labor process encountering manipulable tools to one encountering a machinic apparatus to which laborers become objects or appendages.[94] This is the movement, noted earlier, that Adorno and Horkheimer ascribe to reason, reason first made into a manipulable tool still inhering within the human subject, albeit in reduced form, and reason given over to machinic apparatuses that remold the patterns of human life and consciousness in turn.

In closing out this sub-section, what I propose is bolstering the conceptual recourse that STS, critical geography, and environmental history have had to notions of climate modelling as producing an alienated witness of catastrophe by restoring to the concept of alienation in the critique of science aspects of the Marxian character that Adorno and Horkheimer call upon. We might think about climate models as both tools within and products of a labor process, and in either sense alienable facets of scientific reason. In the Marxian account of alienation (both in the early Marx and implicitly in the discussion of machinery, the factory, and large-scale industry in *Capital*), the tools of a labor process tend towards their own erection as a self-standing force towering over and above the laborers within that labor process, a tendential phenomenon for which we might see

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1844.pdf. For a further reading of the four-fold alienation of the laborer under capitalist production, see Bertell Ollman, *Alienation: Marx's Conception of Man in Capitalist Society*, 2nd ed. (Cambridge, UK: Cambridge University Press: 1977).

[89] Marx, *Economic & Philosophic Manuscripts*, 29; Karl Marx, "Die entfremdete Arbeit," in *Ökonomisch-philosophische Manuskripte*, accessed January 20, 2022 at https://www.marxists.org/deutsch/archiv/marx-engels/1844/oek-phil/1-4_frem.htm.

[90] This argument is perhaps most closely associated with Althusser's formulation of an "epistemological break" between the young Marx's philosophical anthropology and the *science* of Marx's more advanced writings, particularly *Capital*. For more on Althusser's conception of this "epistemological break," see Louis Althusser, "Marxism and Humanism," in *For Marx*, trans. Ben Brewster (London and New York: Verso, 2005), 219-248.

[91] Micheal Heinrich, *An Introduction to the Three Volumes of Karl Marx's Capital*, trans. Alexander Locascio (New York: Monthly Review Press, 2012), 21-22.

[92] Heinrich, *Introduction*, 46-47.

[93] Marx, *Capital 1*, 544-545.

[94] Marx, *Capital 1*, 455-565.

echoes in the appeal of scientists to a virtual space of modelling and attendant proxy extraction as the locus of science itself, over and above the particularities of place. Scientists attend to a self-reinforcing apparatus of data extraction, processing, and simulation as the technically (as opposed to ethically or existentially) alienable and alienated socio-technical apparatus of science's operations. As products of a labor process, climate models are likewise alienable, becoming objects of consumption (by other scientists charged with policy prescription, policymakers, technocratic institutions such as the IPCC) only as an end result, and at a substantial remove from the labors and laborers of their production.

Head, Hand, and Automaticity

When Adorno and Horkheimer refer to the "self-alienation [*Selbstentäusserung*] of individuals who must mold themselves to the technical apparatus body and soul," invoking reason then as a "universal tool," they situate these phenomena within the "bourgeois division of labor." Without elaborating on the particularities of that division of labor, we see already here a recognition that what might be framed as the alienation inherent to scientific reason doesn't simply exists within a vacuum but is engendered within specific schemes of social organization. As noted before, climate models, alongside what's often framed as their alienat*ing* character, could be seen as well as alien*able* in a technical sense, the appropriated tools of a laboring apparatus that stands over and above specific scientific laborers, as well as the products of that labor process folded into the technocratic policy apparatus that's charged with managing the conditions of crisis and oncoming catastrophe. What I argue going forward in this section is that this alienability (and in turn the alienating, whether technically or existentially, features of climate modelling) can be situated within an apparatus that organizes divisions of labor in the operations of climate science. Scientists, technicians, operational laborers, and those existing within the shadows of climate science as a global labor process (logistics handlers in South Africa, extractive laborers helping to produce the materials for climate science's technical apparatuses, etc.) are folded into a global socio-technical apparatus and organizational form through which to read the particularities of the labors within.

In theoretically motivating some of the considerations taken up in this section, I start here by looking at the major arguments laid out by Alfred Sohn-Rethel in his work *Intellectual and Manual Labor: A Critique of Epistemology*. Sohn-Rethel argued that abstractions in knowledge production going back to Greek philosophy were founded in the emergence of the exchange abstraction and helped create and maintain distinctions between intellectual and manual labor, distinctions that came to shape and characterize scientific reason, as well as historical manifestations of class antagonism. Abstraction in scientific knowledge production effects a decontextualization of knowledge claims out of the historical geographies in which such claims are engendered, and importantly this acts as a "real abstraction," insofar as such decontextualized claims and the abstract equivalences and comparisons they rely on come to have a material force in the world, subjecting, for instance, social labor processes to their terms.[95] Among the key insights that Sohn-Rethel's arguments offer, which I return to more fully throughout this section, involve the form that distinctions between intellectual [geistige] and manual [körperliche] labor take, the automaticity of social labor processes under capitalism as facilitated by "real abstractions" of a labor process subjected to measurement and management, "real abstractions" that come to take the ultimate form of machinic automation, and the notion of "bourgeois science" as a "necessary false consciousness" as against the falsified and faulty consciousnesses of other forms of ideological thought.

[95] Alfred Sohn-Rethel, *Intellectual and Manual Labor: A Critique of Epistemology* (Atlantic Highlands, NJ: Humanities Press, 1978).

At a banal level, to speak of climate modelling as a social labor process is to recognize that the Antarctic scientist engaging with the production of climate models, whether in the initial, active data collection phase out in the field or in the act of instrumental servicing or alone at a computer working to give texture to incoming datasets, is not a spectator at the consumption end of said models. They're rather someone who draws a salary to collect and organize information under particular constraints. For many, they're moved onto and off of the ice shelf as a function of the institutional organization of their scientific labor, and as has been suggested by scientists working from Halley in the present, the Brunt Ice Shelf is a place where—like Cambridge, where many of them return to for the winter months—they're busy and experience life under the standard temporal terms of the contemporary wage: a roughly 9 am – 6 pm, 5.5 days/week schedule.[96] At the highest institutional level, full-time base inhabitants over the course of a season are employed by the British Antarctic Survey, a national research institute state-funded by the larger Natural Environmental Research Council (NERC), a subsidiary of the UK's Department of Business, Energy, and Industrial Strategy.[97] Contracts range from season-long, frequently the case for on-base service and mechanical laborers, such as plumbers and cooks, to long-term contracts for regular movement between Cambridge and the ice shelf, more often the case for scientists, engineers, and operations managers.[98]

In the course of the working day, base inhabitants are briefed in the morning on the ice shelf's weather, decide as a group in the morning on the allocation of vehicles and vehicle operators for potential field operations, and then carry out tasks specific to their scientific, technical, or operational role. A managerial strata of the operations team, usually among the highest paid on base, keeps tabs on the activities of scientists and engineers. Base inhabitants frequently informally start their working day prior to official clock-in – attending to email, it appears, doesn't go away when at the edge of the globe. As a function of the labor they're contracted to do and how it's organized, they spend as much of their "on the ice" time with technical instruments and digitized models, as well as the base's various social reproductive add-ons [games, movies, and the technicized forms of sense experience traced in the first chapter] as they do with the ice itself. They're charged with an extractive task, the collection of as much information as possible, both raw and organized, pertaining to the materialities of the Antarctic environment.[99] Overall, the base in its current form might appear like a kind of hybrid of various other spaces of knowledge and technical work, incorporating elements of the laboratory, the university, and the technological firm, though all uniquely housed together with facilities for sleep, eating, and recreation.

Amidst these generalized conditions are specific roles that operationalize conscious divisions of labor, organizing particular knowledge workers across particular tasks, tasks that variably place individuals nearer to or further from the material conditions of knowledge production. At Halley, inhabitants note that those working from the station can be broadly grouped into the science and operations teams. These divides are at once accepted and, arguably as a function of the

[96] This is the on-base schedule for Halley VI suggested by one person I spoke with, pertaining to the summer season in the years since overwintering at the base has been discontinued. Media materials and personal discussions with others suggest fluctuations of these exact numbers, particularly under conditions where overwintering, often involving prolonged periods of boredom and tedium, with little possible in the way of carrying out intensive scientific tasks, is integrated into an 18 or 34 month on-ice period.

[97] "Our Organisation," British Antarctic Survey, accessed January 21, 2022, https://www.bas.ac.uk/about/about-bas/our-organisation/.

[98] "Vacancies"; "Calling all Plumbers and Electricians to Work in Antarctica," British Antarctic Survey, September 8, 2008, https://www.bas.ac.uk/media-post/calling-all-plumbers-and-electricians-to-work-in-antarctica/; "Chef," British Antarctic Survey, accessed January 21, 2022, https://www.bas.ac.uk/jobs/careers-at-bas/operational-support/chef/.

[99] The overall characterization of daily base routines offered comes from a mixture of discussions with those who have worked at the base and from media materials documenting base life.

logisticization of the full scope of knowledge work at the base, at times fluid. Operations team members are often trained and pedigreed in scientific research, while scientists note the frequent integration of their own research tasks with those in operations, who aid in instrumental maintenance, field guidance, and the like.

Discussions with operations and science team members at the base don't obviously attest to something like class consciousness across divisions between such things as science and operations. At most, one scientist hinted that certain on-base inhabitants feel at times more managed than others. Part of this may genuinely be a function of a certain collaborative character of the work and life taken on at the base, engineers, technicians, scientists, and other operations team members frequently brought together both amid and beyond the work-day. BAS materials, from present-day interviews to historical archives and oral histories also note a long-running process of selecting out for perceived negativity among candidates for employment.[100] Scientific expeditions into extreme environments, especially in the British context, throughout their history have been very often tacitly constructed around an exclusivity rhetorically couched in evaluations of who has the "right stuff" for the expedition.[101]

Talking to those working in and around various climatic scientific enterprises, one sees science occupying a particular, if malleable, space within conscious divisions of labor. The glaciologist quoted above marking "science" off from "place," in characterizing his own role, makes recourse for instance to the division between science and operations. Perhaps paradoxically, given the above statement, he relishes the opportunity to work at the boundary between either and thus to occupy an operational capacity with direct applicability beyond what he presents as the esoteric space of research articles and data manipulation. A separate operations team member, formally trained in oceanography, calls upon the same division in noting the various tasks carried out in a typical day at Halley. While operations team members, spanning engineers, chefs, plumbers, and IT managers, service everything from the Halley VI building itself to myriad instruments of measurement and data systems to the bodies of the base inhabitants, science team members perform the work of "collecting data and doing genuine science."[102] Science would seem to stand in for direct interaction with data, involving work in excess of infrastructural servicing.

Within the arenas of "genuine science," analogous divisions unfold, organizing the labors of scientists across disciplines but also across particular spatial demarcations – the digital/virtual space of modelling, the laboratory space, the field. An atmospheric scientist I spoke with, whose work on stratospheric Ozone drawing on data collected from Halley, hovers in the virtual, atmospheric space above the Halley research station, speaks to both the implications and the variability in these divisions as they span different research agendas and disciplines. She herself, trained primarily in numerical modelling techniques, has never been to Antarctica though she worked for a period with the British Antarctic Survey. Colleagues of hers went down to the southern continent and brought back ice core samples as proxies for historical atmospheric conditions. She had difficulty conjuring up any particular relation to Antarctica as place (the continent's special quality, for her, came rather from the measurements, ice core samples, etc. that it afforded) but did note a kind of awe in seeing an ice core, segmented and sampled, up close.[103]

Among atmospheric scientists, she suggested, the distinction between those who develop models as a primary site of investigation and those who carry out measurements is fairly rigid. For

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[100] This point is further developed in Chapter 2, which deals with the effort to stabilize an Antarctic psyche.
[101] See Vanessa Heggie, *Higher and Colder: A History of Extreme Physiology + Exploration* (Chicago: University of Chicago Press, 2019), 55.
[102] T. Barningham (oceanographer and automation specialist) in discussion with the author, April 2021.
[103] A. Ming (atmospheric scientist) in discussion with the author, July 2021.

her, in demarcating where science happens and what it looks like as a labor process, she frequently invoked the interaction of datasets (often drawn from external centers for compiling climate data) and the effort to develop and solve sets of differential equations that help in characterizing those data sets. Her interaction with the atmospheric chemists drilling ice cores came out of a sensibility towards the datasets she works with. As she noted, these datasets were often approximate, imperfect, and incomplete, in ways that become most apparent when one recognizes them as not emerging out of a vacuum but as tightly linked to specific observational practices. Among the atmospheric field researchers she's worked with is the scientist quoted above who saw the work of real science happening at the point of reaching Antarctica's polar plateau. The field, rather than the Matlab window or the whiteboard filled with equations, in this case, for the observational scientist in atmospheric chemistry, is the space where the magic (or the science!) happens. She noted, on the other hand, that oceanographers, no matter the particular nature of their work, are much more likely to go out into the field. She attributes this to differences in the materiality of oceans and atmospheres – oceans are places one can occupy, in a sense, for long durations, while atmospheres (and especially the stratosphere, her area of focus) resists sustained, direct experience.[104]

Within the wider sphere of scientific labor then, forms of what Sohn-Rethel refers to as the division of intellectual and manual labor seem to re-appear: in the distinction between science and operations; between modelling and fieldwork; between disciplines that operate closer to or further from elemental materialities. But the relations across these distinctions complicate the clear demarcations that Sohn-Rethel lays out. Historically, Sohn-Rethel traces the emergence and re-emergence of these distinctions to certain shifts in modes of production. As he argues, forms of geometric measurement of significant sophistication existed in Egypt prior to their formalization in Greek Antiquity, though in specific, concrete acts of laying out materials such as rope. But it was with ancient Greece's development of individuated property relations that measurement came to rely on abstraction. Measurement was no longer extinguished in the act of its use and inherence in specific materials but endured in an abstract geometric space that could guarantee the enduring demarcations of particular plots of land.[105] An analogous shift, Sohn-Rethel argues, accompanied the shift from generalized artisan labor to capitalist organizations of social labor, the former integrating, within the individual artisan, knowledge and the physical acts of production, the latter increasingly displacing knowledge of the labor process as a whole onto abstracted, managerial capacities, separated out from the concrete acts of labor that made up the production process.[106]

Bracketing questions as to their validity, the historical narratives Sohn-Rethel offers serve in conceptually forwarding what is at stake for him in the division of intellectual and manual labor. He's concerned specifically with a capacity to separate a mental act out from the physical conditions that necessitate that act in ways that tend towards producing subjectivity at a distance from the motions and labors of individual subjects. Doing so reflects an externalization of the mental act to the physical one in ways that allow the former to be brought down to bear unidirectionally on the latter. Internally within the constitution of the Antarctic climate sciences, as attested to by those situated variously across them, this unidirectional flow of command from head to hand is not obvious. Individuals vacillate, to some degree, across roles – operations team members have a significant hand in directing the organization of scientific labor based on anything from health and safety concerns to availability of field guides and instrumentation, though science teams still call upon the operations team for specific tasks. Modelling and fieldwork is likewise not, by the account of either side, a one-way flow but rather a recursive process with modelling and field work mutually

[104] Ming.
[105] Sohn-Rethel, *Intellectual and Manual Labor*, 101-103.
[106] Sohn-Rethel, *Intellectual and Manual Labor*, 111-123.

directing one another, and, for certain disciplines, occupying the same teams and individuals at various points throughout the year. Internal to knowledge work in this arena then is, on some level, the kind of integration of head and hand that composes a collective labor process predicated less on control than on collaboration.

Where Sohn-Rethel's theorization though might become useful is in his discussion of a kind of automatic "second nature" of a production process. Introducing what he terms "second nature" as a "purely social, abstract, functional" reality in contrast with the substrate of primary nature in which humans directly interact with their environment, Sohn-Rethel positions the act of commodity exchange as the kernel of this "second nature." Key for his theorization then is that this "second nature" is at once abstract and social, inhering in an act, exchange, that has real social force in the world even as it embodies an act of abstraction out from the commodity's use and production. In this way then, for Sohn-Rethel, "Two aspects are…combined under the single heading 'second nature': its socially synthetic reality in historical time and space and the ideal form of cognition through abstract concepts."[107] "Second nature" consists of a real and a conceptual abstraction, the operations of exchange themselves which dictate the access of producers and commodity owners to means of subsistence and further production and the conceptual sphere that initially enables the exchange act but proliferates and formalizes itself from there. I propose thinking of the virtual space of climate modelling, projection, and simulation along similar terms. As part of the wider conceptual sphere of scientific knowledge, climate modelling virtualizes planetary systems into a "second nature" with its own modes of manipulation and intervention. But it also exists within the context of a "real abstraction," a consolidation of social relations that organize the movement and interactions of people in space and time.

And crucially, for Sohn-Rethel, this "second nature" engenders a kind of automaticity to production processes organized under capitalist social relations. A scientific managerialism acts on the substrate of "abstract social labor" to shape the individual operations of laborers and their organization in space and time relative to one another. Laborers are made to adhere to a process that seems to function automatically.[108] This is the imposition of a subjectivity external to the physical acts involved in production that then come to mold and manipulate those physical acts. What I would suggest is that knowledge work is subject itself to a kind of automaticity, one that draws on an abstracted notion of science and its operations that come to "really" shape how science is carried out but also how its written, where individual knowledge workers are positioned in an overarching scientific process, and how said knowledge workers think their relation to culture, politics, and the like. What STS scholars frequently critique as the narrative of the one-way movement from objective science to political enactment[109] is part of the automaticity underlying the organization of knowledge work. This automaticity inheres in chains of command, disciplining of knowledge, as well as funding and institutional structures in which science is carried. An oceanographer I spoke to notes, for instance, that, in applying for funding for oceanographic cruises to study the Southern Ocean, stable repetition of extant streams of measurement are the most likely projects to get funding as they rest on the ongoing use of existing infrastructure.[110]

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[107] Sohn-Rethel, *Intellectual and Manual Labor*, 61.

[108] Sohn-Rethel, *Intellectual and Manual Labor*, 148-158.

[109] This one-way movement is a variation on what STS scholars have come to call the "diffusionist model" for thinking the relationship between science and society, a model that assumes the production of knowledge in rarefied spaces and its subsequent diffusion into popular consciousness. For more on the "diffusionist model," see Roger Cooter and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture," *History of Science* 32, is. 3 (September 1994): 237-267.

[110] Abrahamsen.

While the results of science may play a role in the direction of other forms of labor, internal to the process of knowledge work is less obviously a direct relation of command and control between intellectual and manual labor and more a running-together across various divisions, equally subject to the automaticity of the sciences, as they've been infrastructurally and institutionally laid out. Compellingly, Sohn-Rethel argues that the actual automation of labor processes is then its own kind of "real abstraction," taking the social relations of an increasingly automatic "second nature" and structuring them into the technological mechanisms around which production processes come to be coordinated.[111] The automaticity of a labor process is then the automaticity engendered by production relations, institutional control, and the like but also tends towards machinic automation itself. This is where I see, at the broadest scale, climate modelling as a "vast machine" of social relations inhering a "real abstraction" of sorts: an abstracted determination of what climate is, how it's known, and how it's acted upon that comes to then really organize the circulation of people, materials, and knowledge across space and time, the affective investments and rhythms of life and labor of knowledge workers, and the possibilities or foreclosures of political interventions.

I would argue this is key in understanding statements noted above that show the affective investment of scientists in the virtualized space of models and simulations, seemingly over and above the particularity of place. Knowledge workers across divisions of labor cathect to the specific objects that occupy them (both cognitively, but also in the nitty gritty temporalities and materialities of their labors) – in some cases climate models and datasets, in others ice core samples, in others the whole of an ocean or ice shelf but mediated through layers of simulation and scientific visualization techniques. That the virtual space of climate models, as against the elemental hold of sea, ice, or air, would swell among scientists as a site of affective attachment makes sense and not just because climate models are the most heavily appropriated, consumed, and commented upon end results of the work of climate science. Amidst divisions and organizations of the labors of contemporary climate science, scientists are very often placed at an increasing remove from the elements as part of a technical re-organization that prioritizes the ongoing extraction of climate observations independent of the physical presence of observers or the subjective act of observation.

In the first chapter of the dissertation, I come to a characterization of the Halley VI research base as a kind of automaton, acting as a unit in the instrumentally-mediated extraction and networked communication of data about the surrounding environment. As with the industrial factory, humans increasingly act as appendages within this automaton, their particular mental acuities out in the field or the laboratory increasingly marginalized to the automated collection, flow, and manipulation of environmental data. Talking to the operations manager who heads up the automation process at Halley VI now, one gets the sense that in the long term, fewer scientists will inhabit the base for shorter portions of the year, and the work of those who do will increasingly bear primarily on instrumental maintenance.[112] At the same time, scientists remain situated at an end of these mechanisms of data collection and manipulation, as processors of information. They develop, work with, and interpret models that result from said data collection and translate the results coming therefrom into descriptions of the present and future state of environmental processes in the land, air, ice, and sea.

In laying out these divisions of labor across the practices entailed in the global labor process of climate science (and climate modelling more specifically), I don't intend to reject climate models as the alienable tools of scientific knowledge production around climate change. What comments from scientists above and the elaborations brought forth in the next section make clear is that climate models are involved in what Sohn-Rethel calls a "real abstraction." In his own critique of the

[111] Sohn-Rethel, *Intellectual and Manual Labor*, 172-175.
[112] Barningham.

bourgeois sciences from Galileo through the 19th and early 20th century, Sohn-Rethel distinguishes between a faulty and a necessary false consciousness. As he argues, what he deems a "false consciousness" in the bourgeois sciences was not faulty or mistaken, not missing the point or making logical errors. In fact, this "false consciousness" was logically sound and held to its own standards of truth. Rather, "Necessary false consciousness is false, not as a fault of consciousness, but by fault of the historical order of social existence causing it to be false."[113] Though it may not be appropriate to hold to Sohn-Rethel's terms here of a false consciousness, the spirit of his argument is what I'm driving at in situating the virtuality and alienation of climate modelling practices within the social organization of knowledge work. By the standards of truth into which scientists and other knowledge workers are positioned and disciplined, climate modelling in its present existence is the clearest, sharpest, most acute mode of making sense of acting upon global environmental change, even as what's expressed in critiques of climate modelling accurately diagnose a paralysis in the mechanisms for active response to climate change attendant to the automaticity of climate science as a global labor process. And even as Sohn-Rethel's critique invites us to take seriously the question of whether climate scientists and other knowledge workers are being exploited or at the very least subjected to and under the impersonal forces of an automaticized system of organizing climate knowledge production.

As the next section will develop, the sphere of climate modelling engenders conscious capacities that shape a depth of perception into the granularity of climatic characteristics and shifts that extends far beyond, even as it might in cases tangentially draw on, the sensually experienced. Perhaps a better way of putting this demands returning then to Stiegler – Dasein and technics co-constitute one another and in that sense, the tools emerging out of climate science have, for those situated in the labor process producing them, engendered new and valuable subjectivities and a depth of vision with regard to climate catastrophe. The remainder of this chapter will be an effort in thinking, not away from climate modelling practices, but rather towards the material dimensions of the subjectivization of the scientific knowledge worker in the midst of their acts of labor.

Materializing the Production of Climate Models

Thomas Kuhn famously critiqued narratives in the history of science that saw the evolution of the sciences following a linear, progressive path coming ever closer to truth. The history of science, he claimed, was rather made out of revolutionary ruptures in the paradigmatic structures that held together a particular discipline and the core theoretical framework(s) underlying it. On either side of these ruptures were standards of truth, of practice, idioms, vocabularies, educational forms and the like that would be effectively illegible to one another, even if their appearance was strikingly similar.[114] Despite the title of his canonical *Structure of Scientific Revolutions*, it was the coherence of paradigmatic structures in a practice of "normal science" that came to hold a thicker, richer texture in his book than the revolutionary rupture itself. A reader of Wittgenstein, [115] Kuhn sought to describe the "normal" practice of science, and thus the resistance within that "normal" practice to revolutionary rupture in the occasions when it arises, as something akin to what Wittgenstein would call a "form of life." The Kuhnian paradigm was not strictly speaking ideological, held within the coherence of a particular theory in and of itself, but rather consisted of

[113] Sohn-Rethel, *Intellectual and Manual Labor*, 197-198.
[114] Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970).
[115] For a recent take on this oft-noted intellectual heritage, see Paul Hoyningen-Huene, "Kuhn's Development Before and After *Structure*," in *Kuhn's Structure of Scientific Revolutions – 50 Years On*, ed. William J. Devlin and Alisa Bokulich (New York: Springer, 2015), 185-195.

integrated modes of habituation and collective disciplining, particular and internally holist grammatical structures, and paradigmatic acts, like a model experiment, each of which couldn't be disentangled from one another without risking unraveling the entirety of a discipline's practice and sense of self-understanding.

This attention to the habituated features of "normal science" came to permeate how the emergent field of Science and Technology Studies initially understood its own relation to the sciences. Reaching its most apparent form in Bruno Latour and Steve Woolgar's anthropological account of the laboratory, STS instantiated an attention to science in its doing rather than science as accomplished claims, results, theories, policy outcomes, or the like. For various reasons, including Latour's own discomfort with his earlier, critical work, much of STS has turned away from this modality.[116] This section is an effort in restoring to a critical STS these earlier moments in its history. What's positioned in earlier sections as the alienated nature of climate modelling as a labor process, displacing subjectivity onto external forms, machinic and institutional, that organize knowledge workers in relation to particular objects of study and concern amidst particular divisions of labor, and often at a distance from the felt urgency, necessity of intervention, and necessity of politicization that those objects conjure for the lay person – this reflects a structural critique of how science and normative scientific epistemology operates and is constructed. But this critique doesn't exhaust a characterization of climate modelling as active labor process which becomes apparent when the experiences of knowledge workers themselves are brought to bear on an account of climate modelling.

Opening up the "black box"[117] of climate modelling conjures forth the habituating and subject-producing acts that climate science entails, exposing a field of individual and collective activity that at once legitimates for those involved and exceeds any present organization of climate science, in the latter case then serving as possible subjective material to work with in beginning to imagine a reconstitution of the sciences. The section is split across certain key ecologies of the climate model: air, ocean, ice, and the virtual, tracing moments of routine, devotion, habit, boredom, desire, awe, and rapture in the interactions of knowledge workers with these ecologies.

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[116] This is maybe for a separate project but I figure I should write out my thoughts on this here. One way I have of understanding the trajectory of STS is to see certain work in the 80s and early 90s, by the likes of Latour and Haraway, to bring the insights of STS to scientists and technologists themselves to initiate cross-the-aisle conversations between the hard sciences and the critical social sciences and humanities, as having petered out to a large extent, not really accomplishing what it hoped to, in terms of intervening in the organization and practice of science, and culminating perhaps, if anything, in the "Science Wars" as a harsh reaction to what STS (conflated to a degree with post-structuralist thought) sought to offer. If, as some claim, post-Marxist thought reflected the intellectual class's disavowal of working class struggle as failing to live up to what had appeared to be its revolutionary possibility, later trajectories of STS reflected a like disavowal of direct engagement with scientists as practitioners who might meaningfully respond to critical insights. STS normatively (though of course with plenty of exceptions) specifically then increasingly veered in a couple different directions. One of these was to largely disclaim techno-science and to move increasingly into an account of extra-scientific and alternative knowledge practices as the enduring site of revolutionary, epistemological possibility. The other direction was to tamp down the more critical elements of early STS, instead seeking to direct STS towards efforts at bringing a social scientific lens towards scientifically-inflected policy prescription, as well as to take science in its doing, to some degree, for granted and to ask after possibilities for its increasing democratiziation and effective dispersal into public consciousness, while lending STS's earlier tools to a critique of the more fringe, and "post-truth," science-adjacent theories of the 00s and 10s.

[117] Drawing on the practices of cyberneticians, technicians, and engineers, who use "black-boxing" to reduce a complicated system or set of processes to a simple input/output structure where possible in technical notation, Bruno Latour conceives in *Science in Action* of what are presented as singular, coherent facts and artefacts in science and technology as "black boxes" within which are a tangle of elements, social and technical activities, objects, and relations that have gone into cohering said fact or artefact into what can be presented in its "black boxed" form. See, Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge, MA: Harvard University Press, 1987), 2, 131.

Air

Comments quoted above from an atmospheric modeler suggest airspace itself is more resistant to casual fieldwork than oceanic space, earth, or ice, and thus, within the larger purview of the climate sciences, tends to see a starker segregation of scientific modelling activity from fieldwork. Where this same scientist did in conversation invoke examples of atmospheric fieldwork, these examples sound almost like something out of a heist movie, extreme efforts to encroach on dicey space to nab findings literally out of the air. She noted for instance research trips that involve flying over oil fields to measure the path of methane emissions out from their direct source.[118]

One of the major global projects involving atmospheric field research she points to as well was STRATOCLIM (Stratospheric and upper tropospheric processes for better climate predictions), an EU-funded effort to measure the stratospheric and tropospheric content "within and above the Asian Summer Monsoon Anticyclone (ASMA)." Dependent upon flyover operations through South Asian airspace, the project ran throughout its duration into significant legal and geopolitical challenges from the Indian state, which held sovereignty over much of the airspace that project participants sought to analyze and expressed concern about the nature of STRATOCLIM's measurement efforts[119] (perceived in all likelihood as an effort to sharply discipline Indian productive endeavors to Western-set environmental standards). Elsewhere, the same project faced challenges from the Swedish military, which expelled a Russian-owned aircraft being used for atmospheric measurements from its testing and installation station in Sweden, due to concern over the possibility that the aircraft would be involved in spying operations.[120] Like oceanic space, as well as the historical efforts to establish surveyance and research bases in Antarctic, atmospheric research sees questions of territorial sovereignty intersecting with the effort to constitute and carry out global scientific research projects.

But in Antarctica specifically, different elemental materialities avail themselves to field operations that lend access to atmospheric observation. The continent's ice and snow hold traces of the past and present atmosphere, making them key proxies in the scientific encounter with air. Alongside the releasing of weather balloons at various stations (Halley being among the most prominent), Antarctic atmospheric scientists journey to the inland polar plateau to make sense, via proxy, of, day-to-day, seasonal, and year-to-year shifts in the Antarctic atmosphere and to help produce records of Antarctic (and by extension global) climate going back upwards of a millennium. That this is a journey is worth pausing on. One BAS scientist notes that "In total, it will take around 3 weeks to travel from the UK to Kohnen Station by a variety of methods – bus, MoD aircraft, ice breaking vessel, snow tractor and Twin Otter aircraft."[121] Though not to the degree of oceanographic research, the atmospheric field trip has, in moments, the feel and rhythm of a contemporary maritime culture, drifting from island to island to coastal port and finally inland, but only temporarily. As this same scientist notes, the field research in Kohnen (on the inland polar plateau) lasts only for a few weeks, before making a similar trip back to the Cambridge-located lab, ideally with ice samples intact.

Like much Antarctic research then, encountering the air relies on a seasonal rhythm of strung together research practices, moving researchers from lab or office space into the remote field and back again. Within these seasonal rhythms are more granular disruptions of the standard

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[118] Ming.
[119] Ming.
[120] Naomi Lubick, "Sweden Expels Russian Research Plan Amid Spying Concerns," *Science*, May 24, 2016, https://www.science.org/news/2016/05/sweden-expels-russian-research-plane-amid-spying-concerns.
[121] Winton, "Journey to the Polar Plateau."

temporal patterns of work, life, sleep, and the like. An atmospheric chemist with BAS who's spent substantial time between the computational modeling stations back at Cambridge and the Antarctic field, offered accounts of her own experiences at Kohnen. One story in particular stuck with me. Her work at that time was largely happening in the small laboratory located in the "clean air zone," a "shipping container on a steel platform" a ways off from the main station. Here she measured chemical concentrations in the surrounding snow over short-term durations, running various experiments at different temporal cycles. She offers the following description of one particularly memorable experience:

> We did experiments as well, and they were actually more fun because you get results very quickly that are very easy to understand. When we were doing the snow photo-chemistry work, for example, there were two experiments that I did: one of them was taking a block of snow, cut a block of snow, and effectively it had a tube going to the center of the block backfilled around it, that tube went to an instrument measuring some of these nitrogen chemicals, you suck the air through (what it means is the air is coming through the snow, not just measuring the air already in the snow). Had one inlet going into the snow and one just in the air and I would switch back and forth between them. and I did that over a 24-cycle and then you could see how the concentrations of these nitrogen oxides in the air changed (at night very similar between the snow block and the ambient air, and during the day the difference accentuated and grew… Because you measure through a full diurnal cycle, that was quite a lovely result. You get your full 24 hours. When I was doing that, I spent 24 hours out in the lab, slept on the floor in the lab, I had to go and change the instrument set-up every hour or so, and so I was lying down on the floor in the lab, with all these pumps around me). Weird, weird place, just this long narrow lab and you'd like there, and then the alarm would go off again and then you would have to get your stuff on again, get your boots on, and tweak…and then go back, clothes off, lie in bed. That was fun and you can do that because you have nothing else that you need to do.[122]

Having to go through a routine of exiting the inner hold of the lab to instantiate a measurement every hour over the course of this 24-hour cycle, she came to perform what appeared much like a monastic ritual: she arose from attempted sleep, dressed in cold-protected gear, paid homage to the performance of science outside, and then returned into the lab, dressing down again, and falling back asleep. The results were an attention to the composition of the snow at a hyper-acute level. Though not within this particular experiment, she noted another moment when she could see, in the minute shifts in the data she was collecting, a brief moment in the day when the vehicular engineers at Kohnen had driven right up to the edge of the "clean air zone."

For this atmospheric chemist then, an interpretative acuity attends the data-mediated construction of atmospheric observations and models. One encounters air by encountering snow, the chemicals therein, and the data that acts in capturing and translating proxy measures. But that encounter is rife with finely honed practices and interpretative moves, through which the end results have the capacity to tell fine-grained stories of human activity and to reflect back on thick stories of a kind of devotional practice, imbued with evident elation, even enchantment, not just at the sight or the feel of the mediating snow, but at the entire ensemble of experimental steps that the scientist moves through, shot through by shards of fragmented sleep, rituals of gearing up and dressing down, and the positively surreal, perhaps even frightening experience of temporary lab isolation in a "weird, weird place."

[122] A. Jones (Atmospheric Chemist) in discussion with the author, August 2021.

Ocean

In the first entry to a diaristic blog detailing his experiences on a research cruise in the Southern Ocean, the BAS oceanographer, Paul Holland, begins by self-consciously invoking the tropes of maritime fiction and travel literature, jokingly alluding to, "removing a few loose teeth with a dry brush woven from shark's gizzards" and "quivering like a sea-cucumber" upon encountering something, "Recognisable to me only as a fearsome monster from the deep."[123] Though offered in jest, these tropes situate the project of Antarctic research, and particularly its oceanographic wing, within longer histories of maritime culture, exploration, and labor. Scientific research cruises indeed emulate, demand, and intersect with the modes and imperatives of travel of contemporary maritime cultures. The major BAS research ships, the James Clark Ross and until 2019, the Shackleton,[124] combine research and logistical activities, scientists, engineers, and technicians brought on for research activities taking part, at various points in the timeline of the largely sea-based research cruise, in the base-side loading and off-loading of the ship as it stops along the Antarctic coast to supply the research bases there.

Though the contemporary BAS maintains an impressive safety record (the last recorded BAS death, the result of a seal attack, having happened back in 2003),[125] the Southern Ocean research cruise is marked by an intensity and volatility even for Antarctic standards. Holland, in his diaries, amidst his first extended research cruise of the kind carried out by the oceanographic teams with BAS, recalls genuine fear as the James Clark Ross faced exceptionally stormy weather. As he notes:

> The view from the bridge last night was terrifying to a land-lubber like me. One moment we were pointing upwards into the sky, the next downwards into a flaming great big hole in the ocean, with everything else obscured by the wall of water crashing forward in our direction. Looking upward at tonnes of water as you steam downwards towards it is a disquieting experience when you are on the bridge, usually a good 20 metres above the waterline. The wind was so strong that the caps of each wave were vapourised and hurled towards us, freezing in the air and then pummelling the windows with frightening force.[126]

Here, the use of "land-lubber," again returning to the trove of maritime tropes littered across the scientist's diaristic account of the trip, demarcates an elemental distinction between land and sea, and in this case, between the experience of oceanographic research from land and from the sea's direct observational vantage point. At a distance from the scientific measuring equipment that make up the oceanographer's primary measuring channel for accessing the dynamics, composition, and characteristics of the ocean, feeling oneself in the grip of a "wall of water crashing forward" offers something different. Scientific observation, insofar as it's predicated on this kind of proximity to the sea's elemental volatility, seems to rest on a degree of danger.

I mentioned this passage to an oceanographer who takes part in polar research cruises nearly every year, and he laughed it off. Perhaps a function of being a more seasoned maritime traveler, he

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[123] Paul Holland, "Laying in the Stores for a Hard Winter," *The Adventures of Half-Hitch Holland: A Voyage to the Bottom of the Bellingshausen Sea*, Blog, February 22, 2007, https://scurvyseadog.travellerspoint.com/archive/022007/s3/.

[124] As of 2021, a new, larger ship named the David Attenborough is slated to begin support research cruises in the next couple of years, taking the place of the James Clark Ross as the BAS's primary logistics and research ship.

[125] "Death of FIDS/BAS Staff in the Antarctic," British Antarctic Survey Archives Service, last updated July 7, 2016, https://basclub.org/wp-content/uploads/2014/04/Deaths-of-Fids-in-Antarctic-by-BAS-Archives-Service.pdf.

[126] Paul Holland, "The One that Got Away," *The Adventures of Half-Hitch Holland: A Voyage to the Bottom of the Bellingshausen Sea*, Blog, April 16, 2007, https://scurvyseadog.travellerspoint.com/archive/042007/.

described the experience of stormy weather aboard the ship as more wearying than anything. "Generally, we have quite a lot of confidence in the ships themselves," he suggested, as well as in the navigational crew directing the ship, but rocking intensely back and forth is of course "not very pleasant" and mitigates opportunities to carry out the work that the scientists hope to perform while aboard the ship.[127] And amidst Holland's diaries, this was an uncharacteristic moment. Elsewhere, a reader sees him enrapt in the sight of ice, the sunsets and sunrises witnessed atop the ship's deck, and curiously wandering around the ship's various quarters. His own scientific activity comes with its own thrills (or frights). Though carried out with extremely strict safety precautions in mind, among his primary tasks was sea ice coring.[128] As of the 2007 research cruise documented in the diaries, sea ice coring is a task done by hand to properly extract the necessary sample and only on the sturdiest, toughest ice shelves to avoid the risk of the ice cracking under the feet of the scientists and engineers involved. As such, it's "damn hard work," a strenuous physical exertion amidst the exceptional chill that researchers face standing atop the sea ice.[129]

"Damn hard work" might in fact describe much of what goes on aboard an oceanographic research cruise during an active research phase. Alongside the bridge work of navigating variably icy, stormy, and remote waters and the stewards' and cooks' serving class work attending to the needs of the rest of the crew on board, scientists, technicians, and engineers with BAS aboard ship routinely adopt 12 hour work shifts (either noon to midnight, or midnight to noon), to ensure watch is kept along observational channels over the full duration of the day and that the maximum use is made of the limited time available asea for measurement, experimentation, and instrumental servicing. Abrahamson noted that research cruises likely kept people far busier than the standard base-work on land, while Holland's diaries suggest the frequent need for a late-morning beer to relax at the end of the grueling late-night/early-morning shift.[130]

The work is variable but in many cases pre-determined. A given, funded research project involves either establishing or recovering measuring instruments at specific, tracked sites across the ocean. At the same time, everyone aboard takes on work beyond what might be demarcated as the "knowledge work" itself. The above-mentioned oceanographer notes, "Depending on the general activities and type of research crews, I'll be doing anything from working the moorings to doing general shifts/watch-keeping, keeping an eye on the data collection, catching up on data processing, checking that everything's working. Communicating with the bridge as well in terms of what activities are going on and where to go next. Trying to stay up to date on weather forecasts and what's going. It's certainly a change from being in the office."[131] Measurement and data processing, navigation, and basic ship maintenance get scrambled together in the timespan of a knowledge worker's working day. The oceanographer suggests further that the oceanographic crew don't just squeeze everything they can out of a given 12-hour shift but also out of the entire life-cycle of the research cruise. When asking him for instance about how knowledge workers use their free time aboard the ship, his first thought went to the seemingly extensive program of conference-style presentations, workshops, and seminars that scientists put together and carry out while the ship is still headed down to the Southern Ocean, and often on the way back as a reflection on the work done that research cycle.

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[127] Abrahamsen.
[128] As is worth noting, archival records indicate the relative frequency in the 1950s and 1960s with which sea ice cracked, knocking individuals attempting to carry out research or logistical tasks atop the ice into the icy cold water.
[129] Paul Holland, "On Thin Ice," *The Adventures of Half-Hitch Holland: A Voyage to the Bottom of the Bellingshausen Sea*, Blog, March 5, 2007, https://scurvyseadog.travellerspoint.com/archive/032007/s5/.
[130] Paul Holland, "Shiver Me Timbers," *The Adventures of Half-Hitch Holland: A Voyage to the Bottom of the Bellingshausen Sea*, Blog, March 4, 2007, https://scurvyseadog.travellerspoint.com/archive/032007/s6/; Abrahamsen.
[131] Abrahamsen.

It's oft been commented upon contemporary logistics work that's its structural function is to minimize productive capital's turnover time, allowing as many cycles of production and circulation as possible over a given investment period and raising profitability of productive investments in turn. This is the basis for "just-in-time" supply chains. A strikingly similar logic attends the research cruise, every ounce of time made the source to secure the steady flow of measurement across short-term, oft-volatile, and not always stable temporal rhythms of research. The project of oceanographic measurement and modelling looks in that sense like a not always frictionless effort to cohere the temporal rhythms of steady, long-term measurement and observation; seasonal, short-term fieldwork; and the day-to-day scramble to keep things moving all amidst the elemental volatility of sea and weather on one side and the potential institutional volatility of research grants, oceanic sovereignty, and the like on the other.

Ice

As Steven Pyne's environmental history, quoted above, suggests, ice stands at the forefront of the Antarctic sublime, it's otherworldly appearance and scope seemingly shocking to first-time observers. For Pyne, a narrative tension in his writing was apparent between the ostensible intention of providing a sober, clear-headed account of the Antarctic as a site of scientific research and the ice's overwhelming sensual force. The writerly choices he made were efforts then to write at a distance from scientific observation, as a mode of capturing something that science reduced. Scientists of course have their own affective relation to ice that at times verges on the sublime. Comments not unlike Pyne's litter the archival records and oral histories of the early era of geological, climatic, and geophysical research in the Antarctic. Holland's oceanographic diaries manifest the limits of narrative to truly capture the sublime force of encounter with ice in ways analogous to, if cruder than, Pyne's discussion. Per the first diary entry upon encountering the regions of the Southern Ocean rife with sea ice, he notes: "The pictures that follow do not do justice to the stunning spectacle that is frozen water. I cannot describe it in words either. To get the idea you could gaze at the pics while listening to Elgar, drinking pure adrenaline, and being massaged by a Silverback Gorilla, and then multiply that experience by several."[132]

Ice is, perhaps more importantly, an acute and recognized site of danger. Its elemental qualities are such that ice will swallow you up much like the ocean but lends the appearance of relative safety and stability. In the history of Antarctic research, the most common cause of death has been falling through or below ice, either due to sea ice cracks at the coastal edge of the continent or hidden crevasses out in the vast Antarctic wilderness. At times, scouring the 1960s era base journals of the old BAS researchers, it seems like someone, usually without serious consequence other than scares and chills, "[takes] a bath through the sea ice" just off base every few weeks or so.[133] And contemporary researchers know this: a BAS glaciologist, in describing his own fieldwork, for instance, "Back in the 60s and 70s, people would fall down crevasses and just disappear all the time."[134] Field journeys up into the present proceed slowly, with extreme caution, aware of the ghosts of past research endeavors.

An existential threat then at the hyper-localized level of small team field research and at the somewhat longer-term time scale of melting ice sheets and subsequent sea level rise, ice exerts an enormous hold on the Antarctic psyche. Modes for observing ice have of course developed and transformed though over the last several decades. The glaciologist studies the major cracks and

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[132] Holland, "Shiver Me Timbers."

[133] The language quoted is drawn from the July 17th Entry of the Adelaide Island Base (Base T) Journal 1960, AD6/2T/1960/b, British Antarctic Survey Archives, Cambridge, United Kingdom.

[134] Marsh.

chasms of the Brunt Ice Shelf and through instrumental apparatuses out in the field and GPS observation, has a granular sense of the texture of these cracks and chasms as they emerge, shift, and grow over time. Like researchers in other terrains, much of his fieldwork involves instrumental servicing. Monitoring equipment out on the ice shelf gets buried in the yearly accumulations of snow and needs digging up. The following comments capture much in terms of the contemporary experience of glaciological observation:

> In the field, we travel out to all these sites, they all need raising (they get buried and we have to dig them up and put them back on the surface). Sometimes they have issues, power issues, lost communication, sometimes they have GPS problems. I take this laptop with me to the field. Even though the data is transmitted back to base, we back it up all the time. A site visit takes about 3 or 4 hours which is mostly digging – we get crazy storms through the Winter – even though it might be a nice sunny day when raising the site. We travel out there on skidoo – on a line with a rope in case one skidoo falls down a crevasse. Sometimes we camp – some of the sites are quite far from the base. The Brunt ice shelf in general is fairly safe – there are large rifts but we know where they are – they're heavily monitored.[135]

Maintaining glaciological observation for computerized models is then multi-pronged, requiring various human touches. A trip entails careful and cautioned navigation, intensive manual labor, and the fairly analog effort of carrying a backup hard drive in the form of a personal laptop out into the wilderness to ensure networked data streams stay running. The form of encounter here strays substantially from the treatment of ice as emanating sublime force but is no less direct. Ice gets worked on by hand, feet, and eye to ensure that, at a granular scale, the mediation of ice through distant observation from above and virtual simulation continues.

This glaciologist was the same scientist who described the particular draw of science over and above place when asked about his relationship to Antarctica. But in speaking of the Brunt Ice Shelf specifically, he noted: "I've gotten quite attached to the Brunt Ice Shelf, having worked with it for a couple of years, having looked over the archives of records. I feel quite a strong knowledge of its behavior."[136] The Brunt Ice Shelf as demarcated object inheres within the various virtual and representational forms that render it, from older maps to contemporary models. For the glaciologist, as this statement suggests, to feel attached to the Brunt Ice Shelf is to feel attached to the process of having worked with it. He ties this work to the investigative research that informs his scientific activity, "archives of records" that paint an intimate picture of the geophysical object's behavior over time. But he's "worked with it" as well in a more immediate sense. He has literally shaped and sculpted the ice in localized places as part of the ongoing effort to maintain observational instrumentation year-in and year-out. And in that sense to cathect to the "science" or to the Brunt Ice Shelf as object of scientific knowledge seems necessarily to mean cathecting, however unconsciously, to the labor processes that that science and the construction of that scientific object have entailed.

The Virtual

"Global climate" exists within a virtual space, that of modelling and simulations, a virtual space that's not disconnected from the physical plane of embodied existence (as discussions above should make clear) but that, in and of itself, inheres within networked computational apparatuses.

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[135] Marsh.
[136] Marsh.

"Global climate" would not be a sensible object of knowledge or concern without this virtual space, even as it informs the localized and regionalized material activities of those who take it up as an object of concern.[137] If, in starting this chapter, I noted that climate change speaks for itself in some sense, through the immediate, felt devastation of its effects, this "speaking for itself" rests on the longer-term discourses that have produced the capacity to comprehend "global climate" and its relation to other human and ecological phenomena.

While a pure separation between the production of climate modeling's virtual space and direct interaction with geophysical entities in the field or lab doesn't meaningfully characterize the work of the vast majority of climate scientists, there are still those who primarily fixate on the virtual space, whose core focus, that is to say, is the generation and analysis of ever more acute climate models. It would be easy to think of the work such scientists do as that of trying to re-produce physical space in the virtual realm with ever greater precision and granularity. But, while that's not entirely inaccurate to the imperatives driving climate modelling at the end of farthest remove from observation itself, it's perhaps more accurate to say that scientists attempt to produce a kind of representational stabilization of vast streams of data into pictures of climatic objects recognized as shifting, dynamic, and resistant to complete capture. Paul Edwards, in his discussion of climate science in *A Vast Machine*, talks about the shimmering quality of climate data and points to reanalysis modelling as one of the key modelling techniques for working through this shimmering quality.[138] As one atmospheric modeler described it to me, reanalysis datasets are, in a sense, data points constructed through growingly sophisticated means of averaging, approximation, and best guess measurement using adjacent geographic and temporal points to produce a clean data image out of disjoined forms and arenas of observation.[139]

This kind of reanalysis modeling is indicative of a practice that doesn't, a la Borges's imagined map, simply look to represent the climatic world at every possible point, but rather wrestles precisely with the impossibility of that project, constructing rather possibilities for granular envisioning that only inhere in virtual space. As such, reanalysis modelling can appear like the deepest point down the rabbit hole of climate's virtual space. But, the space of modelling and simulation, even for those who primarily fixate on the models themselves, is maintained across a vaster set of mediums than re-analyzed data sets. The same atmospheric modeler calls to mind Google Scholar lit reviews, whatsapp threads, in-person and email conversations, python code, and, to a significant extent, the surprisingly analog space of a boxed-in set of equations on a whiteboard as part of the process of translating interesting hunches, curiosities, and unresolved questions into conscious constructions of virtual climatic results. In particular, she notes, "In terms of how I work, I spent a lot of time staring at python, a lot of time staring at plots." "Plots" are likewise what she shares around with colleagues and email, pointing to something that seems "cool" to try to gauge broader interest.[140]

The enrapt effort to make sense out of latched-onto virtual objects, pieces of code, data plots that seem to suggest something anomalous or a question worth asking, by any outside observation, appear on the same plane as the expressed fascination this scientist shares in recalling going down to the lab to see the slicing up of an ice core pulled from Antarctica. Even less so than scientists noted above, this scientist, who's only seen Antarctica by way of ice cores brought back to Cambridge, had little personal attachment to the Antarctic continent per se, but did note it as a special place to study, citing, in particular, it's unique Ozone composition and the fact that it's one

[137] Edwards, *Vast Machine*, 3-8.
[138] Edwards, *Vast Machine*, 336.
[139] Ming.
[140] Ming.

of the few places on earth to extract ice cores. Again, a virtual object for her (Ozone) and the material proxy to which she's had direct contact (the ice core) act as sites of cathexis and attachment, insofar as they are what she perceivably works on. For her as well, a sense of direct collaboration with the more materially embedded atmospheric researchers, those extracting ice cores from the field or monitoring sensor equipment, was crucial.[141] Data means more when you're directly engaged with understanding where it comes from (and thus what its limitations are and what the challenges might be in collecting it).

Conclusion: Polar Modelling as Method

The quote that starts this chapter marks a distinction between the work of the climate scientist and the work of the social scientist: the former has painted a comprehensive picture of the problems we face and it's up to the latter to work through the solutions. Of course, such a claim, itself coming from the vantage point of the climate scientist, depends on an overarching image of a neutral climate science, black boxed from wider social and political dynamics, feeding then its results back into the social sphere to be acted upon as a different array of specialists might see fit. Throughout the first section of this chapter, I have called this image into question through a speculative elaboration of the labors of mitigation and adaptation embedded within the IPCC's reports on the present state and projected futures of global climate.

As much as climate scientific imaginaries, followed into the implicitly figured labors of the Anthropocene, might serve to figure those expected labors, they might serve even more so as maps for thinking through possible sites of contradiction, conflict, and struggle over the conditions of Anthropocenic life. Along the fault lines of these contradictions, a potential politics emerges over the uses and social organization of ongoing climate knowledge. Will climate knowledge act in attempted service of a stabilizing reproduction of a social-ecological totality at a global scale or elsewise towards the delegitimization of and redress to facets of that totality? How and around what relations of power will labors of adaptation and mitigation be socially organized? Seeds of such a politics emerge at various scales in looking at alternative climate internationals that aim to frame climate change from the vantage point of the Global South, seeing in negative the forms of conflict papered over in global climate reports, and asking after the grounding sites of class, racial, and gendered conflict that already do and might very well continue to subtend the forms of productive and reproductive labor embedded in visions of mitigation and adaptation, even beyond the basic conflict between the development of sustainable infrastructural transitions and the inhibiting power of fossil fuel interests.

Thinking politics at these sites of contestation and contradiction expressly doesn't eschew the role of climate science and even global climate science in redressing environmental calamity and other crises of contemporary capitalism, though it does invite a deeper probing of STS critiques of climate modelling practices including the IPCC report, critiques that hover around the alienation of products of climate science from localized, politicized efforts towards responding to environmental harm. Why is the production of climate models in the capitalist system subsubmed into seemingly intransigent specialization, doomed to "ring the alarm bells" and hope abstracted others (including the social scientists) are listening? Sohn-Rethel, among others, might ask us to historicize the distinction drawn between the figure of the climate scientist and the figure of the social scientist but moreover between either figure of intellectual labor and the implicitly figured infrastructural and social reproductive laborers, among others, structured into both popular and scientific imaginaries of Anthropocenic life, social production, and social reproduction at the scale of a global social-

[141] Ming.

ecological totality but also that of localized, regional adaptations and forms of social reconstruction. If a place like Antarctica seems like the spitting image of science siloed off from the world, a closer look at the granular labors that make up Antarctic research projects suggests otherwise, wide swaths of workers of various stripes fluidly moving between oft-integrated tasks even as explicit roles and often-classed specializations are drawn.

Thinking about the labors of climate science in its present form, I've asked in the chapter's middle section after the conceptual concerns that might be brought to bear on the labors that produce the climate model, climate science's clearest, most visible circulating product. I've argued that if critical social scientific accounts of climate science point to a spatio-temporal and affective alienation of the climate model, we might reframe that in terms of the alienation of a labor process subsumed under automaticized (and increasingly automated) organizations of knowledge work. But in a place like Antarctica or the Southern Ocean, this subsumption inherently runs into constraints and unique conditions of an acute environmental extremity. And with this in mind, the latter part of the chapter has sought to track the labors of climate modelling in the polar south to gesture towards subtle dislodgings of expectations around the rhythms, experiences, and moments of cathexis that make up waged and salaried work. When is encountering climate awe-inducing, satisfyingly (or even pleasurably) punishing, adventurous, autonomous, and given to forms of habituation and rhythms of life that don't cohere with the singularly disciplined standards of the contemporary wage? This has been a guiding question for me in the latter part of the chapter's storytelling practice.

Edwards's account of climate science's "vast machine" talks about the shimmering qualities of climate data, the incapacity for models to map one-to-one onto the systems they grapple with. If I look here at polar modelling practices in particular, part of the suggestion is that of treating a kind of labor-based shimmer in polar modelling: in a sense, a method that aims to attend to the necessary resistance of, in this case, polar science as located in granular practices and labors to a subsumption that alienates knowledge into pure formula but also into rote, intransigently subjectivizing disciplining. The practices of climate observation in Antarctica are necessarily, at least in moments, a matter of joy, enrapturement, and profound satisfaction, as well as disruptions of temporal subsumption which rely on standardizations of time that the Antarctic body and psyche can't wholly accommodate. They rely on disruptions of the automaticity of a labor process organized from above that remote Antarctic inhabitants necessarily retain a degree of autonomy from. If only hypothetically, these moments become a basis for reading the activities of the sciences in recognition of but also at a remove from sheer critiques of scientific alienation.

For all there is to problematize in the idealities embedded in the IPCC's elaboration of mitigation and adaptation efforts, what they do offer as idealities is an articulation of a collective project of social construction through and against the effects of a planet embroiled in ecological crisis. To the extent polar climate science appears like a kind of shimmering vanguard of Anthropocenic labors, as much as this is constituted by the particular access of Global North scientific researchers to capital and other resources, the genuine sense of excitement and satisfaction in excess of labor's subsumption to be found in their work offers a glimpse at the promise of collective projects of Anthropocenic social construction. Present social relations of science as a global labor process militate against this enchantment of scientific life, and even more so against its global distribution beyond maintained geographic divisions between intellectual and manual labor. But what lies in excess of science's rote subsumption under capital's organizations of knowledge and labor is, to a significant degree, what's at stake in the contemporary politics of climate knowledge.

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