UNIVERSITY OF CALIFORNIA,

IRVINE

Extreme Environments and the Production of Scientific Knowledge: The History of Science in Antarctica

DISSERTATION

submitted in partial satisfaction of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in History

by

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I am been extremely lucky in the generous, kind, and fastidious staff found at every Archive and Library where I conducted this research. I would specifically like to acknowledge Laura Outterside and Keith Moore at the Royal Society Library and Archives in London, particularly for allowing me to study texts that had yet to be formally archived. Naomi Boneham at the Scott Polar Research Institute's Thomas H Manning Polar Archives additionally was very generous with her time. The Archive at the British Antarctic Survey is one of my favorite places to conduct research, probably due to the excellent organization, professionalism, and kindness of the Archivists: Bev Ager, Jo Rae, and especially Ieuan Hopkins.

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The Antarctic Humanities and Social Science Community around the world is a small but extremely kind and close-kit group who were extremely welcoming and generous with their time, always willing to speak with me on the telephone, send book recommendations and unpublished writings, pass on grant opportunities, and chat about themes either at conferences or digitally. These include Daniela Liggett, Ursula Rack, Cornelia Lüdecke, Peder Roberts, Hanne Nielson, Elizabeth Leane, Johanna Grabrow, Jessica O'Reilly, and Stephen Hicks. Some have taken this help even further and read excerpts of my work in even early draft phases. These superstars include Henry Frankel, Sarah Payne, Charlotte Connelly, Bryan Lincott, Morgan Seag, Klaus Dodds, and my conference buddy, Alessandro Antonello-the only person outside my committee and my sister to read a full draft of my dissertation. I would finally like to thank Adrian Howkins, whose work inspired me more than that of any other historian and whose advice and encouragement introduced me to a whole world of people studying the history of Antarctica.

I conceived of this project during my first year at UC Irvine, while sitting in a World History seminar. We were discussing how Oceanic histories provide unique opportunities for studying the world, since it is essential an international common space. My mind wandered to other possible international spaces, and I wondered if anyone had written about the history of science in Antarctica. This project would not have been possible without the support of the intellectual community at UCI. Staff Members Marc Kanda, Yuting Wu, and Arielle Hinojosa have guided me through the process of earning a PhD. Faculty who were particularly influential were Kristen Peterson, Lyle Massey, Georges Van Den Abbeele, Michael Montoya, Laura Mitchell, Kavita Philip, Valerie Olson, and Renee Raphael. Julia Lupton has been extremely supportive of my interests and arranged multiple opportunities for public engagement on polar history, most notably, a Humanities-Out-There Fellowship for the *Endurance* exhibit at the Bowers Museum of Orange County in 2017. Outside of my committee, Simon Cole largely shaped my theoretical grounding in science and technology studies and is the most supportive mentor that I could ever imagine. I hope that one day I can be as generous of a scholar as he.

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for him as the Research Assistant for the Medical Humanities Initiative was an extremely pleasurable and interesting experience and one that granted me the flexibility to easily travel for research and conferences. Everyone affiliated with this program was wonderful to work with. Not only did it give me a better opportunity to get to know Doug outside of my research, but it also gave me a close working relationship with Amanda Swain who read every grant application that I submitted and many job cover letters as well. She was supportive and encouraging in every aspect of my life; not just academic or professional.

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Finally, I would like to thank my family who were ever so patient with me during this process. I am so happy that my grandmother will see me finish my PhD. While of course Bada, Booboo, Vida, Hoody, Tio, Sparky, and Cabo all dealt with my ramblings about the urgent need to study the history of science over the past decade and my parents both taught me to value education above all things and have patiently waited for their oldest daughter to finally finish

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Sloterdijk P, Boellstorff T, Berghof O, Lustig C, McCahey D, McCoy MR, **Reddy E**, Siakel DR, Valayden D, Wilson J, and Zani L, Gude R. "Satan at the Center and Double Rhizomes: Discussing 'Spheres' and beyond with Peter Sloterdijk." In the *Los Angeles Review of Books*. (January 14, 2014)

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McCahey, D. "Genevieve Carlton. 'Worldly Consumers: The Demand for Maps in Renaissance Italy.' Chicago: University of Chicago Press, 2015. 240 pp. ISBN: 9780226255316. $45.00.", *Itinerario*, 40(3), (2016) pp. 579–581

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ABSTRACT OF THE DISSERTATION

Extreme Environments and the Production of Scientific Knowledge:
The History of Science in Antarctica

By

Daniella McCahey

Doctor of Philosophy in History

University of California, Irvine, 2018

Professor Douglas M. Haynes, Chair

Situating Antarctica within the greater context of the global history of science is at the core of my dissertation. Drawing from archives in New Zealand (Christchurch and Wellington) and the United Kingdom (London and Cambridge), my dissertation examines the history of modern Antarctic science in the late 1950s-early 1960s. Comprised of six chapters, my dissertation begins by contextualizing Antarctic science within both the historic British interest in the region and the organization of the International Geophysical Year (1957-58). The second chapter argues that the varying ways that Antarctic expeditions were funded in New Zealand and the United Kingdom reflect profoundly different visions for the future of Antarctica; one which sought to domesticate the continent and another imperial vision which viewed it as a site for practicing nationalistic, prestige granting science. Chapter Three shows that that the geographical sites of the British base at Halley Bay and New Zealand's Scott Base, neither of which were ideal for proposed research at the respective sites, reveal clashes between the sometimes conflicting priorities of scientists and those making decisions for the bases. Chapter Four

examines how science workers used behavioral and technological adaptations to do research for which their instruments had not been specifically designed. The fifth chapter studies a specific set of geological specimens gathered near the Weddell Sea, arguing that the gathering, study, and final resting place of these specimens reveal not only the roles of masculinity and British post-colonial insecurities within the scientific community, but also played an important role in the ongoing continental drift debate. The sixth chapter uses the IGY Expedition to South Georgia to explore the professionalization of glaciological science in the 1950s as well as the importance of social networks to the production of scientific knowledge.

INTRODUCTION

Antarctica occupies an ambiguous place in both world history and the history of science. As an understudied continent, it occupies a liminal space in terms of scientific and technological research, geopolitics of colonization, nationalism, and the Cold War, and the ways that people reconcile science and politics. Historically, we can see the Antarctic as utopic region where peace and science triumphed over politics,[1] perhaps even a first step in the way that world governance was a way into world peace.[2] Alternatively, it can be seen more cynically, as a place where political agents determined the direction and conditions of scientific research for purely geopolitical reasons.[3] Antarctica also represents various historical understandings of nature and wilderness, morphing in scientific and popular rhetoric from a foreign alien-scape, to an untouched wilderness, to an essential region for determining the health of the planet in the Anthropocene, depending on the argument. Antarctica, as a continent, also enjoys unique legal status, where despite belonging to no one, national laws are enforced in individual stations. So it is both wholly nationalistic, and wholly international. It is militarized, but not a military space. It also, like many other extreme environments, is a space created for and occupied almost completely by scientists. But rather than being a far off, self-supporting utopia of science, the men and, later women, in these stations are completely dependent and at the mercy of the vast networks of infrastructure and technology protecting them from the cold and resource poor landscape. While scientists live on the surface of the continent, they actually occupy all depths,

[1] *Antarctic Treaty*, December 1, 1959.
[2] Mark Mazower, *Governing the World: The History of an Idea, 1815 to the Present* (New York, NY: Penguin Books, 2013).
[3] Adrian Howkins, "The Science of Decolonialization: The Retention of 'Environmental Authority' in the Contest for Antarctic Sovereignty between Britain, Argentina, and Chile, 1939-59," in *Science and Empire: Knowledge and Networks of Science across the British Empire, 1800-1970*, ed. B. Bennett and J. Hodge (Scott Polar Research Institutenger, 2011).

sending equipment to up to the sky, down through the earth and ice and under the sea.[4] And though scientists and a handful of tourists are the only ones who ever see Antarctica, we are constantly reassured that it is vital to the future of the humanity.

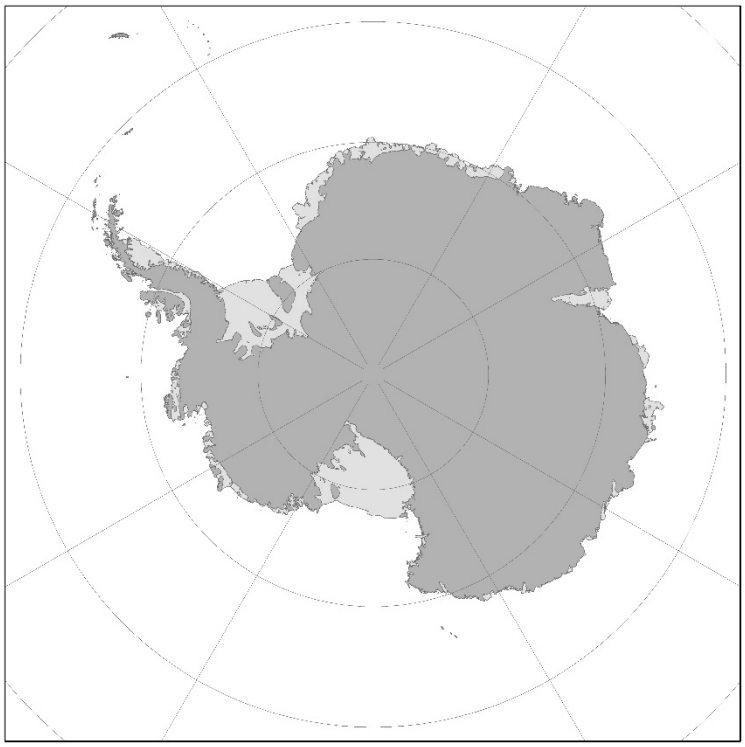

Figure 1. Map of Antarctica and the sub-Antarctic Islands. The island of South Georgia is in the upper left hand corner of the map.[5]

Our modern conceptions of Antarctica are were not produced in a vacuum. The fact that people hold to and pursue research and political policy based on all of these contrasting but simultaneously held perspectives of a continent that they have no native ties to is no accident, but the results of technologies, techniques, and apparatuses that allow us to hold them. Within the context of the sociology of scientific knowledge, the human relationship with Antarctica comes

[4] Alessandro Antonello, "Engaging and Narrating the Antarctic Ice Sheet: The History of an Earthly Body," *Environmental History* 22, no. 1 (January 1, 2017): 77–100.
[5] Laura Gerrish, British Antarctic Survey

from the technologies of the material, technologies of language, and technologies of the social.[6] This relationship with the Antarctic was forged by the post WWII scientists developing a relationship with the region and sharing that relationship with others. So while it may seem as if this region exists apart from human history, in a traditional sense, studying Antarctica is essential to the future of environmental history and the history of science. Drawing from archives in New Zealand (Christchurch and Wellington) and in the United Kingdom (Cambridge and London), my dissertation examines the history of science in Antarctica during the late 1950s-early 1960s, a period marked by the activities surrounding the International Geophysical Year (1957-58), the decline of the British Empire within the context of the Cold War (the Suez Crisis was in 1956), and the establishment of the Antarctic Treaty System in 1959. Building on a growing body of literature examining the geographies of science and the place of Antarctica within world history, I argue that the entanglements of political, social, and environmental factors created the context for the production of scientific knowledge in a part of the world that has growing human importance. My dissertation traces the development, organization, implementation, and aftermath of several large and small-scale expeditions to the Falkland Islands and Ross Dependencies in the late 1950s. By following these expeditions through their conception, funding and organization, execution, and research programs, I show the many interdependent factors that created the way we understand the region and the way that scientific projects in extreme environments are conducted.

In the period of this study, the United Kingdom was one of the most active players in the Antarctic Circle. In fact, of the thirteen countries that engaged in Antarctic research during the IGY, four were members of the British Commonwealth. Britain was arguably the first nation to

[6] Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton University Press, 2011).

be active in the Antarctic through the eighteenth century Cook expedition. They continued to have a presence in the region in the 19th century both through whaling enterprises and the Ross expedition in the 1840s. During the Heroic Age of Antarctic Exploration in the first two decades of the twentieth century, Britain led several expeditions. Into the twentieth century, the UK, New Zealand, and Australia made sovereignty claims to nearly the entire continent. The UK also had an antagonistic relationship with Chile and Argentina over sovereignty and whaling rights in the Antarctic in the years leading up to the IGY, involving gunboat diplomacy and the International Court of Justice. Finally, the UK had a strong, if sometimes uncomfortable, alliance with the United States, in the midst of the Cold War, with the US lending logistical support for a large number of Commonwealth activities in the Antarctic, particularly with New Zealand. While my research will not focus on the geopolitical status of Antarctica, it would be folly to ignore how said politics impacted the type of work being done in the region.

In Britain, social aspects were also at play in their research stations. The scientists and engineers involved with this project were building a new field: Antarctic Science. They were building a field of science, center not on a discipline as most others are, but around a region. Even today, the Scientific Committee for Antarctic Research Conference is a motley affair, with scientists from every conceivable discipline, working together, often with nothing in common but the region they study. This was true of the early stations, were men from every branch of science were expected to work together and collaborate on research. The scientists manning these stations were mostly at the start of their careers, and many used their time in the Antarctic as a way to advance their careers. Even now, doing research while physically in the Antarctic is a virtual requirement for young polar scientists, despite the fact that through machines and computers, many could receive their data from home, with only a few people there to monitor the

equipment. For these scientists, doing research in the Antarctic was a way to establish legitimacy, not just as a scientists and experts, but as men, coming out of the masculine tradition of the adventures in glaciological field work from the nineteenth century through today.[7] As men establishing a new academic research field, they also faced immense pressure as their careers could be made or lost with the eyes of the entire world on them.

Finally, besides the social and political aspects of British science in the Antarctic, at the crux of my argument, there were several enviro-technical entanglements in Antarctic stations that were emblematic of the period and of the history of science in general. For example, the fact that very few instruments or even infrastructural elements of the bases were designed from experience for the Antarctic meant that the scientists often had to improvise to stay safe and successful conduct their research. However, while maybe assumed that scientists improvise in their work, the ways that they adjust to accommodate their environment is scarcely mentioned in their publications, despite the fact that it is an essential part of their scientific method. Studying the history of an extreme environment, like the Antarctic, allows for some remarkable and unique research opportunities. For example, it offers a relatively reductionist view of nature that can complicate human understandings of nature elsewhere. It allows for the study of human-environmental-technological interactions in a hybrid environment, equally created by human and non-human agents.[8] In the Antarctic, the temperature, sea, ice, darkness, building materials, and instruments all co-produced the scientific knowledge along with the young scientists.

Theoretically, my work will draw on the writings of Robert Kohler, David Livingstone, Bruno Latour, and Karen Barad, all who have conceptualized ways to write history that includes

[7] Bruce Hevly, "The Heroic Science of Glacier Motion," *Osiris* 11 (1996): 66–86.; Michael Robinson, "Manliness and Exploration: The Discovery of the North Pole," *Osiris* 30, no. 1 (2015): 89–109.
[8] Steve Pyne, "Extreme Environments," *Environmental History* 15, no. 3 (July 1, 2010): 509–13.

the role of non-human actors. David Livingstone has shown the fundamental importance of geography in the production of scientific knowledge, arguing that local conditions absolutely condition the work accomplished there. In his words, "Science is not some eternal presence slowly taking form in history; rather, it is a social practice grounded in concrete historical and geographical circumstances."[9] Despite the widespread conception that science is "an enterprise untouched by local conditions," [10] it is actually both deeply limited and dependent on the site in which it is practiced. Kohler, in several works, examines how the scientific practice has reworked nature, but also how the material environment works as an aggressive force that contributes to the construction of scientific activity. In his work on biological field stations shows how over time, biologists learned to traverse these boundaries to produce science that integrated the values of the two fields. This was often accomplished by way of biological stations which to some degree relocated the laboratory into the field, creating a new hybrid space.[11]

Another approach to studying the history of science practiced in its material environment is that offered by actor-network theory (ANT). It provides a model of knowledge production embedded in networks of human and nonhuman actors and structures. ANT discards the idea of the clear-cut dualism of nature and human practices, allowing for the agency of nonhuman entities while also rejecting a singular "Nature" able to independently act. ANT provides a model for navigating between materialist and social constructivist perspectives because it suggests that, rather than seeing "Nature" as an actor apart from humanity, we need to conceptualize and examine the hybrid environments as fields of agency and power in which the human and

[9] David Livingstone. *Putting Science in Its Place*: *Geographies of Scientific Knowledge*. (Chicago, University of Chicago Press, 2003). 180
[10] David Livingstone. *Putting Science in Its Place*: *Geographies of Scientific Knowledge*. (Chicago, University of Chicago Press, 2003). 1
[11] Robert E. Kohler, *Landscapes and Labscapes: Exploring the Lab-Field Border in Biology* (University of Chicago Press, 2002).

nonhuman interact and shape change.[12] In the same way, the newer STS approach of agential realism, pioneered by physicist and feminist theorist Karen Barad, observes the conflict between social construction and realism in science studies. She notes however that in science studies, those who champion either social construction or realism within science do not realize that the two are absolutely co-constituted and are not in fact dichotomies. She proposes instead an alternative framework, that of agential realism, which considers science to be a material-discursive practice. Discursive in the sense that it is molded and even created by social factors, but material as it "theorizes agency in a way that acknowledges that there is a sense in which the 'world kicks back.'"[13]

Critical Histories of Antarctic Science

This project will engage with and further develop the work of several scholars in the field of enviro-technical history and history of extreme environments such as Stephen Pyne, Joy Parr,[14] Matthew Reidy,[15] and Helen Rozwadowski,[16] histories of science in the field such as Jeremy

[12] My definition of ANT comes from a reading of the following: Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes ; Philadelphia: Open University Press, 1987).; Bruno Latour, *We Have Never Been Modern* (Harvard University Press, 1993). Michel Callon, "The Sociology of an Actor-Network: The Case of the Electric Vehicle," in *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World*, ed. Michel Callon, Arie Rip, and John Law (Scott Polar Research Institutenger, 1986). 19–34.; Michel Callon, "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay," in *Power, Action, and Belief: A New Sociology of Knowledge?*, ed. John Law (Routledge & Kegan Paul, 1986).; Paul S. Sutter, "Nature's Agents or Agents of Empire? Entomological Workers and Environmental Change during the Construction of the Panama Canal," *Isis* 98, no. 4 (December 2007): 724–54.; Geoffrey C. Bowker, *Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940* (MIT Press, 1994).

[13] Karen Barad, "Agential Realism: Feminist Interventions in Understanding Scientific Practices," in *The Science Studies Reader*, ed. Mario Biagioli (New York: Routledge, 1999). 2

[14] Joy Parr, *Sensing Changes: Technologies, Environments, and the Everyday, 1953-2003* (University of Washington Press, 2010).

[15] Michael S. Reidy, *Tides of History: Ocean Science and Her Majesty's Navy* (Chicago: University of Chicago Press, 2008). Michael Sean Reidy, Gary Kroll, and Erik M. Conway, *Exploration and Science: Social Impact and Interaction*, ed. Mark A. Largent (Santa Barbara, Calif: ABC-CLIO, 2006).

[16] Keith Rodney Benson and Helen M Rozwadowski, eds., *Extremes: Oceanography's Adventures at the Poles* (Science History Publications/USA, 2007).; Helen M. Rozwadowski and David K. Van Keuren, *The Machine in Neptune's Garden: Historical Perspectives on Technology and the Marine Environment* (Science History Publications/USA, 2004).; Helen M. Rozwadowski, *Fathoming the Ocean* (Harvard University Press, 2009).

Vetter,[17] Matthew Farish,[18] and Mark Carey.[19] It will also draw connections between the relationship between science and exploration in the twentieth century. In 2014, Vanessa Heggie asked argued that "Exploration is clearly a constitutive part of scientific practice, if not a science in its own right," but despite attention played to the relationship between science and exploration in the history of science, she argues that the "history of twentieth-century science is routinely written about (and taught) without much consideration of nonlaboratory sciences, and the role of extraordinary encounters between human bodies and the earthly environment is rarely discussed."[20]

However, my dissertation will most clearly identify with the recent body of scholarship attempting to situate the history of Polar Regions within greater world history. In recent years, there have been an influx of scholars working on the history of science in the Arctic including: Michael Bravo,[21] Andrew Stuhl,[22] Sverker Sorlin,[23] Richard Powell,[24] and William Althoff,[25] to name a few. Likewise, several historians and writers have narrated the history of Antarctic exploration before the First World War, focusing on the heroic narratives of explorers like Robert Falcon Scott and Ernest Shackleton. Several of these histories are quite excellent, including Francis Spufford's *I May Be Some Time,* a cultural history of British polar

[17] Jeremy Vetter, "Labs in the Field? Rocky Mountain Biological Stations in the Early Twentieth Century," *Journal of the History of Biology* 45, no. 4 (2012): 587–611.
[18] Matthew Farish, "The Lab and the Land: Overcoming the Arctic in Cold War Alaska," *Isis* 104, no. 1 (March 2013): 1–29.
[19] Mark Carey, *In the Shadow of Melting Glaciers: Climate Change and Andean Society*, 1 edition (New York: Oxford University Press, 2010).
[20] Vanessa Heggie, "Why Isn't Exploration a Science?," *Isis; an International Review Devoted to the History of Science and Its Cultural Influences* 105, no. 2 (June 2014): 318–34.
[21] Michael Bravo and Sverker Sörlin, *Narrating the Arctic: A Cultural History of Nordic Scientific Practices* (Canton, MA: Science History Publications/USA, 2002).
[22] Andrew Stuhl, *Unfreezing the Arctic: Science, Colonialism, and the Transformation of Inuit Lands* (University of Chicago Press, 2016).
[23] Sverker Sörlin, *Science, Geopolitics and Culture in the Polar Region: Norden Beyond Borders* (Routledge, 2016).
[24] Richard C. Powell, *Studying Arctic Fields: Cultures, Practices, and Environmental Sciences* (McGill-Queen's Press, 2017).
[25] William F. Althoff, *Drift Station: Arctic Outposts of Superpower Science* (Potomac Books, 2007).

imaginations,[26] and Eric Wilson's literary take on the history of polar exploration, *The Spiritual History of Ice*.[27] Some of these texts on the early days of Antarctic exploration even serve as critical examinations of the history of science such as Cornelia Lüdecke [28] and Edward Larsen's work. Larsen in particular used his 2011 *An Empire of Ice* [29] and his 2018 *To the Edges of the Earth*[30] to contextualize the expeditions of Robert Falcon Scott, Ernest Shackleton, and Douglas Mawson within the greater history of science in the British Empire, and the global history of early twentieth century polar and alpine exploration, respectively.

Writings about the more recent periods of Antarctic science-that is, since World War I- is scarcer, but it too has seen a recent uptick. In the past twenty years, Stephen Haddesley, Dian Belanger, Adrian Howkins, Klaus Dodds, James Spiller, and Peder Roberts have all published extensively on the history of modern science, exploration, and politics in Antarctica. Stephen Haddesley, a popular rather than academic history writer, has published several monographs on the history of Antarctic exploration, including books on Operation Tabarin and the Commonwealth Trans-Antarctic Expedition.[31] However, Haddesley writes narrative history and neither spends much time on the history of science nor frames these narratives within the relevant historiography. Similarly Dian Belanger's 2006 book, *Deep Freeze,* published for the 50th anniversary of the IGY, is a narrative history of Operation Deep Freeze, the American Naval

[26] Francis Spufford, *I May Be Some Time: Ice and the English Imagination* (New York: St. Martin's Press, 1997).
[27] Eric Wilson, *The Spiritual History of Ice: Romanticism, Science and the Imagination*, 2003 edition (Basingstoke: Palgrave Macmillan, 2009).
[28] Cornelia Lüdecke, *Deutsche in der Antarktis: Expeditionen und Forschungen vom Kaiserreich bis heute* (Ch. Links Verlag, 2015).
[29] Edward J Larson, *An Empire of Ice: Scott, Shackleton, and the Heroic Age of Antarctic Science* (New Haven: Yale University Press, 2011).
[30] Edward J Larson, *To the Edges of the Earth: 1909, the Race for the Three Poles, and the Climax of the Age of Exploration* (New York: William Morrow, 2018).
[31] Stephen Haddelsey, *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica* (The History Press, 2011).; Stephen Haddelsey and Alan Carroll, *Operation Tabarin: Britain's Secret Wartime Expedition to Antarctica 1944-46* (The History Press, 2014).

Operations in Antarctica, written in the tradition of heroic accounts of polar science and exploration.[32]

Adrian Howkins' work, which served as my introduction to the history of modern Antarctica, deals extensively with the history of science. In fact, some of his more recent work has examined the ways that environmental history can inform scientific practice.[33] But unlike my dissertation which addresses the practice of fieldwork, the majority of his work explores how science has been used as a tool in geopolitical sovereignty claims between the United Kingdom, Chile, and Argentina.[34] James Spiller does the same sort of work in an American framework, situating American science and exploration within the context of the Cold War.[35] Similarly, Klaus Dodds, a geographer, has written extensively on science and geopolitics in Antarctica. But, like Howkins and Spiller, he explores science within the context of its international political implications.[36] Finally, Peder Roberts' 2011 book *The European Antarctic* explores the ways that

[32] Dian Olson Belanger, *Deep Freeze* (University Press of Colorado, 2011).
[33] Adrian Howkins, "Taylor's Valley: What the History of Antarctica's 'Heroic Era' Can Contribute to Contemporary Ecological Research in the McMurdo Dry Valleys," *Environment and History* 22, no. 1 (February 1, 2016): 3–28.
[34] See Adrian Howkins. *Frozen Empires: An Environmental History of the Antarctic Peninsula* Oxford: Oxford University Press, 2016. A. Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939-1959," *History of Meteorology* 4 (2008): 27–40.; Adrian Howkins, "Icy Relations: The Emergence of South American Antarctica during the Second World War," *Polar Record* 42, no. 2 (April 2006): 153–65.; Adrian Howkins, "Science, Environment, and Sovereignty: The International Geophysical Year in the Antarctic Peninsula Region," in *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*, ed. Roger D Launius, James Rodger Fleming, and David H DeVorkin (New York: Palgrave Macmillan, 2010).; Adrian Howkins, "The Science of Decolonialization: The Retention of 'Environmental Authority' in the Contest for Antarctic Sovereignty between Britain, Argentina, and Chile, 1939-59," in *Science and Empire: Knowledge and Networks of Science across the British Empire, 1800-1970*, ed. B. Bennett and J. Hodge (Scott Polar Research Institutenger, 2011).; Adrian Howkins, "Reluctant Collaborators: Argentina and Chile in Antarctica during the International Geophysical Year, 1957 - 58," *Journal of Historical Geography.* 34 (2008).; Adrian Howkins, "Melting Empires? Climate Change and Politics in Antarctica since the International Geophysical Year," *Osiris* 26 (2011): 180–97.; Adrian Howkins, *The Polar Regions: An Environmental History* (John Wiley & Sons, 2015).
[35] James Spiller, *Frontiers for the American Century: Outer Space, Antarctica, and Cold War Nationalism* (Palgrave Macmillan, 2015).
[36] Klaus J. Dodds, "Assault on the Unknown: Geopolitics, Antarctic Science, and the International Geophysical Year (1957-8)," in *New Spaces of Exploration: Geographies of Discovery in the Twentieth Century*, ed. Simon Naylor and James R. Ryan (London: I. B. Tauris, 2010).; Klaus Dodds, *Geopolitics of Antarctica: Views from the Southern Oceanic Rim* (Wiley, 1997). Klaus J. Dodds, "Post-Colonial Antarctica: An Emerging Engagement," *Polar Record* 42, no. 1 (January 2006): 59–70.; Klaus Dodds. "The Great Trek: New Zealand and the British/Commonwealth

science served as a stage for displaying international Antarctic in Scandinavia and Great Britain. Though Roberts is more interested in the work of scientists, he still frames his argument within geopolitical interests in the region. Additionally, his periodization ends with the IGY, with my dissertation picking up where he leaves off. While Howkins, Dodds, and Roberts have been essential reading in preparation for this dissertation, I believe that my work speaks more directly to the recent histories of Antarctic science.

In the past three decades, there have been a number of excellent texts published on the history of modern science in Antarctica. G.E. Fogg's *A History of Antarctic Science* (1993) serves as almost a textbook for the history of science in the Antarctic.[37] Written by a biologist, it details the history of several disciplines and argues that within the context of this unique space, the work of Antarctic scientists led to a holistic and interdisciplinary conception of Antarctic science. However, while his work is engaged with the interpersonal nature of Antarctic science, it does not discuss the political, social, or cultural issues at play in the region and barely acknowledges the enviro-technical role contribution on scientific knowledge production. Graham Burnett's *The Sounding of the Whale,* addresses the history of science in the Southern Ocean during this time, but rather than focusing on geophysical research, Burnett studies the history of whaling science exclusively.[38] Jessica O'Reilly's *A Technocratic Antarctic* (2017) examines the practice of science in the New Zealand and American research programs in the Ross Dependency. Like my dissertation, she engages with theory in science and technology studies to understand the nature of Antarctic fieldwork. But as an anthropologist, her text does not much

1955–58 Trans-Antarctic Expedition." *The Journal of Imperial and Commonwealth History* 33, no. 1 (January 1, 2005): 93–114.; Klaus J. Dodds, *Pink Ice: Britain and the South Atlantic Empire* (I.B.Tauris, 2002).

[37] G. E Fogg, *A History of Antarctic Science* (Cambridge University Press, 1992).

[38] D. Graham Burnett, *The Sounding of the Whale: Science & Cetaceans in the Twentieth Century* (Chicago; London: The University of Chicago Press, 2012).

examine the early history of Antarctic science, though like Howkins, Roberts, and Dodds, she argues that policymakers use scientific expertise to make justifications for governance.[39] Additionally O'Reilly engages little with more recent scholarship in Antarctic Humanities and Social Sciences, despite the plethora of work published between the completion of her dissertation and the publication of her book.

Other scholars have written more explicitly on the place of modern Antarctic science within the history of science, work which my dissertation attempts to build on directly. Katrina Dean and Simone Turchetti have published on how specific political and technological conditions allowed for echo-radio sounding to be included in glaciological fieldwork beginning in the 1960s,[40] as well as on the international politics of sharing data in the Antarctic,[41] and the political implications of American seismic traverses.[42] Alessandro Antonello's research investigates the history of Antarctica and the Southern Ocean since 1945, particularly the development of the contemporary international regime of environmental management and protection governing the region and its associated science and politics.[43] Additionally, he has recently conducted excellent place and space based work on the history of Antarctic ice and oceans. In this newer work, Antonello argues that in order to understand the history of Antarctic science, one needs to draw make connections between both the materiality and the social and

[39] Jessica O'Reilly, *The Technocratic Antarctic: An Ethnography of Scientific Expertise and Environmental Governance* (Cornell University Press, 2017).
[40] Simone Turchetti et al., "Accidents and Opportunities: A History of the Radio Echo-Sounding of Antarctica, 1958-79," *The British Journal for the History of Science* 41, no. 3 (2008): 417–44.
[41] Katrina Dean et al., "Data in Antarctic Science and Politics," *Social Studies of Science* 38, no. 4 (August 1, 2008): 571–604.
[42] Simon Naylor, Katrina Dean, and Martin Siegert, "The IGY and the Ice Sheet: Surveying Antarctica," *Journal of Historical Geography*, Science and Geopolitics: the International Geophysical Year, 1957-8, 34, no. 4 (October 2008): 574–95.
[43] Alessandro Antonello, "The Greening of Antarctica: Environment, Science and Diplomacy, 1959 - 1980" Unpublished Dissertation. (Australia National University 2014). Alessandro Antonello, "Protecting the Southern Ocean Ecosystem: The Environmental Protection Agenda of Antarctic Diplomacy and Science," in *International Organizations and Environmental Protection: Conservation and Globalization in the Twentieth Century*, ed. Wolfram Kaiser (New York: Berghahn, 2017).

cultural constructions of the ice and ocean.[44] Finally, in his long career, Aant Elzinga explored the construction of Antarctica as a continent by and for science.[45] Building on this growing and excellent body of literature examining the geographies of science and the place of Polar Regions and the Southern Ocean in history, my project will therefore be of value to scholars across imperial, environmental, gender, and science and technology studies by showing "science in action" within the context of a socially, politically, and environmentally extreme and unstable geographical region.

My research argues that modern science in Antarctica was molded by the environmental, geopolitical, and structural factors involved in polar exploration in the late-British empire. Not only did this sort of research and exploration shape the Antarctic continent as an environment for science, the material elements in geographical landscape shaped the research practices and methods in the region. The first chapter of my dissertation, "The Last Frontier of the British Empire," begins by contextualizing Antarctic science within the historic British interest in the region and the organization of the International Geophysical Year. Although Britain had been long interested in the Antarctic, beginning with James Cook's explorations in the Antarctic

[44] Alessandro Antonello, "Engaging and Narrating the Antarctic Ice Sheet: The History of an Earthly Body," *Environmental History* 22, no. 1 (January 1, 2017): 77–100. Alessandro Antonello and Mark Carey, "Ice Cores and the Temporalities of the Global Environment," *Environmental Humanities* 9, no. 2 (November 1, 2017): 181–203. Mark Carey et al., "Glaciers, Gender, and Science," *Progress in Human Geography* 40, no. 6 (December 1, 2016): 770–93. Alessandro Antonello, "The Southern Ocean," in *Oceanic Histories*, ed. David Armitage, Alison Bashford, and Sujit Sivasundaram (Cambridge, United Kingdom ; New York, NY: Cambridge University Press, 2018). Alessandro Antonello, "Life, Ice and Ocean: Contemporary Antarctic Spaces," in *Handbook on the Politics of Antarctica*, ed. Klaus Dodds, Alan D Hemmings, and Peder Roberts (Cheltenham: Edward Elgar Publishing, 2017). Alessandro Antonello, "Finding Place in Antarctica," in *Antarctica and the Humanities*, ed. Peder Roberts, Lize-Marié van der Watt, and Adrian Howkins (Springer, 2016).

[45] Aant Elzinga, "Antarctica: The Construction of a Continent by and for Science," in *Denationalizing Science: The Contexts of International Scientific Practice*, ed. Elisabeth T. Crawford, T. Shinn, and Sverker Sörlin (Scott Polar Research Institutenger Science & Business Media, 1993). Aant Elzinga, "Through the Lens of the Polar Years: Changing Characteristics of Polar Research in Historical Perspective," *Polar Record* 45, no. 04 (2009): 313–36.

Convergence in the late eighteenth century, until the early twentieth century, they were among the only world power to display interest in the region. As the twentieth century wore on, Chile, France, Norway, and Argentina also made claims to Antarctic territory, forcing Britain to get more heavily involved in their occupation.

When the International Geophysical Year was being planned through the early 1950s, Britain's grasp on Antarctica seemed weaker than ever, facing sovereignty incursions from Argentina and threats of domination by the larger American research programs, as in the context of the Cold War, "new value was placed upon knowledge of the earth itself by states that were increasingly embarking on a quest to know more about those who lived on earth by asking questions of the physical places they inhabited."[46] Going into the IGY, the scientific and polar communities in Britain were generally disunited over what their presence in Antarctica should even look like. Even after suggestions were made to build a new station at Vahsel Bay, within the British territorial claim. Some even believed that Britain should simply focus their efforts of bolstering research programs in the existing Falkland Islands Dependencies Bases. But the hand of the Royal Society was forced when Argentina announced plans to build a station in the Vahsel Bay region for the IGY and Vivian Fuchs simultaneously announced his plans for a Commonwealth Trans-Antarctic Expedition. Even though there was widespread skepticism over the benefits of a station at Vahsel Bay, the political benefits that would be achieved by this stations outweighed the doubts of its value either fiscally or scientifically.

The second chapter, "The Pennies of Schoolchildren," examines the varying ways that Antarctic expeditions were funded in New Zealand and the United Kingdom. Traditionally, Antarctic expeditions received a combination of public and private sponsorship ranging from

[46] Samuel A Robinson, *Ocean Science and the British Cold War State* (S.l.: Palgrave Macmillan, 2018). 18

government grants, to corporate sponsors, to individual subscriptions. This was certainly the case for the Commonwealth Trans-Antarctic Expedition, as well as the Victoria University of Wellington Expedition. However, the rhetoric used in these two countries reflect drastically different visions for the future of Antarctica. In New Zealand, fundraising efforts spearheaded by Edmund Hillary and the Ross Sea Committee propagated a vision of a domestic Antarctica, a frontier which could be conquered through the contributions of the New Zealand populace who could share in these adventures. The United Kingdom, on the other hand, presented an imperial vision, whereby Antarctica was a stage for the practice of nationalistic, prestige granting science. It was this nationalist vision that won out and during the late 1950s, funding for Antarctic science and exploration underwent a major change. By the early 1960s, nearly all polar research was funded and organized through large governmental programs.

Tensions between different visions for Antarctica are also the subject of my third chapter, "How to Select A Research Site." In this chapter, I show that that the geographical sites of the British base at Halley Bay and New Zealand's Scott Base reveal clashes between the sometimes conflicting priorities of scientists and those making decisions for the bases. As explored in the first chapter, many in the British polar community were doubted the value of a research station in the Vahsel Bay area. After it was decided to construct a base there, in 1955, Surgeon Lieutenant Commander David Dalgliesh was sent by the Royal Society to the Weddell Sea, with instructions to build an International Geophysical Year (IGY) research station on either exposed rock or piedmont ice. Due to his lack of equipment and expertise, he selected a site at Halley Bay, about 150 miles away from Vahsel Bay, which, as it turned out, was actually located on floating ice, introducing an unknown geographic quantity to those planning geophysical research. Over in the Ross Dependency, in 1956, a team of New Zealand scientists selected

Butter Point as the best site for constructing a research station for the IGY, which they would share with the New Zealand Party of the Trans-Antarctic Expedition. A year later, when visiting Butter Point, Edmund Hillary, decided that it was unsuitable for his purposes and without consulting or heeding advice from scientists, constructed a Base on Pram Point on the volcanic Ross Island, a decision which had several lasting consequences for the IGY researchers.

While the locations of Halley Bay and Scott Base have been vindicated by subsequent important discoveries made in each site, all were built in places that were little scouted, bizarrely situated, and could easily have been disastrous for the future of scientific research in these areas. This chapter will examine the origins of these two bases, looking at the political and environmental contingencies that determined their locations as well as the scientific and political consequences of these decisions. Using these bases, it will show that in Antarctica, while the geophysical requirements of a research station historically have been taken into consideration before construction, scientific needs are often put at a lower priority than political demands or environmental limitations.

Chapter Four, "Experiments in Measuring," explores these environmental limitations even further, examining the history of instrument use at the TAE's Shackleton Base in the Vahsel Bay area and at Halley Bay. This chapter is divided in two parts. In the first, I examine the use of four instruments that were used by the TAE party at Shackleton Base: microscopes, watches, thermometers, and the Integrating Motor Pneumotachograph. These instruments took on different meanings to those involved in the expedition. For its creator, John McArthur, lending his specially designed microscope to the TAE allowed him to not only capitalize on the international publicity of the expedition, but gave him a geographical laboratory to test the adaptability of his instruments to extreme conditions. Multiple watch companies also vied for the

publicity that would come with their products being carried across the Antarctic continent. Smith's won the contract, promising to provide the expedition not only with watches, but several other instruments at no cost. However, the Expedition came to regret this agreement as timepieces are one of the most vital pieces of equipment in Polar Regions, and Smith's watches constantly malfunctioned. Thermometers too, of varying brands, functioned very inconsistently throughout the expedition, not designed for research in such an environment. Finally, the Integrating Motor Pneumotachograph was used by physiologist Allan Rogers to measure the energy used by men at rest and work. Many volunteers were subjected to this device, creating a barrier between themselves and their environment, inhibiting their own research abilities while they wore it. At Halley Bay, scientists faced several of the same problems with their instruments, but they adapted a series of behavioral and technological adaptations to do research for which their instruments had not been specifically designed, as demonstrated in the second half of this chapter.

The fifth chapter, "The Traveling Rocks," studies a specific set of geological specimens gathered by British and New Zealand geologists during the TAE in the Ross and Falkland Island Dependencies. In my chapter I argue that these specimens provide a lens into several different issues in Antarctic science and exploration including gender, colonialism, non-human agency, and debates in earth sciences. First, while the TAE is often characterized as not having truly scientific goals, several papers were published regarding these specimens, both by the men who gathered them, but also by geologists around the world. The extreme conditions and the publicity surrounding the TAE speaks to ideals of masculinity in polar research. But additionally, two women wrote papers using these specimens, showing how the narrative of masculinity often erases women in science, but also how the mobility of specimens allowed women to participate

in research in a part of the world where they would never travel. One of these women, Edna Plumstead, used these specimens to present a biogeographic argument for continental drift theory, at a time when this theory was dominated by paleomagnetism and oceanography. While in her possession, the rocks also began to ooze unexpectedly, demonstrating the instability of specimens removed from their native environment. Finally, once these specimens had been gathered and initially analyzed, they were immediate the source of a conflict between the British Museum of Natural History and the New Zealand Geological Survey, both of whom desired their possession, revealing tensions in the relationship between scientists in Britain and those in their former colonies.

Finally, the sixth chapter, "The Forgotten Glaciological Expedition," uses the IGY Expedition to South Georgia to explore the professionalization of glaciological science and the importance of social networks to the production of scientific knowledge. In 1956, the Royal Society and the Falkland Islands Dependencies Survey collaborated to send a small expedition to make glaciological observations on the sub-Antarctic island of South Georgia during the IGY. This expedition was poorly planned, funded, and executed. The two scientists fought incessantly. Jeremy Smith, thought his partner, Richard Brown, to be lazy and unqualified for the work. Brown considered Smith to be fanatical, misogynistic, and incapable of social propriety. At the center of much of their discord was the presence of Brown's wife, Elizabeth. Smith found her presence intolerable and after months of complaining, managed to get Brown dismissed and the couple returned to London. Smith's results were never published, due to his death in an accident not long after his return to the UK. This expedition can tell us a lot about the state of British glaciology in the 1950s including its low priority for the British government, the lack of qualified geologists willing to go to Antarctica, and the dwindling relevance of small scale glaciological

surveys to the greater field. But most importantly it shows how boundaries of science were drawn by those practicing it. Smith constantly dwells on what rights should be extended to him, as well as policing the behavior of those like Richard and Elizabeth Brown, who as non-formally trained scientists, should not be on a Royal Society Expedition. Through illegitimating their presence, essentially erasing the couple from official histories of the expedition, Smith validated his own self-estimation as a true scientist.

Situating Antarctica within the greater context of late-imperial Britain, late-Dominion New Zealand, and the global history of science is at the core of my dissertation. By following these expeditions through their conception, funding and organization, construction, instrument use, specimen circulation, and social dynamics, I show that Antarctica's designation as a "continent for science" was the result of several political, social, and even environmental struggles and disputes over its future. A liminal space during the late 1950s, the foundations of modern Antarctic research was based on a series of contingencies and negotiations. It is these contingencies and negotiations that have served to create the many interdependent factors that created the way we understand the region and the way that scientific projects in extreme environments are conducted.

CHAPTER ONE: THE LAST FRONTIER OF THE BRITISH EMPIRE

Introduction

For nearly all of human existence, nearly nine percent of the world's landmass-- and ninety percent of its fresh water-- sat at the bottom of the world, unaffected directly by human activity. At the start of the nineteenth century, a few intrepid explorers and scientists made slight incursions on the Antarctic continent. Following the turn of the twentieth century, the region saw a sudden influx of expeditions coming from Sweden, Belgium, France, Germany, Japan, Norway, and especially Great Britain. After WWI, the number of these expeditions dwindled. Despite claiming sovereignty over the majority of the continent since 1908, there were only two British-organized expeditions to the Antarctic continent between 1922 and 1942: the British Australian New Zealand Antarctic Research Expedition (1929-31) and the British Graham Land expedition (1934-37). This changed during WWII, when Great Britain, nervous about Argentinian and Chilean encroachments on its territory, built several research stations along the Antarctic Peninsula. These stations were however poorly manned and primarily intended for maintaining British claims in the region than geographical or scientific exploration. In fact, despite the untapped potential for myriad scientific projects, other than Chile, Argentina, and Great Britain, no countries seemed interesting in establishing a permanent presence in Antarctica.

This changed in the 1950s when human activity exploded in Antarctica. While this was largely due to the organization of the International Geophysical Year (1957-8), some interest was grounded in various political or scientific reasons outside of the IGY. By the end of the decade, in 1959, the thirteen countries that conducted research in Antarctica during the IGY established a Treaty System that designated the continent as a land to be forever used exclusively for the

peaceful pursuit of scientific knowledge; essentially a continuation of the International Geophysical Year (IGY) to be practiced in perpetuity.[47] In this chapter, I will narrate how Antarctica transitioned from simply a geographical idea in the late eighteenth century to, at the start of the IGY, a frontier on which Britain, in the face of their declining empire, could continue to exude their international relevance. As historian Sabine Clarke has noted in the case of British colonial science in Africa, the West Indies, and Asia, after World War II, "a significant expansion in colonial research offered the prospect of restoring the credibility of British action in the colonial sphere at a time when the British government faced severe criticism over the management of its colonial possessions."[48] In other words, Britain used achievements in science to justify its claims to its territorial possessions around this world. And this was true also in Antarctica. As I will discuss, investing in polar science was a way that the waning British Empire could maintain its relevance on an international stage. Science, therefore, became a political medium by which Britain could make discrete decisions for employing their finite, and even dwindling resources. Since the claims to space were contested, and the roles of nearly all major players were ambiguous and disputed, any research was inherently politicized, if not at an international level, then within the scientific community. At the same time, international and domestic politics became a means of justifying expensive and even impractical research.

Antarctic research was a major emphasis for many of the major players involved in the International Geophysical Year. Great Britain eventually decided to establish one major research station in the Weddell Sea, organized by the Royal Society, while also requesting that smaller research efforts were conducted by the widespread, if generally unscientific, Falkland Islands

[47] *Antarctic Treaty*, December 1, 1959.
[48] Sabine Clarke, "A Technocratic Imperial State? The Colonial Office and Scientific Research, 1940–1960," *Twentieth Century British History* 18, no. 4 (January 1, 2007): 453–80.

Dependencies Survey (FIDS). Additionally, the British IGY contribution was faced with a sudden wrench when Dr. Vivian Fuchs, a FIDS geologist, announced his own plans to lead a Trans-Antarctic Crossing, reclaiming the masculine, heroic, and nationalistic prestige which came from such achievements, and thereby threatening the Royal Society's perhaps futile wishes that their presence could be perceived as apolitical, even if they widely acknowledged internally that any research in the Weddell Sea could only be political. Figures in the Colonial Office, Scott Polar Research Institute, Royal Society, and other institutions took varying positions on both the proposed TAE and the Royal Society Base in the Vahsel Bay, weighing in their minds the political and scientific advantages of each program and their alternatives. Moving into the IGY, there was no unified British voice either in terms of the future of Antarctica or on what an ideal program should even look like. Although some of these incongruences can be explained by the tricky geopolitical position of Antarctica, many came from internal disputes within the scientific community with Great Britain. In this way, the continued British stronghold in Antarctic science came not from inherent strengths in geophysical research or failsafe sovereignty claims in the region, but from a series of intellectual, political, and geographical contingencies.

Drawing on the work of Klaus Dodds, Adrian Howkins, and Peder Roberts, this chapter begins by summarizing both the British interest and presence in Antarctic beginning in the eighteenth century, up through the rampant building of research stations on the Antarctic Peninsula immediately after World War II. Next, it will discuss the origins of the IGY, which grew out of two earlier projects that attempted to coordinate international collaboration on polar research. Finally, it will discuss the internal British politics surrounding the organization of a British IGY program in Antarctica. This discussion will show that in the mid-1950s, the British

polar and scientific community lacked unity as to what role Antarctica should have in the declining British Empire.

Imagining Antarctica Before 1820

British explorers had been some of the first to explore the Antarctic Ocean during the eighteenth century, prompted by the idea that the long-hypothesized *Terra Australis Incognita,* present on countless Renaissance world maps, was yet to be discovered. Since islands were consistently being discovered in the Southern Oceans during the seventeenth and eighteenth centuries, as diplomat and writer John Campbell noted "it is Certain, that Islands, great and small, are seldom, if ever, at a very great Distance from a Continent." Denials otherwise, he continued, are "Hasty Conclusions…extremely fatal to Science in general and to the Art of Navigation in particular."[49] The brilliant Scottish hydrographer Alexander Dalrymple even published *Account of the Discoveries made in the South Pacific Ocean, previous to 1764* in 1769, a variable manifesto for both the existence of a large southern continent and reasons that Britain should be the first to discover it. He believed that Antarctic would be massive, with an enormous population: "The number of inhabitants in the Southern Continent is probably more than 50 millions, considering the extent … 5323 statute miles. This is a greater extent than the whole civilized part of Asia, from Turkey to the eastern extremity of China."[50] Any country that opened up trade with such a new land, Dalrymple predicted, would certainly be the greatest power in the world.

Prompted in part by Dalrymple's urging, the Royal Society outfitted explorer and Royal Navy Captain James Cook, fresh from his exploration of the coast of Australia, to explore the

[49] Quoted in Howard T. Fry, *Alexander Dalrymple and the Expansion of British Trade* (Routledge, 2013). 97
[50]Alexander Dalrymple, *A Historical Collection of the Several Voyages and Discoveries in the South Pacific Ocean* (N. Israel, 1967). xxviii-xxix

Southern Oceans and find a southern continent in 1772-5. In January 1773, Cook became the first documented explorer to cross into the Antarctic Circle, although this can be disputed by the Maori legend of Ui-te-Rangiora, a seventh century Polynesian navigator who, aboard the his vessel Te Ivi-o-Atea, sailed south on the until reaching a sea of pack ice and the Aurora Australis.[51] Cook did not make it as far as the continent, coming within one hundred miles of the Antarctic mainland, when, hindered by the dangerous sea conditions, he wrote that "if it actually exists, must lie within the polar circle, where the sea is so encumbered with ice, that the land is rendered inaccessible."[52] While Cook spent about a year of his second voyage sailing in and out of the Antarctic Circle, Cook realized, "Under all these unfavorable circumstances, it was natural for me to think of returning more to the north, seeing no probability of finding any land here, nor a possibility of getting farther south….I will not say that it was impossible anywhere to get further to the south; but the attempting it would have been a dangerous and rash enterprise."[53]

Antarctica was discovered finally in 1820, by three different men within days of each other: American Nathaniel Palmer, British Edward Bransfield, and Russian Fabian Gottlieb Thaddeus von Bellingshausen. But by the mid nineteenth century, Antarctica was no longer a subject of interest. Although between 1839-1843, aboard the warships *Erebus* and *Terror,* James Clark Ross, charted much of the coastline and discovered the Ross Sea, Ross Ice Shelf, Mount Terror, Mount Erebus, and Victoria Land, Antarctic exploration was dangerous, costly, and seemed to yield little of value.[54] However, beginning in 1843, the British government formally began to administer the territory including "the groups of islands known as South Georgia, the

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[51] Arthur Stanley Helm and Joseph Holmes Miller, *Antarctica; the Story of the New Zealand Party of the Trans-Antarctic Expedition* (Owen, 1964). 13
[52] Quoted in Helen Saunders Wright, *The Seventh Continent: A History of the Discovery and Explorations of Antarctica* (R.G. Badger, 1918). 58
[53] Quoted in Brian W. Richardson, *Longitude and Empire: How Captain Cook's Voyages Changed the World* (UBC Press, 2010)., 54
[54] Ernest C Coleman, *From Frobisher to Ross.* (Stroud: Tempus, 2006).

South Orkneys, the South Shetlands, and the Sandwich Islands, and the territory known as Graham's Land, situated in the South Atlantic Ocean to the south of the 50th parallel of south latitude, and lying between the 20th and the 80th degrees of west longitude."[55] In 1908, Great Britain made a sovereignty claim to this area, which was called the Falkland Islands Dependencies.

The Heroic Age of Antarctic Exploration (1890-1920)

Fifty years later, hearing rumors of German interest in the area, Dr. John Murray, a British oceanographer, gave a lecture to the Royal Geographical Society in London in 1893, called "The Renewal of Antarctic Exploration." In this speech, he argued that Britain, with its long standing pride in its own maritime prowess, should not leave the exploration of Antarctic to other nations.[56] In 1887, even before Murray's lecture, the Royal Geographical Society had already formed and Antarctic Committee. In 1895 the Sixth International Geographical Congress in London passed a general resolution calling on scientific societies throughout the world to promote the cause of Antarctic exploration. But despite this British impetus for Antarctic Exploration, what historians now consider to be the Heroic Age of Antarctic Exploration was launched by an expedition organized by the Belgian Geographical Society in 1897. The first British expedition to Antarctica, the first to winter on the mainland, near Cape Adare, was led by Carsten Egeberg Borchgrevin aboard the *Southern Cross* 1898-1900. It was privately financed by magazine publisher Sir George Newnes, and was extremely international, consisting of five Norwegians, two Australians, two English, and two Sami (indigenous men of northern Scandinavia). However, this expedition was not well received back in England, robbing Royal

[55] Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016). 23
[56] John Murray, "The Renewal of Antarctic Exploration," *The Geographical Journal* 3, no. 1 (1894): 1–27.

Geographical Society of prestige, as they were organizing their own expedition. Additionally, Borchgrevin, as a half Norwegian former whaler did not suit their mold for a model polar explorer.[57]

The National Antarctic Expedition (1901-04), also called the *Discovery* Expedition, was led by famed Antarctic explorer Commander Robert Falcon Scott. This expedition was largely the brainchild of Sir Clement Markham, the Secretary of the Royal Geographical Society. Aside from the incredible scientific observations in biology, meteorology, geology, and magnetism, exploration of untouched territory (including the discovery of the McMurdo Dry Valleys, the Polar Plateau, and King Edward VII Land), and setting the record for venturing furthest South at 82°17′S, this expedition launched the career of several Antarctic polar explorers. In 1907-09, Ernest Shackleton, the third officer on the *Discovery,* organized the *Nimrod* Expedition, attempting to be the first expedition to the South Pole. While not successful in reaching the Pole, many considered this expedition a scientific achievement. The party was accompanied by some of the foremost minds in earth science including household name Sir Edgeworth David, rising star Douglas Mawson, and Raymond Priestley who later founded the Scott Polar Research Institute.

Scott and Shackleton each set out on another expedition within the next ten years, and both of their journeys ended in failure. The *Terra Nova* (1910-1913) was another attempt to be the first to the South Pole. Let by Scott, this expedition included an ambitious scientific program,[58] as Scott "arranged for a scientific staff larger than that which has been carried by any

[57] T. H. Baughman, *Before the Heroes Came: Antarctica in the 1890s* (Lincoln: University of Nebraska Press, 1994).
[58]Edward J. Larson, *An Empire of Ice: Scott, Shackleton, and the Heroic Age of Antarctic Science* (New Haven: Yale University Press, 2011).

previous expeditions."[59] As stated by Scott: "The main objective of this expedition is to reach the South Pole, and to secure for The British Empire the honour of this achievement."[60] But according to the chief scientist Edward Wilson, "No one can say that it will have only been a Pole-hunt ... We want the scientific work to make the bagging of the Pole merely an item in the results."[61] But while Scott reach the Pole in January 1912, he found that Roald Amundsen had already planted the Norwegian flag a month earlier. Scott and the other four men in his party all died before they reached safety. In 1914, Shackleton set out on the *Endurance,* planning on being the first to cross the continent in Imperial Trans-Antarctic Expedition. But his ship famously was caught in the ice of the Weddell Sea and sank, forcing his party to spend two years stranded in the Antarctic until he could make an improbable, though successful, search for rescue. This expedition included geologist James Wordie, who, later in his life, was extremely important to the organization of the Trans-Antarctic Expedition and British participation in the International Geophysical Year.

Britain was certainly not the only nation to express interest in Antarctica during this period. In fact, several other nations launched Antarctic expeditions in the first two decades of the twentieth century including France, Japan, Sweden, Norway, and Germany. But British exploration dominated Antarctic exploration. Besides the *Southern Cross, Discovery, Nimrod, Terra Nova,* and *Endurance* Expeditions, Scottish oceanographer William Speirs Bruce led the National Scottish Antarctic Expedition (1902-04), termed by one historian as "by far the most

[59] Quoted in Edward J. Larson, *An Empire of Ice: Scott, Shackleton, and the Heroic Age of Antarctic Science* (New Haven: Yale University Press, 2011).
[60] Quoted in Diana Preston, *A First Rate Tragedy: Robert Falcon Scott and the Race to the South Pole* (Boston: Houghton Mifflin, 1998). 101
[61] Quoted in David Crane, *Scott of the Antarctic: A Life of Courage and Tragedy* (New York: Alfred A. Knopf, 2006).

cost-effective and carefully planned scientific expedition of the Heroic Age."[62] Annoyed with the indifference of the Royal Geographical Society to his work, Bruce gave the hut that his team constructed on the South Orkney Islands to Argentina, a decision that had major political consequences later in the century. Finally, Douglas Mawson organized the Australasian Antarctic Expedition (1911-1914) to the almost completely unexplored King George V Land, immediately south of Australia, and one which made significant achievements in geology and meteorology.[63] But even in these early days, years before the South Pole was even reached, some British scientists, such as meteorologist Hugh Robert Mill, believed that merely sending expeditions to the Antarctic was not enough to "comprehend the conditions of climate, the movements of sea-currents and the seasonal changes in the ice." Instead, Mill argued that the future of Antarctic exploration lied in the collaborating of "flexible-minded men," preferably representatives of all the exploring nations, who should plan not an expedition, but a system of research by means of simultaneous and consecutive expeditions and fixed observatories."[64] This prediction is remarkably close to the eventual manner in which Antarctic research was organized during the IGY.

Antarctica as an Expansion of the British Empire

After World War I, Antarctic exploration slowed, but the British interest in the region remained steady. The British government's engagement with the Antarctic between the world wars was largely a pursuit for what Adrian Howkins has termed "environmental authority" through science.[65] In 1918, the Colonial Office created the Discovery Investigations, a long-term

[62] P Speak and National Museums of Scotland, *William Speirs Bruce: Polar Explorer and Scottish Nationalist* (Edinburgh: National Museums of Scotland Pub., 2003).
[63] Stephen Haddelsey, *Born Adventurer: The Life of Frank Bickerton, Antarctic Pioneer* (Stroud: Sutton Publishing, 2005).
[64] Hugh Robert Mill, *The Siege of the South Pole* (New York, F.A. Stokes Company, 1905), 437.
[65] Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016).

research program on the marine life in the Southern Ocean based on the island of South Georgia, a program that continued through 1951.[66] The Discovery Investigations were created for two primary reasons. First, the desire to control the rich whaling grounds in the British-claimed Antarctic sector had been one of the major reasons for British assertion of sovereignty.[67] Second, since the United Kingdom's international political interest with respect to the Antarctic was long been dominated by Britain's dispute with Argentina and Chile, the United Kingdom was able to use this research program to support its occupation of the region. In a 1955 International Court of Justice grievance, the United Kingdom used their investments in the Discovery Investigations to justify their claim to the region, arguing that "when the territorial waters of the Dependency were the base of operations of several whaling companies of different nationalities, Argentina took no measures (as a prudent sovereign would have done, or sought to do) to regulate these activities, or to conserve the stocks of the principal economic resource of the territories concerned." Through the work of the Discovery Investigations, "research on the natural history of whales is admitted by expert opinion to have made a vital contribution towards the effective solving of the international problem of the conservation of whale fisheries" and therefore "Great Britain alone undertook the responsibilities of sovereignty and performed the functions of a State."[68]

The British Empire did not limit its occupation of Antarctica to the Discovery Investigations. In 1943, the Colonial Office and the Admiralty collaborated to establish a top-secret program known as Operation Tabarin which would "establish permanent stations of

[66] John Coleman-Cooke, *Discovery II in the Antarctic: The Story of British Research in the Southern Seas.* (London: Odhams Press, 1963).
[67] John Hanessian, "National Interests in Antarctica," in *Antarctica*, ed. J. W. Beagley, T. Hatherton, and New Zealand Antarctic Society (London: Methuen & Co., 1965). 26
[68] Application Instituting Proceedings before the International Court of Justice *Antarctica (United Kingdom v. Argentina)* 1955.

effective occupation in the Dependencies to safeguard British sovereignty"[69] against recent Chilean and Argentinian incursions in the region. While Operation Tabarin was almost a wholly political, military endeavor, it still attempted to integrate a small scientific program.[70] The first base established by Operation Tabarin, Port Lockroy, was the first site to take ionospheric observations and the first to record an atmospheric whistler from Antarctica in 1957. [71] The success of Lockroy as a geophysical research facility retroactively vindicated this site's selection, even though Lieutenant Commander James Marr, the initial leader of Operation Tabarin, "tortured himself over his failure to establish his base at Hope Bay and always viewed Port Lockroy as a poor compromise."[72] Tabarin also established a base near an abandoned Norwegian whaling station in the protected harbor of Deception Island, and at both sites, posted "A made up notice board decorated with a Union Jack and the legend: 'British Crown Lands'" and removed "notices of an Argentine visit of the previous year."[73]

While Britain certainly made its mark on the region through Tabarin, and "Taking the purely political standpoint…the active interest displayed by Great Britain…has once again been revived,"[74] without a permanent establishment in the region, it would be difficult to defend the Antarctic Peninsula against Argentina's sovereignty claims. Argentina had permanently occupied the South Orkney Islands since 1904, when the station had been handed over by William Bruce's

[69] Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016). 87
[70] Stephen Haddelsey and Alan Carroll, *Operation Tabarin: Britain's Secret Wartime Expedition to Antarctica 1944-46* (The History Press, 2014).
[71] W.J.G. Beynon, "Ionospheric Studies in the IGY," *New Scientist* 2, no. 34 (July 11, 1957): 23–25.
[72] Stephen Haddelsey and Alan Carroll, *Operation Tabarin: Britain's Secret Wartime Expedition to Antarctica 1944-46* (The History Press, 2014).
[73] I. MacKenzie Lamb. "Narrative Diary of a British Wartime Expedition, 1944-46." British Antarctic Survey Archives AD 6/15/16
[74] Quoted in Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London; New York; New York: I.B. Tauris). 16

Scottish National Expedition.[75] This gave Argentina an advantage over Britain since they could "claim to [be] fulfilling the legal requirement of effective occupation."[76] While some, including Prime Minister Clement Atlee, questioned the necessity of a permanent British presence in the Antarctic, the defense minister, A.V. Alexander, pointed to the strategic advantages of controlling the southern sea routes between the Atlantic and Pacific Oceans. He stressed that "If we did nothing to check this tendency… Argentina and Chile could establish a most undesirable precedent, embarrassing to both ourselves and in the Dominions."[77] Therefore, at the completion of Operation Tabarin, the Atlee Government formed a non-military imperial survey organization in 1945, which it called the Falkland Islands Dependencies Survey (FIDS).

When recruiting members to staff FIDS, the Colonial Office's position regarding Antarctica was clear: "The primary objective of the Survey…is to strengthen His Majesty's title to the sector of Antarctica." Continuing the "scientific work in the Antarctic" was listed as a secondary goal.[78] Attempting to establish and even strengthen a colonial survey meant to "forestall and counteract any potential threat to British sovereignty in the Antarctic"[79] is somewhat ironic considering the nearly simultaneous attempts to dismantle colonial operations in India. By 1947, FIDS had established more stations on the Antarctic Peninsula at Hope Bay, Cape Geddes, the Argentine Islands, Admiralty Bay, and Signy Island. The Colonial Office believed that like the Discovery Investigations used the superior British knowledge about the

[75] P Speak and National Museums of Scotland, *William Speirs Bruce: Polar Explorer and Scottish Nationalist* (Edinburgh: National Museums of Scotland Pub., 2003).
[76] Adrian Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939--1959," *History of Meteorology* 4 (2008): 27–40. 31
[77] Quoted in Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016). 89
[78] Quoted in Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London; New York; New York: I.B. Tauris). 19
[79] Quoted in Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London; New York; New York: I.B. Tauris). 19

Southern Ocean to display their command over the Southern Atlantic, it would be through a combination of occupation and scientific superiority that Great Britain could establish its supremacy throughout the Dependencies.

It is important to note that while occupation in the name of Britain was the primary goal of FIDS, science always mattered as a key way demonstrate their claims. As the Colonial Office noted, "Apart from political objects, the purpose of the Falkland Islands Dependencies Survey is to acquire knowledge of the topography, geological structure, glacier, weather conditions, living, traveling, and navigating conditions, fauna and flora, and natural resources of the Falkland Islands Dependencies…Such knowledge is needed for the future development not only of the Dependencies but also of other Antarctic regions."[80] Finn Ronne, the leader of a contemporary American Expedition agreed with this assessment and wrote: "The main interests of the British were to maintain settlement for the purposes of colonization and claims, scientific studies and local triangulation surveys."[81] As late as 1953, while some geological, meteorological, and biological studies were being conducted in the Dependencies, "no geophysical investigations have been undertaken."[82] FIDS thus encouraged scientific and geographical study, but as a secondary goal to the more vital task of maintaining a permanent British presence on the Antarctic Peninsula which could counter Argentinian or Chilean claims. But any gestures to constructing research projects in the Dependencies were always overshadowed by the point that "the basic purpose of F.I.D.S. is political, namely to maintain our title to the U.K. Sector by acts of occupation and 'administration.'"[83]

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[80] Quoted in Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016). 95

[81] Finn Ronne, *Antarctic Conquest: The Story of the Ronne Expedition, 1946-1948.* (New York: Putnam's Sons, 1949). 31.

[82] V. E. Fuchs, *Organisation and Methods*, (London: HMSO, 1953).

[83] Letter from J.S. Bennett to Miles Clifford May 10th 1950 Scott Polar Research Institute Archives MS 1326 Stanley Office Proposal of the TAE Box 3

Even as late as 1955-7, recently after the United Kingdom filed their dispute over the Falkland Islands Dependencies with the International Court of Justice, FIDS organized a vast aerial survey project, believing that possessing accurate maps with British place names would strengthen their claims in the region.[84] Since the "production of maps and surveys of the FID was the most visible evidence of a British presence in the polar landscape [,] Maps (and the sketches and notes which led to their production) were valuable artefacts, and were the evidence of British endeavour on the ice."[85] Therefore FIDS made every attempt, despite harsh environmental conditions, to maintain scientific rigor in their production. Science, but always, in the service of sovereignty.

Despite the fact that British Antarctic research largely took place within a nationalistic context, the United Kingdom was not unopposed to international collaboration. In 1949-1952, Britain contributed money and party members to the Norwegian-British-Swedish Expedition to Dronning Maud Land.[86] This expedition represented what historian and biologist G.E. Fogg has termed the beginning of "the modern phase of Antarctic exploration."[87] Peder Roberts has shown that unlike the self-funded expeditions of the past where science to a back seat to adventurism, the NBSX was committed to an image of scientific integrity, focused on mundane routine and specialized expertise rather than enterprise and endurance. Probably, this focus on the more tedious details of glaciological research contributed to the lack of public interest in their

[84] Klaus Dodds, "Aerial Surveying, Geopolitical Competition and the Falkland Islands and Dependencies Aerial Expedition (FIDASE 1955-7)," in *From Above: War, Violence and Verticality*, ed. Peter Adey, Mark Whitehead, and Alison Williams (C. Hurst, Publishers, Limited, 2013), 71–93.
[85] Klaus Dodds, "Putting Maps in Their Place: The Demise of the Falkland Islands Dependency Survey and the Mapping of Antarctica, 1945-1962," *Ecumene* 7, no. 2 (April 1, 2000): 176–210. 190-1
[86] John Giaever, *The White Desert: The Official Account of the Norwegian-British-Swedish Antarctic Expedition*, First Edition edition (Dutton, 1955).; Charles Swithinbank, *Foothold on Antarctica the First International Expedition (1949-1952) through the Eyes of Its Youngest Member* (Lewes: Book Guild, 1999).
[87] G. E. Fogg, *A History of Antarctic Science* (Cambridge; New York: Cambridge University Press, 1992). 270

expedition.[88] It also shows that Britain's interest in Antarctica was not averse to international cooperation in the conduction of scientific fieldwork, although since this expedition took place in Norwegian territory, any work completed could not threaten claims to British sovereignty in the Falkland Islands Dependencies. Britain continued its posturing with Arentina through the 1950s, peaking with an incident at Hope Bay in February 1952, when an Argentinian party, moved by "an excess of zeal in the defense of the national territory of the Republic" fired over the heads of a British shore party.[89]

The International Polar Years (1882 & 1932)

While the International Geophysical Year was, as a massive, and in many ways unique event, it was not without precedent. There had been two International Polar Years (IPY) within the previous century, organized in Europe and including several countries in the Northern Hemisphere. Unsurprising perhaps, considering the general lack of interest in Antarctic exploration in the nineteenth century as well as its relative inaccessibility, Antarctica was almost completely neglected by the participating nations of the First International Polar Year in 1882. Only one research program was set up in the Antarctic, consisting of a German party to the island of South Georgia let by astronomer Karl Schrader. In addition to the IPY program of observations and measurements, the expedition was also to carry out general studies of flora, fauna, geology and tidal movements. South Georgia had a particular importance during the IPY period since the transit of Venus was to occur on 6 December 1882 and the island was well-placed to observe this phenomenon. [90]

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[88]Peder Roberts, *The European Antarctic: Science and Strategy in Scandinavia and the British Empire* (New York: Palgrave Macmillan, 2011). 137

[89] Walter Sullivan, *Quest for a Continent* (New York: McGraw-Hill, 1957). 269

[90] Susan Barr and Cornelia Luedecke, *The History of the International Polar Years (IPYs)* (Heidelberg; London: Scott Polar Research Institutenger, 2010).

During the Second International Polar Year (1932-33), like its predecessor, the organizers "planned to study phenomena on the largest possible scale."[91] Naturally, "The distribution of new stations was…dependent to a great extent on practical considerations," the result being that "we could have hoped to see many more stations in the southern hemisphere then were in fact established."[92] Additionally, due to the worldwide financial crisis in the 1930s, the Second International Polar Year was smaller than its organizers originally imagined it would be, even in the Arctic. In fact, Argentine observations from the South Orkneys were the only contribution from the Antarctic.[93] But the Second International Polar Year was still lauded for the "international collaboration achieved in order to advance our knowledge of Nature,"[94] even if the northern hemisphere was soon torn apart by the Second World War, and enthusiastically drew on the radio communications knowledge and weather maps compiled by the IPY to gain wartime strategic advantages.[95]

The International Geophysical Year

The story of the International Geophysical Year's origins are widely agreed upon.[96] On April 5th 1950, the then little-known American physicist James Van Allen invited a group of four American scientists to his home in Maryland for a social dinner in honor of the visiting

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[91] V. Laursen, "The Second International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959). 223
[92]V. Laursen, "The Second International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959). 225
[93] G. E. Fogg, *A History of Antarctic Science* (Cambridge: Cambridge University Press, 1992).
[94] V. Laursen, "The Second International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959).
[95] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 18-19
[96] This account has been drawn mostly from J. Tuzo Wilson, *I.G.Y.: The Year of the New Moons.* (New York: Knopf, 1961).; Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961).; Ronald Fraser, *Once Round the Sun: The Story of the International Geophysical Year.* (New York: Macmillan, 1958). Harold Spencer Jones, "The Inception and Development of the International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959).; Susan Barr and Cornelia Luedecke, *The History of the International Polar Years (IPYs)* (Heidelberg; London: Scott Polar Research Institutenger, 2010).

distinguished British geophysicist Sydney Chapman. All of those in attendance had taken part the Second International Polar Year. As it happened, while lounging in Van Allen's living room, their conversation shifted to the state of the field of geophysical sciences. World War II had led to the development many new technologies that could lead to advances currently being held back by the lack of data. Inventions like giant rockets, advanced weather balloons, precise optical instruments, sonar, and radar could, if used in the context of widespread, international, simultaneous observations, lead to greater scientific knowledge in the oceans, poles, atmosphere, and space. At this point, American physicist Lloyd Berkner suggested that these new technologies, particularly in relation to ionospheric observations, made further delay for another International Polar Year undesirable.

Endorsed by all present, Berkner and Chapman made a formal proposal to the Mixed Commission on the Ionosphere by the summer. The Commission then drew up a resolution in support of a Third International Polar Year and presented it to the International Council of Scientific Unions (ICSU), a non-governmental federation of thirteen international scientific unions representing academic bodies in forty-five nations. While the ICSU immediately formed a Special Committee for the organization of such an event, many of the Unions, while supporting the plan in theory, were concerned about its focus on Polar Regions. In particular, the World Meteorological Organization, the International Meteorological Association, and the International Association of Terrestrial Magnetism and Electricity advocated that studies be extended beyond the Polar Regions. Chapman then proposed the name "International Geophysical Year," a change that was ratified in the autumn of 1952. The ICSU also reached out to its adhering national organizations, requesting that each country form National Committees for organizing a contribution to the IGY within their territory and indicate "the part your country intends to

take…whether by an extension of the normal permanent observations, or by the organization of temporary or semi-permanent expeditions."[97] Aware that the success of an IGY would depend on widespread international cooperation, even from the communist bloc, they also contacted the Academy of Sciences of the USSR, which was not a member of the ICSU, and requested that they "renew the cooperation that had marked their participation in the first two polar years."[98]

The ISCU's Special Committee for the IGY (Comité Spécial de l'Année Géophysique Internationale, or CSAGI) met in Belgium in June on 1953, at which point Chapman was elected its president and Berkner, vice-president. They decided that the IGY would run for eighteen months, between July 1, 1957 and December 31, 1958, coinciding with an expected peak of sunspot activity as well as several eclipses. At this point, twenty-two nations had already formed IGY national committees, including all "major Western countries" as well as Yugoslavia and Czechoslovakia.[99] Rapidly several more countries submitted proposals to the CSAGI, contributing research programs that were concerned with specific planetary problems of the earth. In a 1954 meeting in Rome, the CSAGI defined these planetary problems as follows: "a) Problems requiring concurrent synoptic observations at many points involving co-operative observations by many stations. b) Problems of branches of the geophysical sciences whose solutions will be aided by the availability of synoptic or other concentrated work during the International Geophysical Year in other geophysical sciences. c) Observation of all major geophysical phenomena in relatively inaccessible regions of the Earth that can be occupied

[97] Letter from E. Herbrays to National Organizations adhering to ICSU November 28th 1952, Harold Spencer Jones, "The Inception and Development of the International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959). 386

[98] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 26

[99] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 27

during the International Geophysical Year because of the extraordinary effort during that interval, in order to augment our basic knowledge of the Earth and the solar and other influences acting upon it. d) Epochal observations of slowly varying terrestrial phenomena; to establish basic information for subsequent comparison at later epochs."[100]

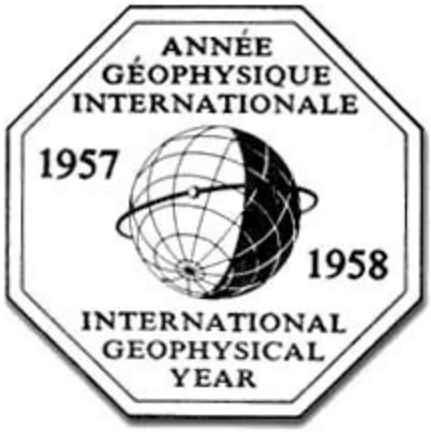

Figure 2. International Geophysical Year Logo

Although nearly every country emphasized the peaceful, cooperative, and apolitical spirit of the IGY, the event still occurred at the height of the Cold War. First, while Chapman insisted that "Questions of politics were almost excluded," he noted the "refusal of the Chinese People's Republic to adhere to the program"[101] if the Republic of China was also accepted. The PRC submitted their application to the IGY in 1955, when the death of Stalin and the end of the Korea War in 1953 had somewhat eased Cold War tensions, paving the way for Academia Sinica's participation.[102] But in 1956, the US State Department, alarmed by China's upcoming

[100] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 30
[101] Sydney Chapman, *IGY: Year of Discovery: The Story of the International Geophysical Year* (Ann Arbor: University of Michigan Press, 1959).109
[102] Zouyue Wang and Jiuchen Zhang, "China and the International Geophysical Year," in *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*, ed. R. Launius, J. Fleming, and D. DeVorkin (Scott Polar Research Institutenger, 2010).

participation, urged the Chinese National Government in Taiwan to apply for participation in the IGY, which they did in late 1956.[103] Since the CSAGI "felt unable to refuse the cooperation of any scientific academy organized under a government in control of a particular paper," regardless of politics, accepted Taiwan's application. China withdrew.

In addition to China's non-participation, the IGY contributed to another major Cold War crisis. During the 1954 CSAGI meeting in Rome, Soviet scientists witnessed the approval of the historic U.S.-sponsored *Vanguard* plan to orbit artificial satellites during the IGY.[104] When, in October 1957, after months of publicity for the US plan, the Soviet Union placed a rival satellite into orbit, over two months before the Americans planned to make their first attempt. The launch of *Sputnik,* rather than boosting the IGY and its goals of international scientific cooperation, "sent a shudder through large parts of the world," since it was clear that one of the most powerful nations in the world was also the strongest in rocketry. This, combined with the secrecy of the Soviet program in conjunction with the elaborate American publicity for their satellite "led to accusations that the Russians had not played the IGY game according to the rules." This meant that the "feeling of wonder and excitement at man's escape from the earth was largely lost in fear."[105] The launch of *Sputnik* was the first move in the infamous "space race," an informal Cold War race between the US and the USSR, both attempting to show dominance in spaceflight. The US launched their own artificial satellite in late January 1958, and created the National Aeronautics and Space Administration (NASA) in the same year. The lofty goals of the IGY, the

[103] Ronald E. Doel, Dieter Hoffmann, and Nikolai Krementsov, "National States and International Science: A Comparative History of International Science Congresses in Hitler's Germany, Stalin's Russia, and Cold War United States," *Osiris* 20 (2005): 49–76.
[104]Asif Siddiqi, "Korolev, Sputnik, and the International Geophysical Year," in *Reconsidering Sputnik: Forty Years since the Soviet Satellite*, ed. John M Logsdon, Roger D Launius, and Robert W Smith (Australia: Harwood Academic, 2000).
[105] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961).
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international context in which both of the satellites were launched, were thereby forgotten as generations of schoolchildren learned to associate space flight in 1957 with the Cold War rather than in the spirit of international scientific collaboration aimed for by the organizers of the IGY.

Despite these tensions, eventually sixty-seven countries participated in the IGY, which was "marked by a most-cooperative and harmonious sprit"[106] contributing to "a valuable increase of knowledge, and…an example of what international co-operation may achieve when directed to peaceful and constructive ends."[107] It was also "the most ambitious and at the same time the most successful cooperative enterprise ever taken by man"[108] and "the single most significant peaceful activity of mankind since the Renaissance and the Copernican Revolution."[109]

The IGY in the Antarctic

Considering the Polar emphasis in the IGY's predecessors and the lack of worldwide knowledge on Antarctica, it is unsurprising that a major concentration of the IGY was focused on developing Antarctic research programs. Before the IGY, very little was known about the Antarctic continent and "by virtue of its unique position and its physical characteristics [it] represents a region of almost unparalleled interest in the fields of geophysics and geography alike."[110] As late as 1957, it was unknown even if Antarctica was in fact a continent, or an archipelago.[111] Beyond just mapping any area inside the coasts, unknowns in Antarctica included, for example, the influence of the ice mass on weather and atmospheric and oceanic

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[106] Sydney Chapman, *IGY: Year of Discovery: The Story of the International Geophysical Year* (Ann Arbor: University of Michigan Press, 1959).107
[107] *The United Kingdom Contribution to the International Geophysical Year.* (London: The Royal Society, 1957). 5
[108] J. Tuzo Wilson, *I.G.Y.: The Year of the New Moons.* (New York: Knopf, 1961) vii.
[109] Quoted in Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 4
[110] Harold Spencer Jones, "The Inception and Development of the International Geophysical Year," in *The Histories of the International Polar Years and the Inception and Development of the International Geophysical Year.* (London, N.Y.: Pergamon, 1959). 401
[111] Angela Croome "Antarctica-One or Two Continents?" *Discovery* March 1959 Royal Society Archives ARF 1082

dynamics, the extent and nature of the aurora australis, and the characteristics of the ionosphere during long absences of sunlight. In addition to these major questions, "in many of the sciences Antarctica offers an almost virgin field."[112] Since so few observations of any kind had been taken in Antarctica, the CSAGI also urged any country that planned to launch a research program in Antarctica to attempt observations in all fields of interest including meteorology, geomagnetism, aurora and airglow, ionospheric physics, glaciology, cosmic rays, oceanography, seismology, and gravity measurements. In 1955, four countries operated a total of 20 stations staffed by 179 men in Antarctica: Chile, Argentina, Britain, and Australia, who opened the Mawson Base in 1954. Responding to the call of the IGY, Belgium, France, Japan, New Zealand, Norway, the US, and the USSR grew the total number of stations to 48 and the number of men to 912 by 1957. According to prominent science writer Walter Sullivan, "It is safe to say that never in the history of exploration has there been, in size, composition, or scope of inquiry, an effort to compare with the international assault on a virtually unknown continent."[113]

Tensions among Argentina, Chile, and Britain, which had manifested in a British effort to present their case for Antarctic sovereignty before the International Court of Justice in 1955, were not the only geopolitical issues to mar IGY Antarctic activity. Additionally, like the Space Race, Cold War tensions played out in the establishment of American and Soviet research stations.[114] Neither the US nor the USSR attempted supersede any of the existing seven claims to the continent but nor did either country formally acknowledge these claims. Since the United States, which had built a substantial naval installation at the McMurdo Sound in New Zealand's

[112] Walter Sullivan, *Quest for a Continent* (New York: McGraw-Hill, 1957). 355
[113] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 306
[114]James Spiller, *Frontiers for the American Century: Outer Space, Antarctica, and Cold War Nationalism* (Palgrave Macmillan, 2016).

Ross Dependency, planned to construct a base at the nationalistically prestigious South Pole, the Soviets sought an equally prestigious position. They settled for building two stations, both located in, uncomfortably for Australia, the vast Australian Antarctic Territory; one at the Magnetic South Pole and the other at what was termed "The Pole of Inaccessibility" about a thousand miles from the sea at the center of East Antarctica.[115] The success of the IGY in Antarctica led to the establishment of the Antarctic Treaty System in 1959, an international treaty which included the first nuclear non-proliferation agreement between the US and the USSR. Antarctica remained a site where Cold War tensions between the USSR and the West were somewhat eased for the sake of discovery and peace in a fundamentally hazardous region. Within a few years, Soviet stations even hosted a handful of American and British scientists Although nationalistic rivalries and geopolitical tensions are still constantly played in Antarctica,[116] the relatively peaceable establishment of dozens of permanent research stations in the region, is one of the most lasting, if less memorable than the space race, international legacies of the IGY.

The British Plans for the International Geophysical Year

The national adhering body to the ICSU in the United Kingdom was the Royal Society, which took responsibility for the British contribution to the IGY. The British government, pledging £550,000 to the effort, half of which would eventually go to setting up the Royal Society Base at Halley Bay,[117] set up a National Committee for the IGY in 1952, to be chaired by

[115] Dian Olson Belanger, *Deep Freeze: The United States, the International Geophysical Year, and the Origins of Antarctica's Age of Science* (University Press of Colorado, 2006).
[116] See, for example, the body of work by Klaus Dodds; Aant Elzinga, "Antarctica: The Construction of a Continent by and for Science.," in *Denationalizing Science : The Contexts of International Scientific Practice*, ed. Sverker Sörlin, Elisabeth Crawford, and Terry Shinn, 1993, 73–106.; Katrina Dean et al., "Data in Antarctic Science and Politics," *Social Studies of Science* 38, no. 4 (August 1, 2008): 571–604. Or even just a photograph of an Argentinian passport, which includes an image of the Argentine claim in Antarctica.
[117] British National Committee for the International Geophysical Year Antarctic Subcommittee Minutes August 8th 1955 Royal Society Archives ARF 1089 Box 10A Halley Bay General

Sydney Chapman, although he was replaced in 1954 by James Wordie. The Royal Society, acting through this Committee, planned a coordinated effort between government departments, universities, and research institutions. They contributed to each of the eleven scientific disciplines of the IGY, assigning a prominent academic in each field to serve as the National Correspondent. They dedicated the work of dozens of research stations within the British Isles to IGY activity, such as, to name a few, the Jodrell Bank Observatory in Manchester, Claredon Laboratory in Oxford, and the Bidston Observatory in Liverpool. There were also dozens of IGY observatories in the greater British Empire including, for example, glaciology on the Ruwenzori Mountains led by faculty at Makerere College in Uganda, a geomagnetic observatory in Nairobi organized by the Royal Technical College of East Africa, auroral spectroscopy studies in Northern Ireland, and seismology in Trinidad. All British Colonial Administrators were expected to take meteorological records and visual operations of aurora, even in tropical areas.[118]

But as far as British overseas observations for the IGY, no region was more covered than the Falkland Islands Dependencies. A Royal Society pamphlet published on the eve of the IGY listed thirteen observation stations in this area. The next highest number of stations in a single British colony were the six in Nigeria. This short pamphlet also contained an entire section completely dedicated to the establishment of the Royal Society Base at Halley Bay. But while the United Kingdom eventually threw themselves wholeheartedly into producing a large IGY effort in Antarctica, this enthusiasm for the IGY in the Dependencies was far more measured in the early days of planning. Some British policy makers viewed the IGY as "crisis rather than an opportunity, embedded in Britain's wider struggle to adjust to new geopolitical

[118] *The United Kingdom Contribution to the International Geophysical Year.* (London: The Royal Society, 1957).

circumstances."[119] In fact, their decision to build an IGY Base outside of the several that they already had operating on the Antarctic Peninsula was largely due to being forced by their ongoing sovereignty debate with Argentina, rather than any specific long term plans to build a station in the Weddell Sea area. This type of decision was not out of place for the Royal Society, which, despite appearing to be independent from the government, its "policies and actions in the period 1945-75 remained closely allied to the interests of the British state."[120]

During the 1954 meeting of the CSAGI, when members were discussing the geographical distribution of research stations around the world including in Antarctica, they took note of gaps in the proposed network and made recommendations for an additional station to be established, near 77°S 35°W, near the Vahsel Bay region of the Weddell Sea. In 1955, the Argentina Antarctic Naval Task Force set up a base on the Filchner Ice Shelf, the first in the region. But at the September 1955 meeting of the CSAGI, the British delegation, headed by David Brunt, the Vice-President of the Royal Society, announced their own plans for a base in the same region. This presented a problem since it was immediately clear to observers that despite the fact that "one of the principles was to keep the stations as far apart as possible," the United Kingdom wanted to build this base near the already established Argentine one "in part to support its assertion to sovereignty over the region."[121] But the Royal Society was able to counter these doubts when they put together a list of scientific justifications for their base, planning a highly comprehensive plan which would address nearly every aspect of the IGY.[122] Although Britain

[119] Peder Roberts, "'What Has All This Got to Do with Science?': The Rhetoric of Scientific Devotion in British Government Plans for the International Geophysical Year.," in *Proceedings of the 3rd Workshop of the SCAR Action Group on the History of Antarctic Research.* (Ohio State University, 2011).
[120] Jennifer Rose Goodare, "Representing Science in a Divided World: The Royal Society and Cold War Britain" Unpublished Dissertation (University of Manchester, 2013). 5
[121] Walter Sullivan, *Assault on the Unknown; the International Geophysical Year.* (New York: McGraw-Hill, 1961). 294
[122] "Scientific Reasons for Vahsel Bay Station" Royal Society Archives ARF 1094 Box 23B IGY/SCAR

highly desired a base in this region, largely for its political value with, like FIDS, science as a secondary goal, their desire to build a base in this area was thrown for a turn when Vivian Fuchs announced his plans for a Trans-Antarctic Expedition to coincide with the IGY.

The Problem with the Trans-Antarctic Expedition

The origins of the Commonwealth Trans-Antarctic Expedition (TAE) were as romantic as those of the IGY. According to the official narrative, the expedition was conceived in 1950 when Falkland Islands Dependency Survey geologist Dr. Vivian Fuchs was huddled in his sleeping bag while a blizzard raged outdoors on Stonington Island while on a sledging expedition. He wrote of his plans on a scrap of paper and even then began to sketch out logistics.[123] When Fuchs returned to the UK, he argued that in addition to the benefits to seismology, biology, geology, meteorology, magnetism, and geography that could be gleaned from an expedition, "A trans-continental journey made wholly within territory claimed by the British Commonwealth…would gain prestige and at the same time contribute to the solidarity of Commonwealth interests."[124] Since no one had attempted a journey of this type since Shackleton's ill-fated Imperial Trans-Antarctic Expedition in 1914, Fuchs warned that if Britain did not take the initiative while opportunities were favorable, another country, perhaps Argentina, surely would. His plan proposed two parties: one leaving from the Weddell Sea area and crossing to the Pole while another left from the Ross Sea, laid food stores for the Weddell Sea Party, meeting in the South Pole and then crossing through the Ross Dependency.

[123] Vivian Fuchs, *A Time to Speak : An Autobiography* (Oswestry Shropshire England: A. Nelson, 1990). 206
[124] Vivian Fuchs, "Plans for a Trans-Antarctic Journey," 1953 University of Canterbury Library Antarctic Collection

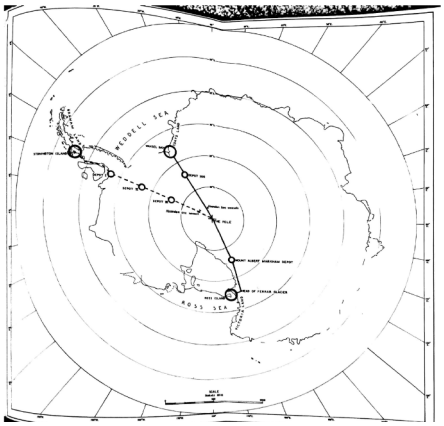

Figure 3. Fuchs' Plans for a Trans-Antarctic Journey[125]

While this story of a stalwart British man of science planning a unique expedition that could serve both science and the British Commonwealth, all while experiencing an Antarctic storm is certainly a romantic and oft-repeated one, in truth, there had been other such proposals. For example, in 1932, charismatic Arctic explorer Gino Watkins announced his plans "to secure for the British flag the honour of being the first carried across the South Polar Continent."[126] A lack of funds and Watkins' premature death halted this plan. Additionally, Miles Clifford, the Governor of the Falkland Islands, had been long clamoring the Colonial Office for similar expeditions only to be told that "what matters most of all is the continuous occupation of fixed points, sited if possible so as to make a patter over the general area claimed. From this point of view, three or four hum-drum meteorologists sitting in a hut from year to year and reading barometers are worth more than exciting but transitory sledging expeditions. Exploration may be good for prestige but prestige is not the same thing as legal title, and the latter is the major object of the whole exercise."[127] He was reminded that "the purpose of maintaining British title to the

[125] Vivian Fuchs, "Plans for a Trans-Antarctic Journey," 1953 University of Canterbury Library Antarctic Collection
[126] Quoted in Stephen Haddelsey, *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica* (Stroud: History Press, 2012), 13.
[127] Letter from J.S. Bennett to Miles Clifford May 10th 1950 Scott Polar Research Institute Archives MS 1326 Stanley Office Proposal of the TAE Box 3

Dependencies, and of spending the available money to the best advantage, might be better served by the occupation of as large a number of relatively cheap static meteorological bases in the more accessible northerly areas where Argentine and Chilean competition is most obvious, rather than by concentrating a high proportion of the available resources on a large programme of sledging and exploration."[128] In short, "the Tran-Continental expedition from Graham Land to the Ross Sea…was not a project suitable to be undertaken by F.I.D.S. in present circumstances, and should be left in abeyance."[129]

Despite the failure in years past to organize a Trans-Continental Crossing, Fuchs acquired the allies necessary to proceed with his plan including Sir Miles Clifford and James Wordie. In March 1953, at a meeting of the Foreign Office's Polar Committee, the practical plans for such an expedition were discussed. Fuchs and Duncan Carse, another explorer working in South Georgia, were asked to prepare detailed plans, which were considered in turn by the Polar Committee, the Governor of the Falkland Islands and the Scientific Committee of the Falkland Islands Dependencies Survey. Fuchs' plan was selected and submitted to the Royal Geographical Society who recommended, in January 1954, that the project should be encouraged. The Polar Committee suggested that the plans should be submitted to United Kingdom Ministers and, once the views of the latter were made known, to the old Commonwealth Governments, to find out whether or not official support might be given. The United Kingdom Cabinet duly considered the plans on July 29, 1954, and gave general approval, subject to consultations with the Old Commonwealth Governments, whose support for the Expedition was regarded as essential. Their

[128] Letter from J.S. Bennet, Colonial Office to Sir Miles Clifford July 25th 1951 Scott Polar Research Institute Archives MS 1326 Stanley Office Proposal of the TAE Box 3
[129] Letter from J.S. Bennet, Colonial Office to Sir Miles Clifford July 25th 1951 Scott Polar Research Institute Archives MS 1326 Stanley Office Proposal of the TAE Box 3

reactions were at first rather lukewarm, but gathered steam when the British Treasury announced a contribution of £100,000, shortly followed by a £50,000 pledge from New Zealand.

Wishing the expedition to truly represent the entire Commonwealth, Fuchs sought and received patronage from the newly crowned Elizabeth II, and also both received financial support and a team member from South Africa in the form of meteorologist Hannes La Grange and Australia with geologist Jon Stephenson. Although Fuchs ardently claimed that his proposed crossing would have scientific value, many acknowledged that "There would be little point in pretending that the Trans-Antarctic crossing is not intended primarily to attract the attention of world opinion to our stake in Antarctica and to bestow prestige upon the peoples of the Commonwealth… an opportunity of doing something imaginative, adventurous[,] Elizabethan, popular and perhaps ultimately remunerative in a cooperative Empire adventure at little cost."[130] The rhetoric that connected Antarctic exploration in the context of the TAE in the reign of Elizabeth II to the Golden Age of Exploration under Elizabeth I proliferated, and even Antony Eden declared that "in the reign of Queen Elizabeth I this curious and venturesome sprit abounded. It still exists, I am glad to say, in the reign of Queen Elizabeth II who is herself the gracious Patron of this enterprise."[131] Eden's analogy of modern Antarctic exploration as a natural successor to the exploration of the Americas in the sixteenth century and the original rise of the British Empire could be read as ironic, considering that he lost his position over the Suez Crisis, marked by some historians to signal the end of the British Empire, only a year later.[132] But it also reflects the optimism that many felt for the promise of a new great age of exploration.

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[130] Letter from I.F.S. Vincent to Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/ 7 CC Brian Roberts IGY Great Britain

[131] Speech Delivered by Sir Anthony Eden November 4, 1955 MS Scott Polar Research Institute Archives 1536/1; BJ

[132] See, for example, Keith Kyle, *Suez: Britain's End of Empire in the Middle East* (London: I.B. Tauris, 2003), and Ronald Hyam, *Britain's Declining Empire: The Road to Decolonisation, 1918-1968* (Cambridge; New York: Cambridge University Press, 2006).

Of course, while the above narrative presents a relatively straightforward account of the early organization of the TAE, it was of course far more complicated and achieved much of its impetus from the energy of a few key individuals, specifically James Wordie and Miles Clifford, than larger scientific bodies in the United Kingdom. In fact, the TAE was quite unpopular with many in the larger British polar community and "caused a huge outcry in Polar circles,"[133] aside from any potential interference with the upcoming IGY. Brian Roberts, the resident polar expert in the Foreign Office attended a 1952 meeting of the FIDS Scientific Committee to discuss the scientific merits of a Trans-Antarctic Crossing during which the Committee was "asked to discuss the proposed Antarctic crossing from a scientific point of view only and to declare whether each part of the programme was or was not desirable. Put this way, we inevitably testified in favour of each item. All attempts to discuss it in a true perspective (i.e. in relation to F.I.D.S. and finances, or alternative projects, etc.) were over-ruled by the Chairman [James Wordie]."[134] So important was Wordie's influence to the success of the project that in his book on the history of polar exploration, *The White Road,* published in 1959 by the Secretary of the Royal Geographical Society, Laurence Kirwan credits not Fuchs, but Wordie, for conceiving the TAE in the backdrop of the IGY. Kirwan, who initially opposed the TAE before eventually offering his reluctant support, wrote that 1953 "was the year in which J.M. Wordie, the president of the Royal Geographical Society and a former shipmate of Shackleton's provided a link with the past by reviving the idea, in striking contrast to these international and largely static operations of a wholly British trans-Antarctic expedition."[135]

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[133] Michael Smith, *Sir James Wordie, Polar Crusader: Exploring the Arctic and Antarctic* (Edinburgh: Birlinn, 2004). 245

[134] Meeting Notes of Brian Roberts December 3rd 1952 FID Scientific Committee Meeting to discuss proposed Antarctic Crossing Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1

[135] Laurence Kirwan, *The White Road: A Survey of Polar Exploration.* (London: Hollis & Carter, 1959). 349

While deciding on the future of the TAE seemed to be a transparent process, the benefits of the crossing were not in fact up for debate. When, for instance, at the same 1955 meeting of the Polar Committee, "the Meteorological Office Representative started to discuss the relative merits and costs of various Antarctic projects he was cut short and asked to answer the specific question:" Would meteorological records from the central part of the Antarctic be of scientific value, or not?" There is only one possible answer to this kind of question. Presumably the affirmative answers given by each specialist in turn will be strung together into a paper for the Polar Committee which will thus have the baby handed back to it."[136] Fuchs' leadership on this expedition was also not up for question as "The Chairman tried to get the Committee to recommend Dr. Fuchs as leader, to adopt his specific play, to appoint a "steering committee" to sustain him, and to reject Mr. Carse's plan… The issue was repeatedly put to us in the form of a straight choice between two plans and hence between two candidates for leadership. At no stage did we near the question whether this journey is really necessary, and, if so, why?"[137]

Very early in the planning process of the TAE Fuchs became aware that despite his support from Wordie and Clifford, "there was a solid body of opinion against my project. This seemed to be headed by Dr Brian Roberts, who worked at the Polar Desk of the Foreign Office, and also at the Scott Polar Research Institute. His views were supported by Dr Colin Bertram, Director of the [Scott Polar Research] Institute and Sir Laurence Kirwan, Director and Secretary of the Royal Geographical Society. There were the big guns with most influence on opinion."[138] According to Fuchs, Roberts, Bertram, and Kirwan were primarily opposed to the TAE because

[136] Meeting Notes of Brian Roberts December 3rd 1952 FID Scientific Committee Meeting to discuss proposed Antarctic Crossing Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[137] Meeting Notes of Brian Roberts December 3rd 1952 FID Scientific Committee Meeting to discuss proposed Antarctic Crossing Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[138] Vivian Fuchs, *A Time to Speak: An Autobiography* (Oswestry, Shropshire, England: A. Nelson, 1990). 221

they were worried about the possibility of international humiliation if Britain were to fail, preferring to "leave such a journey for the Americans."[139] But their apprehensions were far more complicated, and involved not only fear of failure, but wide-ranging logistical, financial, political, and scientific concerns.

For example, within the greater Commonwealth, several others expressed their distaste for such an expedition both on scientific and political grounds. Roberts, from his position in the Colonial Office, maintained correspondence with several leading figures in polar affairs abroad and "Not one of the Commonwealth governments except New Zealand wishes to be involved in this project, and New Zealand does not want to spend any money on it."[140] Many of these countries already had enough polar commitments without adding to them by supporting a project meant to clearly give prestige to Britain above the other Commonwealth countries.[141] In Australia, for example Philip Law, the director the Antarctic Division of the Australian Department of External Affairs "can see no advantages in this journey and is really worried that his advice will be over-ruled at a high level on political grounds for the sake of Commonwealth solidarity" although "his own resources are already stretched beyond their limits, so that he is having to close Heard Island in order to sustain Mawson [station]." According to Roberts, his other contacts in Australia House "tell me the same thing-in brief they say: "We cannot refuse outright to co-operate when asked by the U.K. to do so through high level channels, but we hope this project will die. The only chance of getting it approved in Australia is a really high level

[139] Vivian Fuchs, *A Time to Speak: An Autobiography* (Oswestry, Shropshire, England: A. Nelson, 1990). 221
[140] Personal Note by Brian Roberts November 10th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[141] Klaus Dodds "The Great Trek: New Zealand and the British/Commonwealth 1955–58 Trans-Antarctic Expedition," *The Journal of Imperial and Commonwealth History* 33, no. 1 (January 1, 2005): 93–114.

decision on purely political grounds, but this will mean overruling all the experts (including Sir Douglas Mawson) and all they people who will be involved in making it work."[142]

Canada had little interest in contributing to this expedition, perhaps understandably as they had no sovereignty claims south of the Antarctic Convergence and had their own massive polar landscape to manage. Additionally, the Secretary of the Northern Affairs Council in Ottawa "has told [Roberts] quite plainly that Canada will not play unless they can see some real advantages to be derived, and none has yet been suggested. They have no wish to enter into any additional polar competition… and they think (quite bluntly) that it is scientific nonsense."[143] The Weather Bureau in Pretoria, the South African Department most interested in Antarctic research, was already seeking British assistance in their own "Antarctic projects [already] well beyond their resources."[144] While they eventually contributed some money and a meteorologist to the TAE, South Africa opposed "the diversion of money from anything that will contribute to South African weather forecasting to less productive projects."[145]

Finally, even though New Zealand was publicly enthusiastic about the TAE, largely due to the support of Sir Edmund Hillary, which I will address in the next chapter, the larger Polar community was not so enamored with the TAE. Charles Fleming, a member of the New Zealand Antarctic Society privately wrote to Roberts, having heard confidentially about Roberts' lack of keenness for the TAE, to express his own dwindling enthusiasm for the venture. He based "strong suspicion that the objective is "National Prestige," "honour and glory", rather than

[142] Personal Note by Brian Roberts November 10th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[143] Personal Note by Brian Roberts November 10th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[144] Personal Note by Brian Roberts November 10th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[145] Personal Note by Brian Roberts November 10th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1

exploration and science. … I strongly object to publicity statements that the objectives are scientific and that science is the chief justification." Additionally, "The British Commonwealth commits N.Z. to a base in the best-known part of the Ross Sea, not the area we would necessarily choose as a base for the next activity in the Ross Dependency, and limits objectives and activities even at such a base." Further "The timing of the crossing stands a good chance of seriously prejudicing if not preventing any serious I.G.Y. activity, and there seems to be no encouragement to planning for both projects."[146] Fleming concluded that "I cannot judge whether you think anything can be done to pull some of the chestnuts out of the fire-but this is just an offer to help with the pulling out, if that is possible."[147] Yet by this point, as Fleming noted, it was too late, and the expedition was to go on.

Roberts' reports of international concerns over the TAE are corroborated elsewhere. In February 1955, the South African High Commission noted in a report to the Department of External Affairs in Pretoria that, "Commonwealth interest appears to be lukewarm. The Canadian government has indicated that they are deeply involved in the Arctic and are not anxious to divert their interests. The Australians consider the project of dubious scientific value and have referred to the extent to which they are already involved in Antarctic affairs. The New Zealand government has been non-committal thus far but it is known that public opinion in New Zealand is in favor of participation."[148]

For his part, Roberts agreed entirely with the widespread doubts about the "scientific value of this journey. It seems to me quite wrong and unnecessary to cloak adventure under the

[146] Letter from Charles Fleming to Brian Roberts June 13th 1955 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[147] Letter from Charles Fleming to Brian Roberts June 13th 1955 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[148] Quoted in Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London; New York; New York: I.B. Tauris ; In the U.S. and Canada distributed by Palgrave Macmillan, 2002). 63

guise of science. In short, it can be shown fairly easily that almost every specific problem which Dr. Fuchs has proposed for investigation can be solved more cheaply, easily and rationally in some other way not connected with this transantarctic crossing. The old cynical phrase "Blind them with Science and they will open the coffers" is being applied with great success."[149] Roberts further noted that "Personally, I am not at all happy about the scientific benefits that might be expected to accrue from such a journey. This is a romantic adventure of the old type comparable with climbing Mount Everest. There is no reason to be ashamed of that, but why pretend it is science? Almost every scientific investigation I have heard suggested in connexion with this expedition could, in my opinion, be achieved more efficiently and for less cost if not mixed with this journey."[150] He also believed that the TAE organizers were also somewhat disingenuous and "The intention of the sponsors of the trans-antarctic crossing is to acquire support for their project on whatever grounds may seem fruitful at the moment. Thus they have support from some on scientific grounds (despite the fact that their science is questionable); from others on political grounds, e.g. the C.O. and the C.R.O (despite the doubtful benefits). It is difficult to keep abreast of such skilled opportunism, but one impression is that many scientists think its justification is political and many politicians think its justification is scientific."[151] Additionally, considering the recent expansion of FIDS, Roberts judged that "We have bitten of very much more than we can chew in the Falkland Island Dependencies, and to me it would

[149] Personal Note by Brian Roberts May 5th 1955 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[150] Personal Notes of Brian Roberts May 13th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[151] Letter from Brian Roberts to C.C.C. Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

seem very strange of at this time we divert any of our limited Antarctic potential to other projects."[152]

While Fuchs managed to drum up an enormous amount of support in the United Kingdom, discussed in more depth in the next chapter, his announcement placed an enormous wrench in the Royal Society's plans for the IGY. Despite the enormous political implications of the IGY, implications that other historians have explored at length,[153] many involved hope to present a façade of apolitical cooperation and dedication to science. The clearly imperial and nationalistic goals of the TAE disturbed this façade for the United Kingdom. In fact, many within the Royal Society, Foreign Office, and the Scott Polar Research Institute disapproved of his project. Pondering how to fit the TAE with the supposed apolitical goals of the TAE, Roberts remarked that "as things are F.O. would be asking for trouble of we give any kind of assurance that the Fuchs expedition is not and will not prejudice disinterested British collaboration in the scientific work of the I.G.Y."[154] Since the TAE had an idea to begin in the Weddell Sea, very near where the Royal Society was planning to construct their own base, and perhaps even share some facilities and transport, the Royal Society could not even pretend that they wanted a base in the region for apolitical reasons. As Roberts summarized," The I.G.Y. and Dr. Fuchs are aiming at quite different objectives. Dr. Fuchs would like to keep his journey non-political but I do not think he now has any chance of doing so unless he sacrifices New Zealand (and possibly South

[152] Personal Notes of Brian Roberts May 13th 1954 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1

[153] See the work of Gregory Good, Jacob Hamblin, and Ron Doel in addition to Susan Barr and Cornelia Luedecke, *The History of the International Polar Years (IPYs)* (Heidelberg; London: Scott Polar Research Institutenger, 2010). & R. Launius, J. Fleming, and D. DeVorkin, *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years* (Scott Polar Research Institutenger, 2010).

[154] Letter from Brian Roberts to C.C.C. Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

African?) co-operation, avoids Vahsel Bay, and repudiates what has been said to the C.O. and C.R.O. representatives."[155]

The Settlement of the TAE and the Royal Society's Plans for Vahsel Bay

In the face of the lukewarm reception of his expedition among several in the polar community, Fuchs found another way to garner support. When, the Royal Society made plans to represent the United Kingdom in the International Geophysical Year, Fuchs latched onto the opportunity for his fledging Expedition proposal, while not be a part of the IGY, to coincide with the IGY activity. Members of the TAE team could do IGY research as part of the crossing, thereby borrowing the scientific legitimacy of the IGY. The political value of a British Base in the Vahsel Bay was already on the minds of many organizers of the IGY before Fuchs' announcement, some of whom questioned its value. After all, a site in this area had been proposed as early as 1950 and rejected. Building a base at such an inaccessible site would be extremely expensive compared to the other stations on the Antarctic Peninsula. Additionally, since the United Kingdom did not own an ice-breaker, building in this area could necessitate the purchase of such a ship. Otherwise they could be forced to rely, as New Zealand eventually would, on the generosity of American ice-breakers in the region, or disastrously, if the scientists ran into trouble, there could be "real political repressions that there might be … rescue by the Argentine icebreaker."[156] Additionally, "On the scientific side… the [FIDS] Scientific Committee had, in 1949, expressed discouraging views about the value of exploration in the

[155] Letter from Brian Roberts to C.C.C. Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[156] Letter from Colin Bertram to Crispin Tickell May 1st 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

Weddell Sea," even if "successful achievement of the Weddell Sea expedition should produce geographical and other scientific knowledge which would add to prestige."[157]

After the IGY, David Brunt, then the Vice-President of the Royal Society, wrote that, from its very proposal at the 1954 CSAGI meeting he had "the keenest interest in the proposed Vahsel Bay Station" when he began its organization in early 1955.[158] But in March 1955, he wrote privately to David Martin, the Secretary of the Royal Society and warned against a research station in the region because "The brutal fact is that we have no direct knowledge at of as to conditions at Vahsel Bay. My original opinion was that to try to send a scientific IGY expedition there was stark madness in view of our ignorance. I still think this."[159] Even without the TAE, Brunt had "fears that in the eyes of the world, the Royal Society might be suspected of being motivated politically if an I.G.Y. party goes to Vahsel Bay."[160]

The TAE made Brunt even more disinclined to want a Royal Society Base near Vahsel Bay. As late as May 1955, Brunt met with Colin Bertram, the Director of the Scott Polar Institute, when he confided that "he had made up his mind that there should be no British I.G.Y. expedition in the Weddell Sea area." Additionally he "had some harsh words to say about the Tran-Antarctic venture muddling the position for the I.G.Y. and … that in his opinion even the sharing of shipping between the two ventures is undesirable."[161] Brunt also met with Brian Roberts and let him know that "As the responsible man at the Royal Society, [Brunt] has now

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[157] Letter from J.S. Bennet, Colonial Office to Sir Miles Clifford July 25th 1951 Scott Polar Research Institute Archives MS 1326 Stanley Office Proposal of the TAE Box 3

[158] Brunt, David, "Royal Society International Geophysical Year Antarctic Expedition." *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies*, 1955-1959. (London: Royal Society, 1960-64).

[159] Letter from David Brunt to David Martin March 11 1955 Royal Society Archives ARF 1089 Box 10 A Halley Bay General

[160] Letter from Colin Bertram to Crispin Tickell May 1st 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

[161] Letter from Colin Bertram to Crispin Tickell May 1st 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

made up his mind, after weighing all the different factors, that the R.S. will not sponsor a station at Vahsel Bay for the I.G.Y…He is going to hold a meeting of the British National Committee for the I.G.Y. next week … and tell them Vahsel Bay is definitely off…At the moment, therefore, it looks as if there may be no British I.G.Y. station in the Antarctic"[162] Again, Brunt expressed his frustration with the TAE, and told Roberts that he planned to write "to Fuchs saying that he does not wish to share any facilities, ships, etc. with the trans-antarctic project."[163]

Brunt did not only express these reservations privately. At a 1955 financial meeting in the Colonial Office attended by the Governor of the Falkland Islands as well as other prominent figures in the Royal Society and the Colonial Office he "expressed some anxiety…over the presence of the Trans-Antarctic Journey party in the same area."[164] The Foreign Office too was unhappy with the TAE, but acknowledged that "whether we like it or not the Fuchs' project has H.M.G.'s support and the I.G.Y. has not yet got it. I suggest we exert what influence we can to prevent the I.G.Y. getting further mixed up with the tran-antarctic crossing."[165] But the announcement of the TAE essentially forced the Royal Society into making some sort of permanent station in the Weddell Sea, even it was not universally thought to be a good idea because "We were already publically committed to launching the Trans-Antarctic expedition through Coats Land and any withdrawal now would leave the Argentines in possession of a base

[162] Letter from Brian Roberts to Crispin Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[163] Letter from Brian Roberts to Crispin Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[164] "Note of a meeting at the Colonial Office to discuss the financial responsibility of for the International Geophysical Year Commitments in the Falkland Islands Dependencies in the Antarctic." June 22nd 1955 Cabinet Office "International Geophysical Year" March 31st 1955 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[165] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

in the area and would greatly weaken our title to the eastern portion of the United Kingdom sector."[166]

The fact that neither FIDS nor the Royal Navy owned an ice-breaker added to the quandary that the Royal Society was experiencing regarding the TAE. Since they possessed no ice-breaker for making their way through the notoriously icy Weddell Sea, the Royal Society first wrote to the United States asking if "the U.S.A. National Committee for the I.G.Y. would be willing to consider assisting the British Committee by arranging for an U.S.A. ice-breaker to transport the proposed British expedition over the final stage of the voyage through the Weddell Sea to Vahsel Bay."[167] Thy believed that "an attempt to enlist the aid of the National Academy of Sciences in arranging for a U.S. icebreaker to assist that British I.G.Y. expedition seems very sound so long as the I.G.Y. remains non-political."[168] But in response to this request, they found that the National Academy of Sciences did not want to get involved in the political statement that the TAE was sending. Wallace Atwood, the Director of the Office of International Relations for the National Academy of Sciences wrote to David Martin at the Royal Society in terms of borrowing the use of an American ice-breaker that "the Fuchs expeditions has somewhat 'muddied the waters'" and "the scheduling of the Fuchs expedition for the year just prior to the IGY seems rather unfortunate…Some of us…therefore are a bit disappointed. I say this to you quite frankly because we are both intimately involved in the IGY and are anxious that it move forward smoothly and without political complications." Atwood suggested that to help its

[166] Cabinet Office "International Geophysical Year" March 31st 1955 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[167] Letter from David Martin to Wallace Atwood April 15th 1955 Royal Society Archives ARD 1089 Box 10A Halley Bay General
[168] Letter from Brian Roberts to Crispin Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

reputation abroad perhaps "the Fuchs expedition might be remodelled to fit into the IGY program more appropriately? Perhaps it could be made into a truly scientific effort?"[169]

While the Foreign Office tried to soothe the Americans, writing that "the two projects are entirely separate, and that the various persons and bodies backing each intend to keep them so. Any confusion about their purposes that may have arisen springs from the fact that the starting point for Dr. Fuchs's Expedition also happens to be the Vahsel Bay gap location which the British National Committee for the I.G.Y. (under the auspices of the Royal Society) have been considering as a possible station for the I.G.Y. observations during 1957-58."[170] And, since they were lacking an icebreaker, "the British I.G.Y Committee have not yet decided whether to go forward with the Vahsel Bay project, While we are … in favour of the establishment of a British I.G.Y. base at Vahsel Bay (particularly so, in view …the much bruited Argentine base there), we are unwilling to involve the scientists in these political calculations, and are prepared to abide by whatever decisions the Royal Society may come to."[171] The Foreign Office also wrote that since Fuchs was attempting to reach the Weddell Sea without an icebreaker, "His experiences, good or bad, will of course influence the attitude of the Royal Society towards the establishment of an I.G.Y base at or near Vahsel Bay. Should the Royal Society finally opt for the Vahsel Bay plan, they would, naturally enough, profit by the experiences of Dr. Fuchs and share available facilities with his expedition. In these circumstances, the Fuchs Expedition would be helping out the work of the I.G.Y. rather than (as the Americans fear) the other way about."[172] Additionally,

[169] Letter from Wallace Atwood to David Martin May 20th 1955 Royal Society Archives ARD 1089 Box 10A Halley Bay General
[170] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[171] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[172] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

in their discussions with the Americans, the Foreign Office emphasized that it was Fuchs' scientific goals "rather than the spectacular trappings the Expedition has now acquired, which first won the support of the learned persons and bodies backing the adventure."[173] Attempting to win back their reputation with the United States on this issue, they highlighted both "the scientific character of the Fuchs expedition and its independence of the British National Committee for the I.G.Y."[174]

In the meantime, the Antarctic Subcommittee of the IGY National Committee ardently tried to get an icebreaker, stressing the political value that an ice-breaker could have beyond the IGY,[175] writing even to the Duke of Edinburgh for support.[176] The Colonial Office was doubtful about the need for such an expensive vessel since suitably strengthened whaling and sealing ships could often manage pack ice, and even an icebreaker would be helpless against icebergs. But "This seems rather a narrow view which takes insufficient account of the political factors. Lack of an icebreaker puts us at a technical disadvantage vis-a-vis the Argentines, who possess one, and must limit our freedom of action against them. Our prestige will also suffer if we alone among the major participants of the International Geophysical Year (1957-58) have no icebreaker (the Americans are expected to have at least three and the Russians one)."[177] Additionally without the insurance of an ice-breaker, it was possible that at any base constructed in Vahsel Bay "ice conditions may render such operations difficult and on occasion

[173] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[174] Letter from I.F.S. Vincent Peter A. Wilkinson June 14th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[175] Miles Clifford "Need for an ice-breaker" January 12th 1956 Royal Society Archives ARF 1082 Box 5B
[176] Letter from David Martin to Michael Parker March 22nd 1956 Royal Society Archives ARF 1086 Box 9A Antarctic General.
[177] Excerpts of Progress Report to the Cabinet on Antarctica from American Department July 20 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

impossible."[178] The United Kingdom needed an ice-breaker if whatever Base Fuchs was to construct was "destined to become a regular FIDS Base" at the end of the IGY "unless we are to relinquish this most southerly and scientifically important outpost to Argentina, which is not presumably, contemplated."[179] Even if they did not need one this year, eventually one would need to be purchased since in the future "It would be extremely undesirable politically for a British expedition which got into difficulties to call on the Argentines to extricate them."[180]

Despite the political quandary that the Royal Society was in over both the construction of any base in the Weddell Sea region in addition to the wrench of the TAE, they opted that the benefits of constructing a research station, both scientific and political, outweighed the risks. Although they maintained the lines of separation between the IGY and the TAE, they were able to benefit from Fuchs' publicity. It helped that while there had been some plans involving the IGY and TAE sharing facilities, which, as explained in more depth in chapter three, did not come to fruition. Rather than claiming that the Argentine presence necessitated countering with their own rival station, the Royal Society created a narrative of poor Argentina science requiring an additional station at this longitude. In fact, "The alternative to a British I.G.Y. station …is likely to be that the Americans will offer to fill the gap in this longitude themselves. They are no more impressed with the integrity of Argentine science than we are."[181] Additionally, at an IGY National Committee Meeting in 1955, despite any personal feelings toward a station at Vahsel Bay David Brunt expressed reservations over the quality of Argentine science as enough of a justification for a Royal Society Base, considering the importance of research at this specific

[178] Miles Clifford "Need for an ice-breaker" January 12th 1956 Royal Society Archives ARF 1082 Box 5B
[179] Miles Clifford "Need for an ice-breaker" January 12th 1956 Royal Society Archives ARF 1082 Box 5B
[180] Cabinet Office "International Geophysical Year" March 31st 1955 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[181] Letter from R.N. Quirk to R.L. Speaight April 6th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

longitude: "Although it was true that an Argentine station already existed at Vahsel Bay, the Argentines were not only just beginning scientific work and their results were not likely to be as reliable as those obtained by a British station."[182] This Anglo-centric critique of Argentine science was not universal as that same year the Foreign Office warned that "We cannot afford to be too superior about Argentine science and Argentine scientists. All the evidence goes to show that they are taking the Antarctic and its problems extremely seriously and are anxious to prove their qualification and make known their achievements."[183]

This experience illustrates further the vast disunity of the scientific, and indeed the polar communities in the United Kingdom as it launched the IGY and the TAE in Antarctica in the 1950s. Not only was there discord over whether or not these expeditions to Vahsel Bay and across the continent should even happen, considering both the political statements that they could send and the potentially low quantity and quality of scientific research that would be produced, but there was disagreement each step of the way over what these expeditions should even look like. Disagreements between leadership in the Royal Society, Royal Geographical Society, Scott Polar Research Institute, Foreign Office, Falkland Islands Dependencies Survey, and the TAE flourished in this uncertain time, with several major figures attempting to take the lead regarding Britain's future in Antarctica, all whist displaying "unsavory personality clashes between key individuals."[184] These debates were extremely heated, and Roberts' papers, on which this chapter heavily relies, were not unbiased in their content. Roberts in fact largely opposed both British involvement in the IGY and especially the TAE as he worried that these projects could deter his

[182] Cabinet Office "International Geophysical Year" March 31st 1955 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[183]Letter from Curtis Tickell to Brian Roberts April 28th 1955 Scott Polar Search Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[184] Michael Smith, *Sir James Wordie, Polar Crusader: Exploring the Arctic and Antarctic* (Edinburgh: Birlinn, 2004). 246

own plans for an aerial survey of the Dependencies at the same time,[185] concerns that were eased when the government agreed to fund his project.[186] But he was also driven by the particular animosity that he felt for Wordie.

Roberts blamed many of the disagreements over the British commitment to Antarctica on the influence of Wordie in both the Polar and the greater science community as "the sole non-government arbiter of polar matters in the United Kingdom."[187] He argued that "Mr. Wordie is using all of his influence to make sure that the risky Fuchs' commitment at Vahsel Bay (which originated with Mr. Wordie)," as opposed to another site, "is "insured" either by having icebreaker help or by the knowledge that a government sponsored I.G.Y. party marooned there would have to be rescued by the government."[188] Roberts also felt that, after his opposition was known Wordie deliberately excluded, he and Colin Bertram from discussions of Britain's plans for the IGY in Antarctica, writing in 1955 that "we at the [Scott Polar Research] Institute are more fully informed about nearly all the foreign I.G.Y. plans than we are about the British proposals. We have not had a single paper on the subject from you; no any opportunity to discuss the matter with you…It is hard… to explain to foreigners why our own chairman takes this attitude."[189] Bertram was of a similar mind and wrote to Wordie that "you as the Chairman …and I as Director have not appeared to be in full agreement, indeed we are known to have been

[185] P. G. Mott, *Wings over Ice: An Account of the Falkland Islands and Dependencies Aerial Survey Expedition 1955-57* (Long Sutton: P. Mott, 1986), 3-5.
[186] Stephen Walter Hicks, "The Commonwealth Trans-Antarctic Expedition 1955-1958: How the Crossing of Antarctica Moved New Zealand to Recognise Its Antarctic Heritage and Take an Equal Place among Antarctic Nations" Unpublished Dissertation (University of Canterbury, 2015).
[187] "Note for the File of Falkland Islands Dependencies Survey Scientific Committee and related papers (end of 1956) Brian Roberts December 31 1957" Scott Polar Research Institute Archives 1308/22/9/ER Antarctic Falkland Islands Dependencies Survey Correspondence and Committee Papers
[188] Letter from Brian Roberts to C.C.C. Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[189] Letter from Brian Roberts to James Wordie July 29th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

govng contrary advice. It is essential the Institute presents a united front."[190] Roberts also believed that both Wordie's influence and character, a personality characterized by Betram as 'devious,'[191] prevented with the Scott Polar Research Institute and the Foreign Office from reliably carrying out its responsibilities: "So long as the present chairman of the British National I.G.Y. Committee (Mr. Wordie) is at large, I can only suggest that the F.O. refrains from coming itself on the subject in any way which he can refute or nullify. We must privately be under no illusions that he is entirely unscrupulous and does not hesitate to make promises which he has no intention of carrying out."[192]

Wordie also had specific quarrels with Roberts and believed that under Roberts' influence, the Scott Polar Research Institute was being turned into a branch of the Foreign Office. He even believed that Roberts was trying to deliberating sabotage Britain's role in the IGY in order to pursue the Foreign Office's agenda. He declared that Roberts "completely failed to see the purpose and importance" of the British role in the IGY and therefore "his activities were directed towards preventing the IGY Committee from carrying out its programme and for a time he held up plans for the Halley Bay base. He should have understood its great national importance. This shows his weak side."[193] Wordie's acrimonious relationship with the Scott Polar Research Institute led to such a hostile atmosphere that Colin Bertram tendered his resignation as the Director of the Institute. When its management committee refused to accept such a crucial resignation during a both busy and delicate time for the Institute, Bertram solved

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[190] Michael Smith, *Sir James Wordie, Polar Crusader: Exploring the Arctic and Antarctic* (Edinburgh: Birlinn, 2004). 249
[191] Michael Smith, *Sir James Wordie, Polar Crusader: Exploring the Arctic and Antarctic* (Edinburgh: Birlinn, 2004). 246
[192] Letter from Brian Roberts to C.C.C. Tickell May 27th 1955 Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[193] Quoted in Michael Smith, *Sir James Wordie, Polar Crusader: Exploring the Arctic and Antarctic* (Edinburgh: Birlinn, 2004). 248

his problem with Wordie by ousting him from the chairmanship of the management committee, a position which he had held for eighteen years. Many years later, Bertram too shifted blame for these problems on Wordie, writing "James Wordie was the difficulty. The Institute staff (with me as Director and Brian Roberts wearing his F.O. hat) and Wordie came into opposition over these matters."[194]

Brian Roberts was contemporaneously described by Laurence Kirwan as "an energetic and capable administrator…a man of strong character and decided, somewhat rigid, opinions…the moving spirit in the Institute."[195] This man was so annoyed with his experiences advising the organization of both the TAE and the Royal Society Expedition that, nervous about his legacy, he left a note in his papers for future historians, deflecting blame from himself and the FIDS Scientific Committee to external pressures: "Any historian of F.I.D.S. should remember that the policy of F.I.D.S was still, at this date, primarily influenced and complicated by broader consideration of British foreign policy and not solely by the views of the Governor or of the Scientific Committee."[196] 1956-8 was a vital year for Antarctic history in Britain since it involved the creation of the high-profile research station at Halley Bay and the successful Trans-Antarctic Crossing, as well as the scientific outputs of both projects, but neither of these projects, despite their positive historical legacies, were uncontroversial both in regards to the politics of the British polar community and Britain's geopolitical claims in the region.

Conclusion

[194] G. C. L Bertram, *Antarctica, Cambridge, Conservation and Population: A Biologist's Story* (Cambridge: G.C.L. Bertram, 1987), 62-5.
[195] Quoted in Klaus J. Dodds, *Pink Ice: Britain and the South Atlantic Empire* (I.B.Tauris, 2002). 22
[196] "Note for the File of Falkland Islands Dependencies Survey Scientific Committee and related papers (end of 1956) Brian Roberts December 31 1957" Scott Polar Research Institute Archives 1308/22/9/ER Antarctic Falkland Islands Dependencies Survey Correspondence and Committee Papers

In the context of the Cold War and the Space Race, few realize that the International Geophysical Year was also responsible for the widespread international settlement of Antarctica. But, while IGY vastly increased the human population and even interest in the continent, Great Britain's presence in the region dates at least as far back as the eighteenth century. At the start of the twentieth century, it was responsible for several major expeditions into the region, made formal claims, and began administering the territory, though they did not establish any permanent outposts south of South Georgia. In the 1940s, when the United Kingdom faced Argentine incursions into their imperial territory, they compensated for their absence by rapidly building a colonial survey service and several permanent outposts at the very edges of their otherwise shrinking empire. In 1955, it filed a legal case with the International Court of Justice arguing for the superiority of their claims to the Falkland Dependencies over Chile and Argentina. If anything, the IGY interrupted their vague expansionist plans in Antarctica. First, they acknowledged that because of the IGY, the "world will more easily forget our work in Antarctica, overshadowed by present spectacular operations by Russia and American."[197] Second, because of the CSAGI's suggestion for a base near Vahsel Bay, right at the edge of their disputed territorial claim, and the Argentine announcements to build their own station in the same region, they were forced to dedicate enormous resources to constructing and maintaining a base which almost certainly would not otherwise have been built. Finally, the overtly nationalistic TAE, already in motion before Royal Society plans to build at Vahsel Bay, contained the British scientific reputation abroad, associating the British IGY Base at Vahsel Bay with Fuchs' Elizabethan adventurous endeavor.

[197] Copy of Meeting Minutes [undated] Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

Notably, the Royal Society Expedition to Halley Bay was one of Britain's only major Antarctic contributions to the IGY. Their other stations around the Antarctic Peninsula were instructed to take observations in accordance with the IGY programming and are included in any list of British efforts during the IGY. But these others were given little, if any, additional funds or manpower for making these observations, and "no provision was made…for funds to cover the work which F.I.D.S. was asked to undertake during the I.G.Y."[198] This lack of support often rendering the FIDS IGY efforts quite minimal and even ineffective. For example, in compliance with this directive, a meteorologist at the Signy Base reported that for the IGY during normal nightly meteorological observations "it should be noted that met. assistants look at the sky whenever they go outdoors. No aurora were seen."[199] The construction of the research station at Vahsel Bay, later Halley Bay, took up any scientific budget for research in Antarctica. This led to extremely negative consequences for IGY research elsewhere in the Falkland Islands Dependencies, as explored in more depth in Chapter Six. FIDS, for the moment, remained an organization designed for political occupation rather than an intensive scientific program.

But finally, the early disorganization and disunity over what Antarctic science should look like during the IGY and beyond is a distinguishing feature of British Antarctic research. At the end of what is traditionally considered the British Empire and the start of its active administration of territory in Antarctica, the polar and scientific community had little idea how to succeed at staking their claim to a part of the world that may not even have much material value while simultaneously professing a dedication for apolitical and rigorous scientific research. They were making deeply political decisions at a specific moment in time when the profession "was propagating the idealist version of science and the scientist as essentially internal, pure,

[198] Letter from M.A. Willis to David Martin July 24th, 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[199] J.W.Stammers "Aurora Report" British Antarctic Survey Archives AD6/2H/1958/O

objective, uninterested in power."[200] No matter what decision the Royal Society made in regards to Vahsel Bay or whether or not Fuchs planned his expedition to coincide with the IGY, these actions or inactions had political consequences. And these debates within the scientific and polar communities over what sort of political message their research would send reveals fissures in the certainty of a British stronghold in Polar Affairs.

[200] Margaret Gowing, "The History of Science, Politics, and Political Economy," in *Information Sources in the History of Science and Medicine*, ed. P. Corsi and P. Weindling (London ; Boston: Butterworth-Heinemann, 1983).

CHAPTER TWO: THE PENNIES OF SCHOOLCHILDREN

Introduction

In 1964, when recounting the history of New Zealand's role in the Trans-Antarctic Expedition (TAE), Arthur Helm and J.H. Miller remarked "Finance, or rather the lack of finance, is the most burdensome problem to beset any Antarctic expedition."[201] Sir Edmund Hillary, recalling the organization of the TAE ventured years later, "I think everybody who goes to the Antarctic has problems with finance."[202] Even during the days of the Heroic Era, in the first two decades of the twentieth century, this was the case. As noted by Arctic explorer Fridtjof Nansen in 1912: "When the explorer comes home victorious, everyone goes out to cheer him... How many of those who join in the cheering were there when the expedition was fitting out, when it was short of bare necessities, when support and assistance were most urgently needed?"[203]

Many historians have argued that after the Second World War, national governments were the primary funding body for scientific research. [204] As early as 1967, science journalist Daniel Greenberg charted the dominance of government and military funding for even what is described as 'pure science' during and immediately following World War II, which in the United States had demonstrated that "bigness had become indispensable in many fields of research [and]…the instruments of war that were developed through fundamental knowledge could just as well serve to produce new fundamental knowledge."[205] Historian Paul Foreman took this analysis even further and argued that this new post WWII interdependence between science and

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[201] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 56
[202] Edmund Hillary. Interview with Jacqui Foley. New Zealand Antarctic Society Oral History Project. New Zealand October 4, 2004
[203] Captain Roald Amundsen and Roland Huntford, *The South Pole: An Account of the Norwegian Antarctic Expedition in the Fram, 1910-1912*, Cooper Square Press (Cooper Square Press, 2000). xxvii
[204] Chandra Mukerji*, A Fragile Power: Scientists and the State* (Princeton, N.J.: Princeton University Press, 1989). 4
[205] Daniel S Greenberg, *The Politics of Pure Science* (New York: New American Library, 1968). 97-8

the national government, at least in the United States, altered the direction of physical research, shifting its focus from pure science, meant to understand the laws of nature, to technical prowess.[206] The governments of the United States, Soviet Union, and their respective allies were not only concerned by the nuclear weaponry that defined the Cold War, but also the exploration of space, the oceans, and the interior of the Earth, the rise of telecommunications, nuclear power, "and many other scientific and technological developments …tied directly to the global conflict that the Cold War entailed."[207] This trend was epitomized by large government funded projects such as the Manhattan Project in the United States.[208] It was also true for the Americans in the course of Cold War polar exploration, such as Operation Deep Freeze in the Antarctic and in their strategic, military funded environmental studies in Greenland and Alaska, which sought to acquire "environmental knowledge-itself a key characteristic of the Cold War."[209]

While to some extent British governmental spending on science had been crippled by the war and their rapid loss of overseas colonies, the end of the Second World War also marked a period of close relations between science and the central government, when "the role of the state as [a] sponsor of science ha[d] undergone tremendous changes."[210] David Edgerton has, for example, shown the close relationship between the state, scientific and technological research, and Britain's powerful armaments industry in the mid-twentieth century.[211] Likewise, consolidating diverse means of funding and organizing oceanographic research including the,

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[206] Naomi Oreskes, "Introduction," in *Science and Technology in the Global Cold War*, ed. Naomi Oreskes and John Krige (Cambridge: MIT Press, 2014). 19
[207] Naomi Oreskes, "Introduction," in *Science and Technology in the Global Cold War*, ed. Naomi Oreskes and John Krige (Cambridge: MIT Press, 2014). 1
[208] Richard Rhodes, *The Making of the Atomic Bomb*, (New York: Simon & Schuster, 1986).
[209] Ronald E. Doel, "Defending the North American Continent: Why the Physical Sciences Mattered in Cold War Greenland," in *Exploring Greenland: Cold War Science and Technology on Ice*, ed. Ronald E. Doel, Kristine C. Harper, and Matthias Heymann (Palgrave Macmillan, 2016). 27
[210] Tom Wilkie, *British Science and Politics Since 1945* (Oxford, UK ; Cambridge, Mass: Blackwell Pub, 1991). 3-4
[211] David Edgerton, *Warfare State: Britain, 1920-1970*, (Cambridge, UK ; New York: Cambridge University Press, 2006).

domestic fisheries management, the Colonial Office's Discovery Investigations in the Antarctic and oceanographic research oriented 'Group W' based in the Admiralty's Research Laboratory, the National Oceanic Council was approved in 1950, meant to swallow all existing oceanographic institutions, an area of research which had been neglected in early twentieth century Britain. This new Council was supported principally by the Admiralty, with additionally funding from the Colonial Office, Development Commission, and the Commonwealth governments, and it solved the problem of money for a field where "the nation seemed largely to have lost interest in oceanic research, especially physical oceanography in the first half of the 20th century."[212] Since the public was no longer willing to fund this research, the government intervened directly. These consolidations were not universally applauded, and in some cases, caused tensions with the Royal Society and universities that feared government intervention could damage the 'independence' of science.[213]

Although historically many governmental bodies contributed to scientific research for centuries for various projects ranging from geodetic surveys to building technical schools, this almost complete dependence on government funding had not necessarily been the case before the war, when the "scope of such ventures was so limited that their economic, social, and political implications are obviously not comparable"[214] to those after World War II. Before the war, many research programs relied largely on private funding. For example, historian Robert Kohler has demonstrated how in the first half of the twentieth century, scientists formed partnerships with the officers of large foundations in order to fund their larger and more costly projects.[215] It

[212] Margaret Deacon, "Marine Science in the UK before World War II," in *Of Seas and Ships and Scientists: The Remarkable Story of the UK's National Institute of Oceanography 1949-1973*, ed. A. S Laughton et al. (Cambridge: Lutterworth Press, 2010). 19
[213] Jon Agar, "The New Price and Place of University Research: Jodrell Bank, NIRNS and the Context of Post□war British Academic Science," *Contemporary British History* 11, no. 1 (March 1, 1997): 1–30.
[214] Norman J. Vig, *Science and Technology in British Politics* (Oxford: Pergamon, 1968). 1
[215] Robert E Kohler, *Partners in Science* (Chicago: University Of Chicago Press, 1991).

certainly was not the case during the Heroic Age of Antarctic exploration, which had been almost entirely funded by wealthy individuals, foundations, or companies. British and New Zealand research programs in Antarctic, still nascent in the late 1950s, did not yet have an established means of garnering financial support. However, due to the often dangerous conditions, logistics and research were quite costly. As such, the wide variety of expeditions venturing to the Antarctic in this time had diverse means of support, which often determined the level of ambition or even success of their expeditions. This ranged from tiny, low budget expeditions like the Victoria University Wellington Antarctic Expedition (1957) and the New Zealand Alpine Club Expedition (1959-60) which operated on a shoestring, with more ambition than money, to governmental survey or environmental management projects like those of the Falkland Islands Dependencies Survey, the New Zealand Geological Survey, and the British Colonial Office's Discovery Investigations based on the island of South Georgia. Between these extremes was the more widely publicized Trans-Antarctic Expedition. The term 'expedition' is a general one, and the expeditions detailed in this chapter were also quite different from each other. To control for this incongruity, for the purposes of this chapter, I will adopt Marianne Klemun and Ulrike Spring's definition, which very broadly identifies a "scientific expedition" as "a culturally and historically specific mission carried out by a group of people with specific work tasks, and with the aim of reducing the unknown and of systematically acquiring, collecting, and documenting knowledge."[216]

These expeditions were exceptional because they utilized several different methods of scientific funding. While, in the tradition of large scientific projects developed post World War II, they did rely on government funding to a considerable extent, they also raised funding from

[216] Marianne Klemun and Ulrike Spring, "Expeditions as Experiments: An Introduction," in *Expeditions as Experiments: Practising Observation and Documentation*, ed. Marianne Klemun and Ulrike Spring, 2016. 7

an array of sources more reminiscent of the nineteenth century private patronage of science. For example, scientific societies and businesses ranging from multi-national corporations to tiny firms, donated much of the necessary monies, instruments, and goods for these journeys. Additionally, these expeditions, particularly the TAE, also relied on public fundraising among the New Zealand and United Kingdom publics. This fundraising not only allowed several people, such as women and former colonials, traditionally excluded from the scientific elite, to participate in a material way to the production of scientific research. It also gave thousands of people a stake in a region of the world that they would be unlikely to visit, giving untold numbers of Britons and Kiwis a relationship with the Antarctic, something which supports their respective territorial claims in the region.

This chapter addresses the funding of scientific research and expeditions in the Antarctic in the 1950s and 60s. It will begin with the organization and fundraising efforts of the New Zealand Alpine and Federated Mountain Clubs and the Victoria University Wellington Expedition. These two expeditions, organized by a handful of men, almost completely independent of government or any other large funding body, still resulted in fruitful scientific research. These expeditions, in several ways, clearly resembled the funding situations of pre-war scientific expeditions which relied on the generosity of a few private organizations and trusts. However, despite their claims of being extremely small and low-budget, they openly depended on the presence and logistical support coming from the New Zealand and United Stated Governments, whose navies and official research stations lent rides, equipment, and a safety net for any problems encountered in the field, support which would have been unaffordable for these groups.

The support drawn on by the smallest expeditions would have been impossible without the mechanisms in place by the largest ones. The New Zealand Geological Survey (NZGS) and the Department of Scientific and Industrial Research (DSIR) in New Zealand and the Falkland Islands Dependency Survey (FIDS) and the Colonial Office in the United Kingdom had vast networks in Antarctica. In fact, while the New Zealand government presence in Antarctica was somewhat smaller and almost entirely stemming from survey expeditions based out of the McMurdo Sound, in 1958, FIDS maintained nineteen bases scattered throughout the Antarctic Peninsula and the sub-Antarctic islands, mostly dedicated to survey, biology, geology, and meteorology. In addition, the Colonial Office oversaw whaling networks in the region, many of which hosted biological research. Since the Ross Dependency and the Falkland Islands Dependency were claimed by New Zealand and the United Kingdom, these stations and expeditions largely were designed to bolster these territorial claims[217] and therefore had the weight of their respective governments at their disposal, even if these governments were reluctant to spend money in a region that might not yield any long term value.

Finally, in the case of the Trans-Antarctic Expedition, funding followed a less traditional path. While either outright government grants or more 'soft' funding through scientific societies and universities, New Zealand and the United Kingdom provided a bulk of the monetary support, organizers sought support from a variety of other sources as well. Private companies, ranging from British Petroleum Ltd to law firms to leather goods suppliers sent in donations, both large and small in the form of monies or goods. Trusts and societies also provided several monetary gifts. In the case of the TAE, the Queen became the official patron of the expedition, adding to her existing patronage of the Royal Society which established the British IGY base at Halley

[217] Adrian Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939--1959," *History of Meteorology* 4 (2008): 27–40.

Bay. Finally, the organizing bodies of the TAE made an enormous effort to fundraise for the expeditions among private citizens. Schools in particular became a huge source if not for direct revenue, a nationalist spirit which linked giving to the cause of Antarctic science and exploration akin to buying war bonds-an investment in the positive future of one's country and their legitimacy in Antarctica and a way to vicariously experience what was considered one of the last existing great adventures into unknown parts of Earth.

Small Private Expeditions

Victoria University of Wellington Antarctic Expedition I & II (1957-59)

The students who participated in what would eventually be known as the first Victoria University of Wellington Antarctic Expedition (VUWAE) first went to the continent "uninvited, unheralded, and unwanted."[218] In July 1957, Peter Webb and Barrie McKelvey, a pair of students in the geology department at the Victoria University of Wellington (VUW), knowing that as relatively unskilled undergraduates they had no chance at being selected for any of the larger expeditions, approached Dr. Robert Clark, the chair of the Geology Department, for assistance. Clark outfitted the two with his military kit from World War II and wrote to the Ross Sea Committee, which was organizing the TAE and assisting in the organization of Scott Base, for their guidance. Clark, who turned out to be an enthusiastic and persuasive advocate for Antarctic research at VUW, managed to secure transportation for Webb and McKevley to Scott Base aboard the HMNZS *Endeavour*[219] in exchange for some manual labor once ashore. They soon found themselves in Antarctica, free, once the ship was unloaded, to fend for themselves on the continent. Although the Ross Sea Committee "had been just a bit dubious about having two

[218] Trevor Hatherton, "The Birth of the VUWAE," *Tuatara* 15 no. 3 (December 1967): 100-101. 100
[219] P. N. Webb and B. C. McKelvey, "Geological Investigations in South Victoria Land, Antarctica: Part 1-Geology of Victoria Dry Valley," *New Zealand Journal of Geology and Geophysics* 2, no. 1 (February 1, 1959): 120–36. 136

unsupervised students gadding about on the continent,"[220] the two, particularly Webb, who was raised on a farm, made themselves as useful as possible to the New Zealand and American men who were on the McMurdo Sound in a more official capacity. Through one of their new friendships with an American representative of the International Geophysical Year, they hitched a helicopter ride to the Wright and Taylor dry valleys, where they camped and "succeeded in mapping geologically about 400 square miles,"[221] the report of which was ultimately published in three parts for the *New Zealand Journal of Geology and Geophysics.*[222] Ultimately, the cost of this "very successful" venture "was very low, amounting to little over £100."[223] (**GB £1100**)

Figure 4. Peter Webb views the terminal face of the Upper Victoria Glacier[224]

[220] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 22
[221] Letter from R.H. Clark to G.W. Markham July 16 1958, New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"
[222] P. N. Webb and B. C. McKelvey, "Geological Investigations in South Victoria Land, Antarctica: Part 1-Geology of Victoria Dry Valley," *New Zealand Journal of Geology and* Geophysics 2, no. 1 (February 1, 1959): 120–36; B. C. McKelvey and P. N. Webb. "Geological Investigations in South Victoria Land, Antarctica: Part II—Geology of Upper Taylor Glacier Region." *New Zealand Journal of Geology and Geophysics* 2, no. 4 (November 1, 1959): 718–28.; B. C. McKelvey & P. N. Webb "Geological investigations in southern Victoria Land, Antarctica: Part 3-Geology of Wright Valley," *New Zealand Journal of Geology and Geophysics* 5, no.1 (August 25, 1962)143-162.
[223] Letter from R.H. Clark to G.W. Markham July 16 1958, New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"
[224] Depicts Peter Webb, Antarctica New Zealand Pictorial Collection

Pleased and inspired with McKelvey and Webb's success on such a small budget, Colin Bull, a newly appointed senior lecturer in the Physics Department, hoped to replicate it, but hopefully in a more organized fashion. Bull, a PhD from the University of Birmingham, who had already served on polar expeditions to Spitsbergen and Greenland had turned down a place on the Commonwealth TAE in order to emigrate to New Zealand for his new position. After hearing Webb and McKelvey speak to the Geology Department, he realized that despite turning down an offer to be on the TAE, he could still possibly visit Antarctica. Bull's hypothetical expedition soon had a fourth member in the form of Richard Barwick, a junior lecturer in the Biology department interested in studying the biology of the region, especially the large numbers of mummified seals which Webb and McKelvey had seen in their first visit. With his party now complete, Bull, who had "a demonstrated ability for organizing shoe-string expeditions,"[225] approached Robert Clark. Clark "was incredibly keen to establish some sort of continuing work there from his Department…In me, Bob quickly saw the possibilities of generating further expedition. In Bob, because he was a senior member of the University, who knew his way around the tricky paths of academia, I saw the means of gathering backing, of an academic if not financial nature, for a first 'proper' university expedition to the continent."[226]

However, since Bull was a bit more ambitious in terms of the academic objectives of any future expedition, it became clear that in the case of his fledgling plan "Money would help but we had very little and the University wasn't likely to give us much, if any."[227] After finding an ally in Clark, he approached the chair of his own department who "agreed to support Bob's

[225] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 196
[226] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 34-35
[227] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 37

request to the Council for approval for the expedition. I also visited Dr Williams, the University's Vice-Chancellor, and...he was thoroughly enthusiastic... he suggested that I apply for a New Zealand University Research Grant and… I was gratified to receive, in September 1958, a grant of £300 [**GB £3330**], which was soon supplemented with £410 [**GB £4550**] from the Council at Vic. Very good! I hadn't expected that! Most of the £410 was spent on insurance for ourselves and the scientific and survey equipment we borrowed. We didn't need the £300 and most of it was spent in the following year by the successor expedition."[228] Bull's proposal was then submitted to the Ross Dependency Research Committee (RDRC), successor to the Ross Sea Committee, which was comprised of representatives of Divisions of the Department of Scientific and Industrial Research, the Dominion Museum, the Department of Lands and Survey, New Zealand Universities, the Royal Society of New Zealand, Department of External Affairs and the New Zealand Chiefs of Staff of the Armed Forces.[229] Since "No expedition or person goes to the Ross Dependency without the Government's permission… [and] the U.S. authorities would not give logistic support to any expedition unless they know it had the New Zealand Government's blessing,"[230] it was necessary for Clark and Bull to go through them. Although the RDRC "didn't like the idea of having people working independently of the government," and they "would need to cooperate with many others in order to gain the logistic support we needed, to borrow some of the field equipment and a host of other matters,"[231] the Minister for Scientific and Industrial

[228] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 3
[229] L. B. Quartermain and G. W. Markham, *New Zealanders in the Antarctic* (Wellington: Antarctic Division, Dept. of Scientific and Industrial Research, 1962). University of Canterbury Library Antarctic Collection.
[230] Letter from G.W. Markham to R.H. Clark October 9, 1958 New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"
[231] Colin Bull et al*., Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 38-9

Research approved the proposal on the Committee's recommendation[232] and to informally secure assistance from Admiral Dufek, the commander of the US *Operation Deepfreeze,* through Trevor Hatherton, the Lead Scientist at Scott Base, for support.[233]

Now, having received the blessing of both the RDRC and VUW, Bull and his companions needed to finance their expedition. In addition to the University research grant, Clark believed that it was "probable that most of the necessary equipment for this venture would be made available by the University."[234] But despite these advantages that Bull's group had over the previous year, they would still need to secure far more funding and supplies to "enable the objectives of the expedition to be achieved."[235] Bull was experienced in these matters having organized nearly all of the funding for the Birmingham University Spitsbergen Expedition. He was able to borrow scientific gear not only from the VUW, but also from the Universities of Canterbury and Wellington, Royal New Zealand Navy, Meteorological Office, and the DSIR. Now left with the need for the other food and supplies, Bull turned to fundraising.

In order to fundraise, Bull composed a series of letters to local businesses. While some of their appeals were to organizations who had already shown an interest in Antarctic affairs, such as this request for warming clothing and sleeping bags from Arthur Ellis & Co., in Dunedin: "Like most University scientific endeavours of these days this Expedition is greatly hampered by lack of adequate financial support and, knowing of your interest in Antarctic work, I respectfully wish to enquire whether you are in a position to give some assistance to us…if you can help us in

[232] Ross Dependency Research Committee "The New Zealand Antarctic Research Expeditions Dec 1958-Dec 1959" Wellington NZ, 1959 University of Canterbury Library Antarctic Collection. 19
[233] Letter from G.W. Markham to R.H. Clark October 9, 1958 New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"
[234] Letter from R.H. Clark to G.W. Markham July 16 1958, New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"
[235] Letter from G.W. Markham to R.H. Clark October 9, 1958 New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition"

this matter we can assure you of our continued gratitude and that you will be supporting a worth-while scientific cause."[236]

A letter to Cadbury's, allegedly the first composed for the expedition, read: "I write on behalf of the Victoria University of Wellington Antarctic Expedition, 1958-59. This Expedition will be leaving this country in early December and expects to spend the following three months working in the unexplored area of south Victoria Land, north of Taylor Valley, [but]... the expedition, like many scientific ventures of these years, finds itself still greatly in need of financial support.

In planning for our 12 weeks of fieldwork we find ourselves in need of the following of your products:

168 bars of Cadbury's Dairy Milk Chocolate, each 4 ounces;

12 jars of Cadbury's Drinking Chocolate, each 8.8 ounces;

if you find yourself able to donate these items to the Expedition, or to supply them at a reduced price, we can assure you that you will be supporting a most worthwhile scientific endeavour."[237]

Cadbury's offered, at no cost, twice the product that Bull asked for, stating that two undergraduates could surely eat that much chocolate. They did have only one request "Did [Bull] think [they] could take an intrepid photograph or two, showing someone hanging by one hand from a rock knob on a vertical rock face, and eating a bar of chocolate held in the other hand, while smiling contentedly at the camera?"[238] Emboldened by their success, Bull repeated his letter to a number of firms and most of their letters solicited success.

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[236] Letter from Colin Bull to Arthur Ellis September 19, 1958 New Zealand National Archives CAHU CH370 Box 11 "Policy and Programme-Victoria University of Wellington Expedition

[237] Letter from Colin Bull to John Oliver Fry, Managing Director of Cadbury's New Zealand. Quoted in Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 46

[238] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 47

In the end, Bull received gifts or financial discounts from companies ranging from Kodak, Nestle, and Glaxo Laboratories, to NZ Co-operative Rennet Co. and Kiwi Bacon Co.[239] In gratitude, Bull and the others attempted to name several geographical features after these companies, perhaps looking to the precedent set in the New Zealand Antarctic Manual which allows features, such as coasts, mountain ranges, prominent islands, bay, and glaciers etc. to be named for "Persons who by substantial contribution of funds or supplies have made possible and Antarctic expedition." Perhaps due to the fact that naming features for products or with "Names of contributors of funds, equipment, and supplies, who have by the nature and tone of their advertising have endeavoured to capitalize or to gain some commercial advantage as a result of their donations,"[240] were deemed inappropriate, the New Zealand Geographic Board did not approve of the "30-odd peaks so we had to clear our collective conscience by naming one handsome peak 'Sponsors' Peak.'"[241]

This first officially sanctioned university expedition, which cost its organizers only £1000, was deemed an overwhelming success. After spending only 52 days in the Wright Valley, the work that Bull, Barwick, Webb, and McKelvey produced resulted in eighteen publications in academic journals.[242] Beyond the geological survey which had defined the earlier expedition, they collected results in glaciology, biology, meteorology, gravity, and palaeomagnetism. This expedition paved the way for a program that has sent hundreds of students to Antarctica and still exists today. These university expeditions were only possible really coming from a country like

[239] "Immediate Report of the Victoria University of Wellington Antarctic Expedition 1958-59" February 17th 1959 University of Canterbury Library Antarctic Collection. 7
[240] Ross Sea Committee "New Zealand Antarctic Manual 1956-1958" University of Canterbury Library Antarctic Collection. 47-52
[241] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 47
[242] L. B. Quartermain and G. W. Markham, *New Zealanders in the Antarctic* (Wellington: Antarctic Division, Dept. of Scientific and Industrial Research, 1962). University of Canterbury Library Antarctic Collection.

NZ where the distance traveled to Antarctica was so little that it was relatively easy to get there. Additionally, the geographical accident that the McMurdo Dry Valleys were located in the Ross Dependency meant that it was possible to spend extended time there without too much equipment since the area is relatively ice free. In fact, by 1964, Clark feared that Victoria's Antarctic adventure was coming to an end, both because of changes in funding following the dissolution of the University of New Zealand, and because there were no more ice-free areas left to map. New opportunities were opened, however, by geologist Harold Wellman's measurements of the temperatures of Lake Vanda in Wright Valley.[243] But the initial low costs of the early expeditions in some way do not actually reflect the actual cost. Through relying on American helicopters and New Zealand naval vessels for their transport, they used thousands of pounds worth of resources without which would have made the expedition impossible.

New Zealand Alpine Club Expedition (1959-60)

Besides the VUWAE, another non-governmental party was active in Antarctica in the late 1950s; the New Zealand Alpine Club. While the RDRC did not condone parties to visit the Ross Dependency solely for the sake of mountaineering, this club actually contributed to the New Zealand Field Program. In the 1959-60 season the New Zealand Alpine Club undertook a man hauling expedition to the Hood Glacier area south of the Beardmore Glacier, during which they accomplished geological and topographical survey work. However, the organization of this expedition, despite having more financial security than the VUWAE, had a much harder time in getting to the Ross Dependency.

Despite the some of the obstacles faced by the VUWAE, Clark and Bull were able to receive permission and even funding for their expedition with relative ease. This was certainly

[243] Rachel Barrowman, *Victoria University of Wellington, 1899-1999: A History* (Victoria University Press, 1999). 171-72

not the case of the New Zealand Alpine Club Expedition. This expedition began in November of 1958, when R.D. Dick, the chairman of the New Zealand Alpine Club (NZAC) wrote an informal letter to Geoffrey Markham requesting some "advice and assistance" for the planning of an eight man expedition with the primary objective to climb Mt. Lister, a peak slightly over 13,300 feet in the Royal Society Range.[244] While their initial proposal did not include a scientific program other than an offer to assist with any fieldwork already being done, their second letter included some vague plans for physiology, geology, biology, and survey work. Mostly, they claimed, they were ready to go, needing only assistance in the form of negotiating with American forces for transport of personnel and material to and from the McMurdo Sound. Their request was turned down.

Mountaineers already had a long history in Antarctica. In fact, several members of the TAE as well as the NZGS had been members of the NZAP and other mountaineering clubs around New Zealand. Though an emphasis was made at recruiting people for working in Antarctica who had mountaineering experience and before deployment the men trained at the Tasman Glacier, in this case, P.N. Holloway, the Minister in charge of the DSIR, replied that other government sanctioned expeditions, "have greater priority for the logistic resources available than does your Club's Expedition."[245] He did, however, invite members of the mountaineering club to apply to join the more traditional Antarctic expeditions. The RDRC did informally reach out to the American Antarctic Program to get their position and found themselves further supported when the National Science Foundation responded with the following telegram: "Regret find it necessary to concur with Ross Dependency Research

[244] Letter from R.D. Dick to G.W. Markham November 27, 1958. New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[245] Letter from P.N. Holloway to R.D. Dick April 23, 1959. New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"

Committee and Minister of Science and Industrial Research in respect to Alpine Club request for US support. Demands on helicopter capabilities this season so… heavy part of planned scientific program may have to be limited. Any additional demands would surely curtail scientific program."[246] In fact, internal correspondence between Holloway and Prime Minister Walter Nash opined that to make a formal to request to the US Government for support "would have been embarrassing to both Governments."[247] Additionally, financials were a consideration because "it would involve the Government in providing equipment, supplies and, indirectly, finance to meet the desires of a private non-scientific body."[248] This general sentiment was expressed by Hatherton as early as 1957, when he write in his diary that New Zealand Alpine Clubs were "Sterile Groups and if I had any say [their involvement in Antarctica] would be over my dead body."[249]

Dick and the rest of the Alpine Club did not take this rejection lying down. Instead, as the government anticipated, they "press[ed] for an expedition later…[and] endeavor[ed] to enlist public opinion in their support."[250] In a series of appeal letters, the NZAC focused on the academic credentials of their club members, who would "ensure a highly satisfactory contribution of scientific work,"[251] as well as New Zealand's financial obstacles in the Antarctic compared to their own financial stability. For example, "we have arranged the finance required for the expedition and in our application made no request for financial help from the N.Z.

[246] Telegram from T.O. Jones to G.W. Markham June 22, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[247] Letter from P.N. Holloway to Walter Nash July 24, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[248] Letter from R.G. Simmers to P.N. Holloway June 16, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[249] Personal Diary of Trevor Hatherton April 29, 1957, Curtesy of Kate Carnaby
[250] Letter from R.G. Simmers to P.N. Holloway June 16, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[251] Letter from R.D. Dick to P.N. Holloway May 19, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"

Government. There would be no expense to the N.Z Government, other than transport costs (if any), and the possible loan of certain equipment already discussed with the R.D.R.C. An expedition such as this can be a money saver to the N.Z. Government."[252] Additionally, "It is enlisting New Zealand press and public support, and has obtained financial assistance overseas from the Everest Foundation Trustees, and the Hillary-Lowe Everest Fund…I also feel that when the position is explained to the American authorities and they realise that the Expedition will be doing worthwhile work in a unexplored region, the required support will be forthcoming."[253]

One of the Alpine Club's more ardent defenders came in the form of the MP of Invercargill, J. Ralph Hanan, who questioned Holloway's decision to deny the Alpine Club's request. He noted that "No cost to the New Zealand tax-payer is involved in the proposals of the N.Z. Alpine Club"[254] and stated that while high in quality, the quantity of New Zealand's research in Antarctica was low when compared to the United States. A "highly qualified team of the N.Z. Alpine Club could develop and strengthen New Zealand research in the field."[255] Though Holloway was incensed at the implied slight the New Zealand Program which he vigorously defended, he began to take steps to negotiate with the Alpine Club, weighing various possibilities for their participation in some manner of Antarctic research during the 1959-60 season. He conceded that the trip would unlikely require many search and rescue resources given the experience of the Club members with mountaineering in extreme conditions, the mapping burden that this would remove from the NZGS, and the possibility of legitimate scientific research through the academic qualifications of the proposed members. Additionally, since the

[252] Letter from R.D. Dick to P.N. Holloway May 19, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[253] Letter from P.N. Holloway to Walter Nash July 24, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[254] New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[255] New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"

government was, as previously mentioned, somewhat dependent on Alpine Club members to man their own expeditions, they believed it necessary to "promote friendly relations with the Alpine Club."[256] This can be seen as a specific response to the implicit threat in an earlier letter from Dick arguing that "You will be aware, Sir, that…Travel and scientific work in the Antarctic require experience which has been provided in a large part by our members, and…If this "pool" of personnel, skilled and experienced in Antarctic conditions, is not maintained, the pursuit of future scientific work will be made all the more difficult."[257] The final team rivaled any more official New Zealand team in terms of qualification and consisted of a food chemist from the Wheat Institute (a branch of the DSIR which continued to pay his salary during the expedition), a senior lecturer in geology from the University of Adelaide, a Biology Research Fellow from the University of Western Australia, an engineer/surveyor, a school teacher, and three undergraduates in Engineering and Soil Science.

Eventually the NZAC and the RDRC settled on a plan to carry out geological reconnaissance surveys and topographical mapping of the unexplored region east of the Beardmore Glacier, in accordance with the requirements of the New Zealand Geological Survey and the Lands and Survey Department. Additionally, they were instructed to take a collection of lichens and moss, the only plant life in Antarctica, for the Dominion Museum.[258] In a press statement from September 1959, Holloway announced: "the Government gives its full support to this Alpine Club venture. Here is a first-class chance to make a worthwhile contribution on the mapping of the Ross Dependency, and I am sure the Club will make the most of it. The

[256] Notes of Interview by Chairman R.D.R.C. with Minister of D.S.I.R. July 16 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[257] Letter from R.D. Dick to P.N. Holloway May 19, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[258] Ross Dependency Research Committee "The New Zealand Antarctic Programme 1959-1960" Wellington NZ, 1960 University of Canterbury Library Antarctic Collection. 23

Americans have been quick to appreciate the value of the Alpine Club's proposed exploration, and realise that this team will fit into the pattern of the coming season's scientific work in the Antarctic."[259] This public statement is a reversal of both Holloway's and the American National Science Foundation's previous private stances of the expedition.

When the men of the NZAC returned home, its leader, Robin Cawley, termed the expedition "a grand trip." It resulted in the exploration and mapping of some 1,000 square miles in the Ross Dependency, the collection of soil and lichen samples, and the discovery of insects, (a type of *Cellempola* now no longer considered to be insects) at the furthest point south to date. The Department of Lands and Survey published three maps based on their survey work in the early 1960s. Cawley, a food scientist with the Wheat Institute, published an article on baking in Antarctica in the *New Zealand Baker and Confectioner.* In fact, the Wheat Institute, a government institution, continued to pay his salary during the expedition as "All we know of Antarctic circumstances affecting food has come from people without special training in Food Chemistry…It is not unreasonable to suggest that the food industries are so important to New Zealand that this opportunity should be taken to find out whether a food chemist can many something of an opportunity in Antarctica as well as the physicists."[260] 1959 turned out to be the start of a lifelong commitment to Antarctic geology for Robin Oliver, the team's geologist, who published on Antarctic until his death in 2001, including multiple papers at the First International Symposium on Antarctic Geology in 1963 in Cape Town.[261] But although Cawley "hope[d] it

[259] Press Statement from the Office of the Minister of Scientific and Industrial Research September 19 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[260] Letter from E.W. Hullett to the Department of Scientific and Industrial Research October 27th, 1959 New Zealand National Archives CAHU CH370 Box 11 "Policy and Program: NZ Alpine Club Expedition"
[261] R.L. Oliver, "The Level of Former Glaciation Near the Mouth of the Beardmore Glacier," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964).; R.L. Oliver, "Some Basement Rock Relations in Antarctica," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964).; R.L.

will be followed by others,"[262] in reality, it represented one final triumph of private expeditions to Antarctica. While in the 1962-63 season the Federated Mountain Clubs, mainly composed of Tararua Tramping Club members,[263] undertook a man hauling expedition to the Trafalgar Glacier area near Cape Hallett with geological and topographical surveys, mapping the northern head of the Mariner Glacier,[264] the last one before the United States and New Zealand laid down a policy of non-support for private parties in 1963, the sun was setting on privately funded Antarctic Research.

Oliver, "Geological Observations at Plunket Point, Beardmore Glacier," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964).

[262] R. Cawley "New Zealand Alpine Club Antarctic Expedition" *New Zealand Alpine Journal* 18 no. 47 (1960) 253-68. 253-4

[263] John Millen, *Tararua Antarctic Expedition, 1962*-63 (Wellington: Federated Mountain Clubs of New Zealand, 1964). University of Canterbury Antarctic Collection

[264] P.C. Le Couteur; E.C. Leitch "Preliminary Report on the Geology of an Area South-west of the Upper Tucker Glacier, Northern Victoria Land." *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland. 1964)

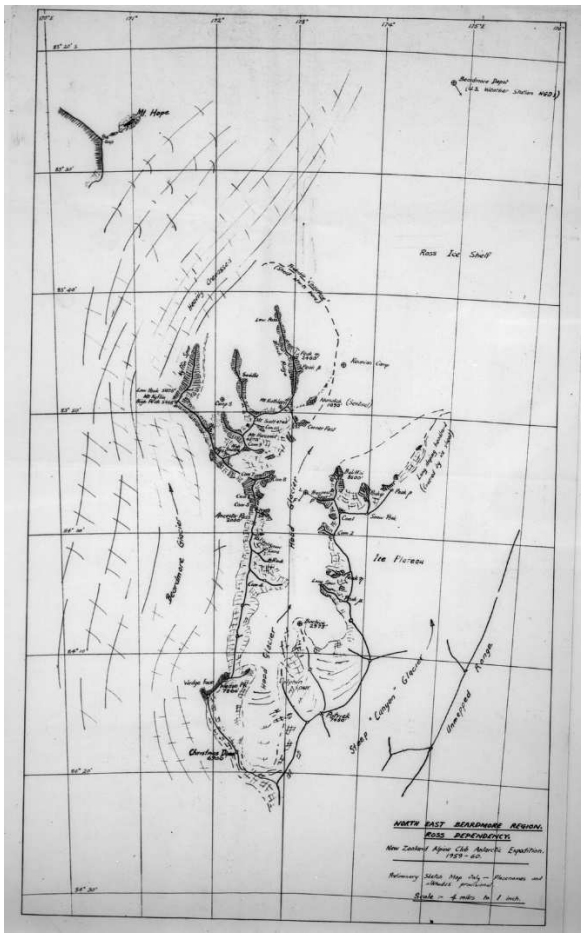

Figure 5. North-East Beardmore Glacier region, Ross Dependency. Taken by that New Zealand Alpine Club Expedition 1959-1960[265]

But despite the fact that privately funded expeditions had long been the norm in Antarctic research, the difficulty of the NZAC in getting their expedition off the ground, and the fact that it went pretty much unrepeated, shows a change in the dynamics of Antarctic research. While grassroots fundraising and mostly scientific freedom was the norm in early expeditions, over time, not only did the government get more involved in the semi-private expeditions, they soon eliminated them entirely. Despite New Zealand's extremely stretched resources (the HMNZS

[265] Antarctica New Zealand Pictorial Collection

Endeavour, for example, was described affectionately as "elderly,"[266] "wee,"[267] and "not a glamour ship,"[268] and more harshly as "a plywood toy,"[269] "the little wooden piss-pot"[270] and "the cheapest ship that could be found to do battle with the toughest land in the world"[271]), and the fact that until the late 1950s New Zealand's government was very hesitant to commit any funds to defend their territorial claims in Antarctica in the form of research programs,[272] it were extremely reluctant to pass responsibility to non-governmental groups. This could possibly be due to the relative paucity of immediate output by Club scientists in comparison to the VUWAE- while a good deal of territory was mapped, in the immediate aftermath, they produced very few publications. Additionally, as Markham and Holloway argued, it was relatively easy for Alpine Club members, particularly scientists, to participate in Antarctic Expeditions organized by either the NZGS or the RDRC. However, considering this was a time when New Zealand was ardently trying to maintain their claim to Antarctica, it is likely that they believed that allowing non-governmental, scientific bodies to have Antarctic expeditions, they were undermining their own claim and legitimacy in the region, particularly when held up to the United States.

Government Expeditions

New Zealand Geological Survey (1957-8)

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[266] R.H. Clark, "The Antarctic Research Programme of the Victoria University of Wellington 1957-1967," *Tuatara* 15 no. 3 (December 1967): 102-116. 102

[267] Colin Bull et al., *Innocents in the Dry Valleys: An Account of the Victoria University of Wellington Antarctic Expedition, 1958-59* (Fairbanks, Alaska: University of Alaska Press, 2009). 22

[268] *H.M.N.Z.S Endeavour Report of Proceedings to the N.Z.N.B. on the Antarctic & Naval Operations in Support of the British-New Zealand Trans-Antarctic & I.G.Y Expedition December 1956-March 1957* University of Canterbury Library Antarctic Collection

[269] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren, 2014. 50

[270] Quoted in Ian Church, *Last Port to Antarctica: Dunedin and Port Chalmers : 100 Years of Service* (Dunedin, N.Z.: Otago Heritage Books, 1997). 97

[271] Ross Sea Committee Press Statement March 28, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/01

[272] H.M.F. Logan, "Cold Commitment: The Development of New Zealand's Territorial Role in Antarctica 1920-1960" Unpublished Dissertation (University of Canterbury, 1979). Chapter 7

Despite the fact that Great Britain had conferred the Ross Dependency to the governorship of the Dominion of New Zealand in 1923, the first large-scale government survey of the territory did not occur until the New Zealand Geological Survey sponsored a survey in 1957-58. This survey had its origins in frustrations within the scientific community over the specifications of the IGY. The IGY, which was heavily supported by several different departments within the New Zealand Government heavily emphasized research within the Polar Regions. However, geologists, who had many burning academic questions regarding the Antarctic, were generally excluded from IGY parties.[273] Geophysicists both in New Zealand, and within the US National Committee for the IGY (a major ally on this project) were adamant about this issue. American geologist Laurence Gould, who was the deputy leader of the Byrd Expedition to Antarctica in 1928-30, expressed his frustration with this embargo with Dr. Lucy Cranwell, a prominent New Zealand botanist then living in the United States. They developed an idea for a group of geologists to form an official New Zealand Government Expedition to Antarctica, concurrent to the IGY.

This expedition, which was the first fully funded government expedition from New Zealand to the Antarctic was approved by the New Zealand Government in June 1957. To be headed by New Zealand geologist H.J. Harrington, who had already led expeditions to Spitsbergen, it received a budget of £6,000 (**GB £68,750**) and, courtesy of Gould, was transported to Hallett Station, a joint US and NZ IGY research station aboard the naval icebreaker *U.S.S. Alka.*[274] Harrington managed to stay within this budget and this expedition managed to produce several maps of the Dependency. Though it was the first official

[273] N.Z. Geological Survey Antarctic Expedition 1957-58 Circular No. 2 July 1957 Joseph Holmes Miller Papers New Zealand Alexander Turnbull Library MS-Papers-6480-24
[274] E. B Fitzgerald, *Surveying the Antarctic: The New Zealand Geological Survey Antarctic Expedition 1957-1958* (Nelson, N.Z.: E.B. Fitzgerald, 2012). 4-6

government expedition, it was the last managed by the New Zealand Geological Survey and the New Zealand Survey Office and the next year, the supervision of all New Zealand Government activity moved under the purvey of the newly developed Ross Dependency Research Committee, overseen by the Department of Scientific and Industrial Research.

Falkland Islands Dependency Survey

The New Zealand Experience with Government Expeditions to the Antarctic was markedly different from that of the Falklands Islands Dependency Survey (FIDS). During the time the New Zealand was embarking on Antarctic Research for the first time with a relatively low budget, the Falkland Islands Dependency Survey, under purview of the Colonial Office and the official leadership of the governor of the Falkland Islands, was managing nineteen bases within the territory that they claimed. FIDS did not have a massive budget in this time, nor was the primarily cause of their existence for the purposes of scientific research. They made their research stations in relatively safe and protected areas, which would not require the same costs as larger expeditions, as a way to bolster the competing claims which Chile and Argentina shared over the land. Enough funding was required to maintain the bases and pay small staffs of scientists to make meteorological observations, survey the territory, and in some cases, research the geology, glaciology, flora, or fauna, in the area.

Commonwealth Trans-Antarctic Expedition (1957-8)

United Kingdom Fundraising and Nationalistic Prestige Building Science

As explained in Chapter One, the Trans-Antarctic expedition was conceived in 1950 when Vivian Fuchs was huddled in his sleeping bag while a blizzard raged outdoors on Stonington Island on a sledging expedition. He wrote of his plans on a scrap of paper and even

then began to sketch out logistics.[275] Like Ernest Shackleton's abortive attempt to cross the continent in 1914, Fuchs' plan proposed two parties: one leaving from the Weddell Sea area and crossing to the Pole while another would leave from the Ross Sea, laid food stores for the Weddell Sea Party, meeting in the South Pole and then crossing through the Ross Dependency.

Fuchs spent the next few years attempting to organize his expedition. When, quite separately, the Royal Society made plans to represent the United Kingdom in the International Geophysical Year, coming up in 1957-8, Fuchs latched onto the opportunity for his fledgling Expedition proposal, while not to be a part of the IGY, but to coincide with the IGY activity and members of team to do IGY research as part of the crossing. Wishing the expedition to truly represent the entire Commonwealth, Fuchs sought and received patronage from the newly crowned Elizabeth II, and also both received financial support and a team member from South Africa in the form of meteorologist Johannes "Hannes" LaGrange and Australia with geologist Dr. Jon Stephenson. But what Fuchs needed most, after gaining support within the UK, was the help of New Zealand.

New Zealand, of the Commonwealth countries, was the closest geographically to the Pole and through an application of Article Three in 1923 of the British Settlements Act, they exercised sovereignty over a massive swath of land, known as the Ross Dependency-the exact area that Fuchs envisioned another party crossing. The New Zealand Government was initially somewhat reluctant to commit the funds and support necessary for New Zealand participate so largely to this proposed expedition, particularly because even with the pledging of government funds, the TAE would still need a good deal of private patronage.[276] While eventually, the

[275] Vivian Fuchs, *A Time to Speak : An Autobiography* (England: A. Nelson, 1990). 206
[276] H.M.F. Logan, "Cold Commitment: The Development of New Zealand's Territorial Role in Antarctica 1920-1960" (University of Canterbury, 1979). Unpublished Dissertation. University of Canterbury Library Antarctic Collection. Chapter 7

Expedition successfully fundraised a good deal, through soliciting private 'shares' in the adventure, having school children sponsor sledge dogs, and requesting corporate sponsorship (British Petroleum ended up being the largest corporate contributor), among other means, the New Zealand Government was convinced when one of the most famous New Zealanders in history was appointed the leader of the New Zealand party. This was Sir Edmund Hillary (1919-2008), one of the most famous men in the world, who had become the first to successfully scale Mt. Everest in 1953 and "the sort of man who couldn't help becoming an international figure if he had merely beaten a record at flagpole sitting."[277]

In the Spring of 1955 the Management Committee for the Commonwealth Trans-Antarctic Expedition had their first meeting in their London office. At this point, several bodies that Dr. Vivian Fuchs expected to support his expedition had demonstrated lacklustre, even negative enthusiasm for the TAE, including the Scott Polar Research Institute, the Royal Geographical Society, and the Polar Desk at the Foreign Office. At this meeting, Sir John Slessor, the Chairman of the TAE, Marshall of the Royal Air Force, and Vice President of the Royal Geographical Society suggested improving the profile of the expedition by writing to Martin Charteris, the Queen's Private Secretary asking to "Her Majesty The Queen to be Patron of the Expedition."[278] On June 20th, Slessor composed a letter to Lord Charles Tryon, the Director of the Privy Purse Office: "The object of this letter is to ask you to approach the Queen to ask whether she would do the members of the Expedition the great honour of becoming their Patron… This is going to be a formidable and arduous venture, involving as it does the crossing of some 1,800 miles of mostly unexplored country in the region of the South Pole. I need hardly

[277] Gerald Bowman, *From Scott to Fuchs.* (London: Evans Bros., 1958). 147
[278] Eleanor Fuchs (Honnywill) "Trans-Antarctic Expedition 1955-1958: 'Behind the Scenes'" Unpublished; Written in 1996 Canterbury Museum 2015.113.425

say what a tremendous encouragement and inspiration it would be to all those taking part if Her Majesty would graciously consent to become their Patron."[279]

While South Africa and Australia both committed funding and one scientist each to the TAE, the vast majority of funding came from both public and private sources in the United Kingdom and New Zealand, as: "To launch such an expedition would require time and a great deal of money, probably, I thought, about a quarter of a million pounds."[280] Early in 1955 a General Committee of twenty-four members was formed under the chairmanship of Marshal of the Royal Air Force Sir John Slessor, and from this body three subcommittees were formed under Sir Edwin Herbert, Professor H.H. Read and Sir Miles Clifford, to deal respectively with finance, the scientific program, and the selection of personnel. In February, Fuchs achieved a coup when Winston Churchill announced that the United Kingdom Government would contribute £100,000 (**GB £2,292,000)** towards the endeavor. Over the summer of that year, after the Queen's commitment of patronage, the financial leadership successfully solicited large gifts from the governments of South Africa (£18,000) and Australia (£20,000) (**GB £412,500** and **£458,300** respectively) which served as "tangible evidence of the faith and enthusiasm that the Government…places in the importance of the venture."[281] The Government of New Zealand, in addition to £50,000 (**GB £573,000)**, assumed responsibility for the Ross Sea Party and Scott Base. This entailed much work by Government departments, in particular the Royal New Zealand Navy which acquired and manned HMNZS *Endeavour,* the Royal New Zealand Air Force which provided four men and an Auster plane, and the New Zealand Post Office which

[279] Letter from Sir John Slessor to Lord Tryon, June 20 1955 Scott Polar Research Institute Archives MS 1326 Box 35 CTAE Correspondence with Buckingham Palace
[280] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition,* 1955-1958, (Boston: Little, Brown, 1959). 2
[281] Letter from John Slessor to Rt. Hon. R.G. Menzies August 17th 1955 Scott Polar Research Institute Archives MS 1326 Box 25 CTAE Chairman's Letters of Thanks

provided the radio equipment and communication facilities. Many other department also assisted in the planning and building of Scott Base, which was to house not only members of the Trans-Antarctic Expedition but also a number of scientists sent by the Department of Scientific and Industrial Research to form a part of New Zealand's contribution to the International Geophysical Year.[282]

While these cash contributions from the involved Commonwealth countries totaled £187,000 **(GB £4,285,000)**, the Expedition still needed to raise about £300,000, **(GB £6,875,000)** split between New Zealand and the United Kingdom's organizing Committees. They did this through a vast appeal, which, reflecting the private sources of funding for nineteenth century science, called upon trusts and scientific societies, industry, and private citizens. The expedition itself was formed as a Limited Liability Company which was granted the status of a charity by the Commissioners of Inland Revenue. This enabled it to earn money towards the cost by the sale of press (*London Times)*, book (Little Brown & Cassels), broadcasting (*BBC*), and other rights. In all, the income from these sources amounted to about a fifth of the total required.[283] For the rest, the TAE turned to vast nation-wide appeals in the two countries.

In the United Kingdom, financial planning was organized by the Financial Sub-Committee of the TAE General Committee led by Sir Edwin Herbert and former Falklands Governor, Sir Miles Clifford. Though the TAE's Advance Party, a small group who would spend the British winter establishing a foothold in the Antarctic through building a base in the Weddell Sea, was departing south in 1955, the Committee planned to used their upcoming departure as

[282] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition,* 1955-1958, (Boston: Little, Brown, 1959). 4
[283] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition,* 1955-1958, (Boston: Little, Brown, 1959). 5

catalyst for fundraising and began their Appeal in late October of that year. They primarily appealed to the public through radio, television, and newspaper appeals to be rolled out methodically throughout the month of November. These appeals targeted small firms, schools, universities, townships, and individuals. In this case, committee members wrote to public figures from areas around the United Kingdom, both in the peerage (such as the Duke of Hamilton in Scotland who nominally led a fundraising committee and the Duke of Abercorn in Northern Ireland who declined the opportunity, citing poverty in his region), universities and the business community, to lead fundraising projects within their locality.

One perhaps unexpected source of funding for the TAE was children. Through appeals to schools, drawing on the historic tradition of schools supporting exploration, the Committee implored that "Many schools assisted Scott's Expedition in this way, and any sum raised, however small, would be of great importance to us."[284] But in addition to the historic precedent of schools contributing to polar exploration, the TAE Committee argued that through the contribution of funds, boys and girls could, not contribute to the development of modern science, per se, but could have the "opportunity is open to them to have their share, however small, in this great adventure."[285] In addition to children, this was a way that women could tangibly contribute to the organization and success of the expedition. For example, Mrs. Eleanor Honnywill, the primary 'office girl' at the headquarters of the TAE "bearing in mind the acute need for funds…was doing a roaring trade 'selling' huskies to schools."[286] Four thousand schools in

[284] Letter from C.L.R. Parry to St John's College Southsea Dec 29th 1955 Scott Polar Research Institute Archives MS 1326 Box 26 CTAE Appeal General Correspondence
[285] Appeal which appeared in "The Scouter" after a letter from C.L.R. Parry to Evelyn Mary Campbell, Lady Strathenden and Campbell (Head of the Girl Guides Organization) and Thomas Corbett, Lord Rowallan (Head of the Boy Scouts Organization) December 1, 1955 Scott Polar Research Institute Archives MS 1326 Box 26 CTAE Appeal General Correspondence
[286] Eleanor Fuchs (Honnywill) "Trans-Antarctic Expedition 1955-1958: 'Behind the Scenes'" Unpublished; Written in 1996 Canterbury Museum 2015.113.425

Britain ended up adopting some aspects of the expedition, through bottle drives, bake sales, and forgoing their bus money.

For more substantial and targeted fundraising, what was termed the "City Appeal," it was devised that they needed to send "A personal letter from members of the General Committee and Committee of Management to their more influential friends drawing attention to the business as a whole. Such friends will be requested to pass the financial needs of the Expedition on to their friends and so on."[287] They planned specifically to target the firms or companies of which members of the T.A.E. Committee were associated but also British Banks, Investment Trusts, Insurance Companies, Discount Houses, Brokers, Commonwealth Banks, Lloyds, Shipping Companies, and Industrial Companies. Additionally, they sent "a circular despatch to Colonial Governments drawing their attention to the appeal which your Committee is making and asking them to give it whatever informal assistance they may think possible or desirable. We have considered carefully your request that Colonial Governments themselves might be asked to contribute but I feel that this must be a matter for Colonial Governments themselves to decide in the light of your appeal."[288] David Stratton, a member of the TAE, eventually completed a lecture tour in Jamaica, which resulted in numerous proceeds directed towards the endeavor.[289]

The public drive was launched on November 4, 1955 by Sir Anthony Eden at a luncheon at the Savoy Hotel, when he argued that while he was pleased that the government could give such large gifts, "a pioneer Expedition should be financed partly by public money-with which I am sure you will agree-and partly from private funds. Thus it was in the days of Elizabeth

[287] Appeal Organization Scott Polar Research Institute Archives MS 1326 Box 26 CTAE Appeal General Correspondence
[288] Letter from the TAE Financial committee to Sir Miles Clifford October 19, 1955 Scott Polar Research Institute Archives MS 1326 Box 26 CTAE Appeal General Correspondence
[289] Trans-Antarctic Expedition Minutes of a Meeting of the Committee of Management July 13, 1956 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-3

I…And it seems fair that individual subscriptions should still pay their part to finance this expedition." [290] In the very beginning of the British campaign, the TAE financial committee had every reason to be optimistic. Although originally "The money is coming in somewhat more slowly than we had anticipated and despite the handsome lead by the Governor of the Bank of England, the Chairman of "the Big Five" and Lloyds, response from the City has been particularly disappointing,"[291] these fears were soon put to rest. The Royal Geographical Society, which had not initially supported the Expedition, as, "if it failed it would be so humiliating for Britain, and such a disgrace in front of the Argentines,"[292] fairly quickly lent their support in the form of £1400 **(GB £32,080)**. The Everest Trust pledged £5000 **(GB £114,600)** to the TAE in the light that "much of its work will be carried out in mountainous areas" and that while "mountain climbing will not be one of the objects, but it may be expected that new mountain areas will be mapped en route."[293] Since they would be sharing some equipment and transportation costs, the Royal Society also contributed funds, though they were mostly concerned with paying for their own expedition to Halley Bay as Britain's official Antarctic contribution to the International Geophysical Year.

Over the next year, this was followed by similarly large cash gifts such as those from Shipbuilder's Conference (£5,000) **(GB £114,600)** and Shell Oil (£2500) **(GB £57,290)**, and smaller donations of cash, facilities, and equipment from firms ranging from the Bank of London and South America to Rolls Royce to MacDonald's Wool-Sheepskins, which after supplying

[290] Speech Delivered by Sir Anthony Eden November 4, 1955 Scott Polar Research Institute Archives MS 1536/1; BJ
[291] Letter from Sir Miles Clifford to M.F. Cairncross December 2, 1955 Scott Polar Research Institute Archives MS 1326 Box 26 CTAE Appeal General Correspondence
[292] Eleanor Fuchs (Honnywill) "Trans-Antarctic Expedition 1955-1958: 'Behind the Scenes'" Unpublished; Written in 1996 Canterbury Museum 2015.113.425
[293] Letter from C.L.R. Parry to Mount Everest Foundation October 18, 1955 Scott Polar Research Institute Archives MS 1326 Box 25 CTAE Chairman's Letters of Thanks

coats for the Expedition, rebranded themselves as Antartex.[294] The *London Times* purchased the rights to exclusive photos and interviews in exchange for funding. For specialized scientific instruments, many firms positively responded to the entreaty at the bottom of enquiries that "Since this expedition, like all others, is dependent on the good will of business firms, I must beg your indulgence on the matter of cost,"[295] and freely lent, gave away in exchange for photographs, or heavily reduced the price of their wares. This support from the British business community was alluded to throughout the expedition such as in this TAE Newsletter, circulated to patrons: "The progress of the Expedition is being watched not only by scientists all over the world, but also in a more personal sense by the many Companies and Organizations who, by their support and enthusiasm have fulfilled so well the exacting requests, inevitable in an enterprise of this nature. It is natural, therefore, that the achievements of the Trans-Antarctic Expedition should reflect upon those whose efforts have made the venture possible."[296] At the conclusion of the TAE, Fuchs credits these businesses with the success of the expedition: "it is with the greatest sense of gratitude that I record the magnificent response of firms, large and small, both in the United Kingdom and in New Zealand. The fact that some small advantage might ultimately accrue to our supporters if we were successful was regarded only a small return for a very practical act of faith when the project was in its early planning stages and open to all the doubts and criticisms which surround any new venture."[297]

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[294] Felicia Lee "A girl's whim and a bottle of blue ink gave the MacDonald's a new business" *Sports Illustrated* December 5, 1966

[295] Letter from Dr. Hal Lister to Electrical Musical Instruments September 17, 1956 Scott Polar Research Institute Archives MS 1326 CTAE Glaciology

[296] Trans-Antarctic Expedition Newsletter, December 19, 1957 Scott Polar Research Institute Archives MS 1326 CTAE Working Papers of T. Gaskell.

[297] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition*, 1955-1958, (Boston: Little, Brown, 1959). 4

In terms of the lending of financial, material, and even intellectual support for the TAE, Fuchs' biggest corporate support came from British Petroleum Ltd. (BP). This initial support was not directly solicited by Fuchs. Rather, a member of the Board of Directors of BP, an acquaintance of Fuchs, repeatedly tried to contact the TAE office, in order to hear something "greatly to his advantage."[298] This advantage turned out to be all the fuel required for the Expeditions ships, tractors, and aircraft, both in the UK and in New Zealand in addition to £50,000 **(GB £1,146,000)**. In addition, the company offered to supply some seismic equipment and a geophysicist to accompany the expedition.[299] In return, Fuchs promised that the Expedition would only use BP fuel and would have sole rights to make and distribute the film of the journey.[300]

While it would be easy to argue that large companies, particularly those like BP, who certainly did benefit from the publicity of their gift, of donating merely for show, their motivations appear to be more complicated. At least one senior staffer argued that "I consider that there is little justification in offering greater direct help to this expedition that we have already done in our supply of products and the free loan of a geophysicist."[301] But very high levels of support for the expedition prevailed, in part through the advocacy of BP physicist T.F. Gaskell, who argued for a more altruistic, or at least nationalistic reason to support the expedition. He argued that if BP was unprepared to supply scientific equipment to the TAE, which he believed could be done for less than £25,000, **(GB £572,900)** "It might be worthwhile

[298] Eleanor Fuchs (Honnywill) "Trans-Antarctic Expedition 1955-1958: 'Behind the Scenes'" Unpublished; Written in 1996 Canterbury Museum 2015.113.425
[299] Trans-Antarctic Expedition Minutes of a Meeting of the Committee of Management March 30, 1955 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-3
[300] Eleanor Fuchs (Honnywill) "Trans-Antarctic Expedition 1955-1958: 'Behind the Scenes'" Unpublished; Written in 1996 Canterbury Museum 2015.113.425
[301] BP Memo from J.M. Pattinson to W.H. Dowling February 29, 1956 Scott Polar Research Institute Archives MS 1326 Box 50 Working Papers of T.F. Gaskell

tackling the geophysical prospecting companies who work from England for special grants for geophysical work, but this approach should be made by the Expedition itself. I believe they could collect from S.S.L., Geoprosco, Shell, I.P.C, Kuwait Oil Co., G.S.I. (if they have not done so already). It does not really matter who supports the undertaking so long as this British Expedition gets proper support. This country does not operate, as so others, with government grants, and so those with money must sponsor expeditions."[302] Additionally "As a British subject, I am very keen that the Trans-Antarctic Expedition shall be a great success. The Expedition is at a disadvantage financially compared with those of the U.S.A., U.S.S.R. etc., because it has to be supported by voluntary contributions…"[303] Ultimately Haskell's persistence succeeded and BP supplied all of the seismic equipment. But despite all of their support, in the end, they were embarrassed when, Sir Edmund Hillary was photographed and filmed using Standard Vacuum petrol for his final dash to the Pole.[304]

New Zealand Fundraising and the Domestication of Antarctica

If the fundraising for the TAE in the United Kingdom can be characterized through the targeting of titans of industry doing their share, supplemented by smaller donations from the public, New Zealand took a somewhat different approach. Even shortly after the expedition, it was noted that "There was a great deal of difference between the "Old Boy" basis of the English collection of funds and the New Zealand method."[305] Instead, the Ross Sea Committee divided the country into regions and each large center was assigned a quota which they could reach using

[302] Excerpt of BP Memo between T.F. Gaskell and Mr. ImThurn, BP Distribution Department March 6, 1956 Scott Polar Research Institute Archives MS 1326 Box 50 Working Papers of T.F. Gaskell
[303] Letter from T.F Gaskell to W.H. Dowling March 15, 1956 Scott Polar Research Institute Archives MS 1326 Box 50 Working Papers of T.F. Gaskell
[304] Letter from Arthur Helm to Edmund Hillary January 16, 1958 New Zealand Alexander Turnbull Library, Arthur Helm Papers 72-132-4/04
[305] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 57

whichever method was most suited for their region. After identifying 67 centers, Charles Moore Bowden, the chairman of the Ross Sea Committee and Prime Minister Sidney G. Holland, the Vice-Patron of the New Zealand Expedition,[306] sent letters to the mayors of these towns, requesting that they, with the support of the main Committee in Wellington, organize an appeal within their own district. The nation-wide appeal opened on October 10, 1955, approximately one year before their Expedition was scheduled to begin.[307] With these smaller committees focusing on cash donations to the expedition, the Ross Sea Committee could dedicate itself to soliciting material donations of goods from New Zealand firms. This decentering of fundraising meant that there was incredible diversity in the ways in which funds were raised around New Zealand. Many of these local committees were organized by Rotary Clubs[308]and methods of raising money in the various districts included: raffles, carnivals, bottle drives, house to house collections, local business solicitations, and film viewings.[309]

While this grassroots fundraising seemingly indicates widespread local interest around New Zealand, the Ross Sea Committee in fact had an uphill battle from the start. While the government pledged £50,000 **(GB £573,000)** to the endeavor, an amount which later became over £100,000,[310] **(GB £1,146,000)** "the responsibility of financing, organizing, and directing the New Zealand Party in the Trans-Antarctic Expedition still rests with the Ross Sea

[306] Minutes of the Ross Sea Committee June 3, 1955 New Zealand Alexander Turnbull Library Trans-Antarctic Expedition (London) Records 96-289-3
[307] Trans-Antarctic Expedition of New Zealand Annual Report Appendix IV June 26, 1958 New Zealand Alexander Turnbull Library Trans-Antarctic Expedition (London) Records 96-289-1
[308] Edmund Hillary. Interview with Jacqui Foley. New Zealand Antarctic Society Oral History Project. New Zealand October 4, 2004
[309] Ross Sea Committee, Monthly Letter to Appeal Chairmen and Secretaries No. 5 June 1 1956 University of Canterbury Library Antarctic Collection
[310] Malcolm Templeton, *A Wise Adventure: New Zealand in Antarctica, 1920-1960* (Victoria University Press, 2000). 117

Committee…from the money subscribed by the people of New Zealand."[311] At the first meeting of the Ross Sea Committee, the Prime Minister enthusiastically stated that the Government was solidly behind the project, and that "the public would be fully sympathetic and that an appeal for funds would be successful."[312] But considering the government's own lack of interest in Antarctica until the late 1950s, it should not be surprising that "the attitude of the public has varied from stolid apathy to open hostility."[313]

Edmund Hillary and George Lowe, the two most publically famous men in New Zealand connected to the TAE due to their experience on the 1953 British Mt. Everest Expedition, both cited the public's lack of interest in providing funds for the expedition in their memoirs published soon after the expedition. Lowe argued that "The truth was that a vein of insular boredom with the 'useless' wastes of the Antarctic continent ran through many a New Zealand heart, in which warmth was not really felt for anything that was not directly concerned with those basic national industries, butter, meat and wool."[314] In fact, he recounts an oft cited anecdote which he believed epitomized the New Zealand attitude towards Antarctic exploration. At a fundraising drive, "'Ed Hillary reckons there's a great future for New Zealand down in the Antarctic,' said the mayor. 'How about a contribution to the funds of the expedition?' At which point one of the farming men...said: 'The Antarctic? How many sheep to the acre does it carry?'"[315]

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[311] Ross Sea Committee Monthly Newsletter No. 4 May 1, 1956 University of Canterbury Library Antarctic Collection
[312] Minutes of the Ross Sea Committee June 3, 1955 New Zealand Alexander Turnbull Library Trans-Antarctic Expedition (London) Records 96-289-1
[313] Report from the Department of Treasury, Quoted in Malcolm Templeton, *A Wise Adventure: New Zealand in Antarctica, 1920-1960* (Victoria University Press, 2000). 116
[314] George Lowe, *Because It Is There* (London: Cassell, 1959). 49
[315] George Lowe, *Because It Is There* (London: Cassell, 1959). 49

Hillary was somewhat more optimistic to the public's seeming lack of interest in donating: "The many Appeal Committees were doing their best against a lot of public apathy. It wasn't so much that the public weren't interested in what was going on in the Antarctic-far from it-the interest was considerable and the coverage of Antarctic matters in the Press was extremely generous. Our main problem was that we were batting against a strong national feeling that the Government should be financing the whole affair. In truth let it be said that I thought exactly the same thing, but as the Government thought differently we were forced to go one with the Appeal."[316] Fuchs even asserted disparagingly that "It seems now that many in the N.Z government and among the people (more naturally) care nothing for such work. These people would be glad to see themselves rid of the responsibility."[317] In particular, he hoped that "that if we could establish a base in the Ross Dependency than at last after more than 30 years N.Z. would do something in her Antarctic Territory," [318] a future that he believed was in jeopardy.

However, despite Hillary's admission that "Fundraising proved to be the toughest part of the whole expedition,"[319] in New Zealand, his role as the public face of the expedition was largely responsible for the success of the appeal. Hillary, and to a far lesser extent, Lowe, were not the only national celebrities and sportsmen to advocate for the TAE. For example, Richard 'Tiny' White, the famous Gisborne star of the All-Blacks, New Zealand's national rugby team, "lent his fully weight of support to the Gisborne Antarctic Appeal. Speaking to those who were attending a film evening in aid of funds, he urged everyone to give support to the Expedition… 'The men who go down there to the South Polar region on behalf of New Zealand are entitled to be regarded as Dominion representatives,' he said. 'Let us make them feel that they are as much

[316] Edmund Hillary, *No Latitude for Error*. (New York: Dutton, 1961). 51
[317] Vivian Fuchs, TAE Journal April 29, 1957 Scott Polar Research Institute Archives MS 1425; BJ
[318] Vivian Fuchs, TAE Journal April 29, 1957 Scott Polar Research Institute Archives MS 1425; BJ
[319] Edmund Hillary, *Nothing Venture, Nothing Win,* (London: Hodder & Stoughton Ltd, 1975). 187

All Blacks as any man who played Rugby football."[320] This connection between sport and Antarctic exploration echoed the rhetoric surrounding the British Antarctic Expedition of 1907–1909 (*Nimrod)* expedition whereby some organizers and scientists emphasized the "sporting nature" of science and exploration and compared the physical endurance required to cricket and rugby in order to gain support from a disinterested Australian public.[321] But ultimately it was Hillary's international fame which was used most effectively to solicit both finances and national support for the expedition.

In 1953, the thirty-three year old Edmund Hillary, a professional apiarist and keen mountaineer from Auckland was catapulted into international fame when he, along with Nepalese mountaineer Tenzing Norgay became the first men to reach the summit of Mt. Everest. Hillary's friend George Lowe, who travelled with the British Party of the TAE was also on the Everest expedition but did not reach the final peak. From the start of the Appeal it was clear to the Ross Committee that Hillary's reputation would be essential to their fundraising. Hillary's image and reputation was invoked both by the Ross Sea Committee and in the Appeal centers around the country. For example, the Whakatane Appeal raised money by raffling an encyclopedia set "personally autographed by Sir Edmund Hillary."[322] A very popular, if not particularly lucrative form of fundraising was the purchase of share certificates. The Committee found it "gratifying that a number of grandparents are purchasing Share Certificates for their grandchildren, and this is an aspect that Committees might well consider in their approach for

[320] Ross Sea Committee, Letter to the Chairmen and Secretaries of Appeal Committees No. 9 October 1, 1956 University of Canterbury Library Antarctic Collection
[321] Peder Roberts, "Fighting the 'Microbe of Sporting Mania': Australian Science and Antarctic Exploration in the Early 20th Century," *Endeavour* 28, no. 3 (September 2004): 109–13.
[322] Ross Sea Committee Monthly Newsletter No. 4 May 1, 1956 University of Canterbury Library Antarctic Collection

funds."[323] These share certificates, which came in a variety of colors, certify that their holders had "qualified to share in the joy and pleasure which comes from assisting in the achievement of great deeds but SUBSCRIBING One Pound (£1) **[GB £11]** towards the cost of this GREAT ANTARCTIC ADVENTURE."[324] These certificates had a photograph of Hillary in the center and a stamp of his signature and that of Ross Sea Committee Chairman Charles M. Bowden.

Soon, the publicity demands on Hillary became so extreme that a statement was "issued to the public that the Committee preferred to see Sir Edmund working on the organizing of the Expedition and the public be asked to understand that requests for his appearance could not be met."[325] This statement announced Hillary's scheduled appearances and further announced that Lowe would be picking up to speak in centers where Hillary would be unavailable. Even with this limited schedule Hillary "found the succession of talks in support of the appeal a heavy burden and so was all the traveling involved. On one particular day I gave four public lectures and drove 500 miles in the process."[326] Not long after the Expedition, Arthur Helm, Secretary of the TAE, remarked "that there is no rest for the famous: not those of Antarctic fame, anyway."[327] As for Hillary, he knew more than anyone else the value of publicity for maintaining both public interest and funding for an expedition. He demonstrated this knowledge on this only a few years later, when in 1960, he organized an international expedition to the Himalayas during which he planned to "explore on some of the superb peaks," "tackle the secrets of high altitude

[323] Ross Sea Committee, Monthly Letter to Appeal Chairmen and Secretaries No. 5 June 1 1956 University of Canterbury Library Antarctic Collection
[324] "Share Certificates; Trans-Antarctic Expedition" Antarctic Manuscripts Canterbury Museum 2008.123.1-3
[325] Minutes of the Ross Sea Committee April 23, 1956 New Zealand Alexander Turnbull Library Trans-Antarctic Expedition (London) Records 96-289-1
[326] Edmund Hillary, *Nothing Venture, Nothing Win*, (London: Hodder & Stoughton Ltd, 1975). 187
[327] Ross Sea Committee, Newsletter No. 26 April 1, 1958 University of Canterbury Library Antarctic Collection

acclimatization," and "search of the Abominable Snowman and find out if he was a myth or monster."[328]

The start of Lowe and Hillary's speaking tours marked a huge turn-around in public interest and financial support for the expedition. Not only did these sold out lectures, raise a great deal of money, by June of 1956, it was observed that "in the last two months there has been a marked change in the public attitude toward the appeal and the man in the street is now coming solidly behind the campaign to raise funds to enable New Zealand to play its part."[329] The contribution of every citizen, based on what was possible for their income, an approach which was advocated early by the Opposition Leader Walter Nash,[330] became a point of national pride. As professed by the Auckland Appeal chair, W.H. Knox, "When the New Zealanders return from the Antarctic in 1958 with their mission successfully accomplished, every New Zealander will sing their praises and share the glory. Is it too much to ask New Zealanders to subscribe to the success of the mission? How can we join in the cheering to welcome them home if we know that we failed them at the time they needed our help most?"[331] Newspapers made pleas on a similar note, such as the one found in the *Dannevirk Evening News* in May of 1956: "In the years ahead, those who have given support to the expedition may well refer with pride to the fact that while they were unable to be among the chosen few to venture on to the icecap, they had a real share in the adventure by throwing their weight fully behind it…It would be idle indeed to try and assess the full importance of the forthcoming Antarctic adventure in material terms. There is no way to measure national pride, human endeavour or courage. And it will take all three to ensure the

[328] Edmund Hillary, *Nothing Venture, Nothing Win*, (London: Hodder & Stoughton Ltd, 1975). 235
[329] Ross Sea Committee, Monthly Letter to Appeal Chairmen and Secretaries No. 5 June 1 1956 University of Canterbury Library Antarctic Collection
[330] Ross Sea Committee Monthly Newsletter No. 4 May 1, 1956 University of Canterbury Library Antarctic Collection
[331] Ross Sea Committee, For all Appeal Committee Chairmen and Secretaries Newsletter No. 6, July 1 1956 University of Canterbury Library Antarctic Collection

success of the expedition. New Zealand has pledge itself to support those who are to carry the country's name farthest south."[332] Hillary's reputation also yielded a perhaps more unexpected donation when the National Beekeeper's Association and the New Zealand Honey Marketing Authority donated a quarter ton of honey since "the thoughts of our beekeepers will be especially close to the expedition next year, as the leader, Sir Edmund Hillary, is himself a beeman."[333]

In conjunction to their capitalization on Hillary's fame, another major source of funding and publicity was achieved through their explicit targeting of children. Of course schools were a source of funds in the United Kingdom, and by November 9, 1955 "Some 30 thousand schools were circulated and so far 1,600 have contributed £4,500 **[GB ££103,100]** between them, and a further 1,650 have promised support later."[334] As late as June 1956 it was still being reported that in Scotland, "a fairly generous response to the Appeal had been received from schools."[335] But in New Zealand, fairly early, schools and schoolchildren became a popular source of fundraising, something that was highlighted strongly in the Newsletters that the Ross Sea Committee distributed so that "a large body of public opinion as possible to be well informed regarding the Ross Dependency and what the Trans-Antarctic Expedition will do there,"[336] meaning that even if their donations were not large, the charismatic nature of the nation's children supporting the appeal had great value to the Committee.

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[332] Quoted in A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic* Expedition (Wellington, N.Z.: R.E. Owen, 1964). 51

[333] Ross Sea Committee, To All Chairmen and Secretaries of Appeal Committees Newsletter No. 10. November 1, 1956 University of Canterbury Library Antarctic Collection

[334] Trans-Antarctic Expedition Minutes of a Meeting of the Committee of Management November 9, 1955 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-3

[335] Meeting Minutes of the Trans-Antarctic Expedition Scotland Appeal Committee June 12, 1956 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-2

[336] Ross Sea Committee, Monthly Letter to Appeal Committee Chairmen and Secretaries, March 1, 1956 University of Canterbury Library Antarctic Collection

Even well before the Expedition, it was noted that "In a great many cases the most eager contributors have been the children of schools."[337]Afterward, children were again acknowledged for their generosity: "Children all over the country had been thrilled by the exploits of Hillary in the conquest of Mount Everest. The Antarctic adventure caught their imagination, and they showed their wealth in a great variety of ways. Proportionally to their wealth, the children contributed more than any other section of the community to the funds raised in the appeal."[338] First, school children made up the majority of the audience for Hillary's lectures. For example, in June of 1956, "No less than 3,000 school children-each of whom paid 1/-[shilling] a head, crowded the Dunedin Town Hall…to attend the matinee lecture given by Sir Edmund Hillary and Squadron Leader John Clayton."[339] When Hillary, along with four other members of the expedition lectured in Wellington, they were received by 2,000 Wellington school-children, an experience which was broadcast on the New Zealand television news. Eleven thousand, all paying a shilling turned up in Auckland over the course of five days and ten lectures and "So great was the pressure that we found it necessary after the first day to bring Dr. Hatherton, the leader of the New Zealand I.G.Y party from Wellington to assist him. So popular were these lectures had we had the necessary time our attendance could easily have doubled and we apologise to those teachers and children we could not accommodate."[340] Additionally, several children embarked on precocious and novel projects which were broadcast across the country such as the Kaikoura children who held an art show of their own paintings of Antarctic

[337] L.B. Quartermain "The Trans-Antarctic Expedition New Zealand Prepares" *Antarctic News Bulletin* No. 20 (December, 1955). 1
[338] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 59
[339] Ross Sea Committee, For all Appeal Committee Chairmen and Secretaries Newsletter No. 6, July 1 1956 University of Canterbury Library Antarctic Collection
[340] Ross Sea Committee (Auckland) Report of Chairman W.H.Knox December 12 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-0/09

landscapes,[341] boys from Lower Hutt selling tadpoles, and the sixteen year old niece of Arthur Helm, the TAE secretary, making scrapbooks.[342] BP New Zealand, who like their British parent was providing all fuel and lubricants for the expedition,[343] also created a board game for stimulate further support among children called "Polaroute" with rules similar to Snakes and Ladders, but with the South Pole for the goal while navigated hazards "similar to those which Sir Edmund and his party will meet on their depot-laying trips."[344] This game sold about 150,000 copies.

One of the biggest ways that the Ross Sea Committee received funding from children was through the adoption of husky dogs. Helm authored the idea that various schools could adopt the husky dogs which were to be used for sledging by various committee members. For £50, **(GB £573)** a school could adopt a dog, name it, and received photos of its progress. This was a popular option for many schools and across New Zealand over sixty dogs were adopted in this way. In fact, when Grey Main School in Greymouth wrote in with news that they had raised £50, hoping that the "stock of 'Huskies' is not yet exhausted,"[345] they were told that "At the present time, all the dogs at present in this country have been adopted by different schools" but they could be the seventh on the list to adopt new dogs being shipped in from Greenland "if they do not mind waiting."[346] This question of adoption became somewhat problematic at the end of the

[341] Ross Sea Committee, To all Appeal Committee Chairmen and Secretaries Newsletter No. 8, September 1 1956 University of Canterbury Library Antarctic Collection
[342] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 61
[343] L.B. Quartermain "The Trans-Antarctic Expedition New Zealand Prepares" *Antarctic News Bulletin* No. 20 (December, 1955). 1
[344] Ross Sea Committee Newsletter No. 15 May 1 1957 University of Canterbury Library Antarctic Collection
[345] Letter from N.E. Clemens to the Ross Sea Committee August 7, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-11/02
[346] Letter to N.E. Clemens from the Ross Sea Committee August 9, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-11/02

expedition when, while a few were saved for zoos around the country, the dogs were destroyed.[347]

While most people seemed to admire and stress the large contributions made by children to the expedition, at least one major figure in the New Zealand Antarctic community was extremely critical. In March of 1956, newspapers reported that Frank Simpson, President of Auckland Branch of the New Zealand Antarctic Society and editor of the 1952 book *The Antarctic Today* had slammed the Ross Sea Committee at a Rotary Club Meeting in Paeroa. He called the expedition "shamefully ill-equipped" and accused New Zealand of sending the expedition to tackle the most desolate country in the world in the cheapest possible way. This would mean that the "knowledge that Sir Edmund Hillary and his New Zealand Expedition bring back from the Antarctic will be tainted with unnecessary suffering and unnecessary risk because New Zealand went the cheap way in equipping them" He specifically criticized the low price that the government paid for a used, decades old ice breaker, and that the Committee had sent officials and Sir Edmund Hillary around the country to "gather pennies from schoolchildren."[348] One could perhaps even see some of Simpson's frustrations in the Ross Sea Committee's correspondence with the Auckland Girls Grammar School, the headmistress of which, after being assigned their dog, wrote "It was a real sacrifice to send £50 for "Leo" because we are struggling to raise £15,000 **[GB £171,850]** for school Swimming Baths and almost begrudge any money going out for any other purpose." However, the school assured that "'Leo' himself has removed

[347] Letter From C. Bowden to Edmund Hillary October 7, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-4/04; Letter from A. Helm to C. Bowden May 3, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/10; Report from E. Hillary to the Ross Sea Committee April 17, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/10

[348] Press Statement March 28, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/01

this uncharitable feeling and…as far as the school is concerned has rekindled an interest in Antarctic Exploration."[349]

In a furious response, the Ross Sea Committee dismissed Simpson's charges. A month later, while not wishing to comment of the "reported strictures on the Government, Simpson's critiques of money raised and spent on the expedition could only stem from ignorance. Chairman Bowden stated that "In accommodation and food, the expedition will be as well equipped as any expedition than has ever gone to the Antarctic."[350] As far as sending Hillary around the country to fundraise, Bowden argued that traditionally, such Antarctic exploratory voyages had been largely financed privately. Bowden did admit that as of March 1956 "As Mr Simpson and the public generally are well aware, our appeal for funds has not been answered as rapidly and generously as the Committee would wish. Lack of the total funds needed to equip the expedition as thoroughly as is desired by both the Ross Sea Committee and Mr Simpson, is obviously an embarrassment to the Committee. If the money will come in to enable us to do the job properly, only time can tell, but I suggest to Mr Simpson, Antarctic enthusiast that he is, that he could help the expedition more by vigorous money-raising than by ill-considered statements."[351] It is interesting to note that in the time between Simpson's comments and Bowden's response, the Government agreed to greatly bolster their support of the expedition by over £80,000 **(GB £916,500)** through the purchasing of expensive equipment and greater logistical support.[352]

While businesses did not receive the same emphasis for fundraising as in the UK, it would be incorrect to minimize the donations of New Zealand businesses to the campaign.

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[349] Letter to W.J. Hall from R.J. Gardner July 2, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-11/01
[350] Press Statement April 28, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/01
[351] Press Statement April 28, 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/01
[352] Malcolm Templeton, *A Wise Adventure: New Zealand in Antarctica, 1920-1960* (Victoria University Press, 2000). 117

However, by emphasizing the seemingly personal and grassroots nature of the NZ fundraising, the Ross Sea Committee succeeded in entering Antarctica into the national consciousness, where everyday people felt they had a stake in the success of the expedition. As such, through the careful selection of business donations, they emphasized that it was uniquely New Zealand products that would make their men succeed in the region. This was particularly true in their solicitation for food products. The Poultry Board, Meat Producers' Board, Dairy Board, National Beekeepers' association, J. Wattie's and Company (Canned goods), Levin and Company (brandy), St. James Tobacco Company, Dominion Breweries, Timaru Milling Company among others contributed donations of the same, uniquely New Zealand products, that expedition members would have eaten at home. This use of New Zealand products to bring New Zealand culture to Antarctica was not exemplified more than the Ross Sea Committee's reception of the gift they received from Cadbury's. Cadbury's supplied their chocolates to the VUWAE in the following year, and especially formulated recipes for both dog and man pemmican, a paste of dried and pounded meat mixed with melted fat and other ingredients. The company was also lauded for "donating all our biscuit requirements." This is important because "The requirements of the expedition in biscuits are large, for the New Zealand habit of morning tea, afternoon tea and supper is one that certainly will not be discarded in the Antarctic."[353] Again, we can see the hidden participation of women scientists in the TAE, as Dr. Muriel Bell (1898-1974), a nutritionist and medical researcher at the University of Otago, planned the daily rations for the expedition and her suggestions were used as a guideline for soliciting food donations.[354]

[353] Ross Sea Committee, For all Appeal Committee Chairmen and Secretaries Newsletter No. 6, July 1 1956 University of Canterbury Library Antarctic Collection
[354] Muriel E. Bell "Rations for the New Zealand Trans-Antarctic Expedition" *New Zealand Medical Journal*. 66 no. 314 (1957): 289-304

If BP gave the largest donation in terms of cash and material to the expedition, it was another company who made the most important iconographic gift to the New Zealand Expedition. In June 1956, "It was reported that through the generosity of the Ferguson Company in England and Dominion Motors in Wellington…tractors would be given free on loan to the expedition."[355] In Fuchs' original plan for the expedition he had estimated that only two vehicles would be required for the New Zealand Party, as the main purpose of these vehicles would to carry out general duties around camp. However, according to Hillary "the great increase in the size of the expedition and my ambitions to widen its scope by taking vehicles into the field, made an increase in numbers highly desirable. I spent many hours trying to think of ways and means of acquiring two or three Sno-cats, but could find no answer to their substantial price of over £7,000 **[GB £80,200]**each. Money was very short... So by a process of elimination we were down to the Ferguson tractors. The manufacturers had agreed to lend us several free of charge. We approached the New Zealand agents and they generously agreed to lend us a couple more and this brought our numbers up to five."[356] Though the Americans at McMurdo were initially "rather amused at our 'toy' tractors compared to their huge ones,"[357] or even the weasels, which were initially designed for the snow, the modified Ferguson tractors were incredibly successful and incidentally allowed New Zealand to showcase both their agrarian economy and ingenuity. They were-at first-typical farm tractors-Model TE20.[358] But after radical alterations in New Zealand and Antarctica, they became the first tracked vehicles to reach the South Pole by land.

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[355] Minutes of the Ross Sea Committee June 18, 1956 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-1
[356] Edmund Hillary, *No Latitude for Error*. (New York: Dutton, 1961). 54
[357] Letter from Arthur Helm to J.W. Hall January 16, 1957, New Zealand Alexander Turnbull Library Arthur Helm Paper 73-132-1/11
[358] Pratt D.L., "Fuels and Lubricants for the TransAntarctic Expedition," *Journal of the Institute of Petroleum*. 45, no. 422 (1959): 19-41. 21

Alternatively, in the United Kingdom, fundraising called upon a combination of British nationalism and the necessity of public contributions to scientific research, in New Zealand, advocacy came more from the opportunity for New Zealanders to forge a connection to the Antarctic by essentially buying a share in the adventure. In the end, adventure seemed to be the more popular motivator, as, "Despite the difficulties in raising the money in New Zealand, on a *per capita* basis the sum realised was higher than in the United Kingdom."[359] While they "never looked like achieving our objective of £100,000 **[GB £1,146,000**] yet our final result could not be regarded as unsatisfactory from a population of two million people. Altogether we obtained £34,873 **[GB £399,600]** in cash and £23,702 **[GB £271,600**] by gifts in kind-making a total of £58,575 **[GB £671,000]** from the New Zealand public and business community."[360]

The two countries' focus on fundraising, the science versus the adventure, were also reflected in the results of the expedition. The New Zealand members of the TAE contributed only two papers of the sixteen published from the expedition overall. Additionally, even with the greatly increased government funds and the frequent reliance on American support, support which was becoming "embarrassing,"[361] the British campaign looks more successful. For example, in addition to the greater number of publications, larger contribution to the Expedition's *Scientific Reports,* not to mention their successful crossing of the continent, the first men ever to achieve that task, at the end of the expedition, the TAE Committee of Management had a monetary surplus. They were able to return the £5,000 **(GB £114,600)** gift to the Everest Trust and, with the remaining £30,000 **(GB £687,500)** turned into the Trans-Antarctic

[359] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 57
[360] Edmund Hillary, *No Latitude for Error*. (New York: Dutton, 1961). 50
[361] Trans-Antarctic Expedition Minutes of a Meeting of the Committee of Management January 12, 1956 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-1

Foundation, making funds available to Commonwealth nationals for "research and exploration in Polar regions."[362] New Zealand, perhaps always at a disadvantage when they accepted "the overall direction of the London Committee, in particular the matter of ordering supplies and equipment, the ordering of shipping, the acceptance of gifts, and direction of publicity campaign,"[363] ended the expedition with a deficit. In fact, "For a year Helm had an account from the Ministry of Works for the sum of £39,663 10s. 4d. **[GB £454,450]** lying on his desk before he could pay a penny of it. Not until a year after the base had been formally handed over to the New Zealand Government was it possible to pay the last instalment of this debt."[364]

Yet, the New Zealand campaign was an unabashed success, if only because it inspired the country, particularly among the younger generation, to feel that they had a stake in Antarctica. They accomplished the feat of "Bringing the Antarctic into Every Home."[365] By focusing on children, communities, local businesses, and even immigrant groups (for example the Chinese community of Palmerston North donated over £38 **(GB £436)** through a Chinese film series)[366] the Ross Sea Committee and the government achieved their goal that "the people of New Zealand by personal giving be closely identified with the project."[367] Within a few years New Zealand produced the third highest amount of research on the region, after only the United Kingdom and the United States, who happened to also be their biggest collaborators in polar

[362] Trans-Antarctic Expedition Minutes of a Meeting of the Committee of Management March 25, 1959 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-1
[363] Ross Sea Committee Minutes June 9, 1955 New Zealand Alexander Turnbull Library, Trans-Antarctic Expedition (London) Records 96-289-3
[364] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 56
[365] Ross Sea Committee, For all Appeal Committee Chairmen and Secretaries Newsletter No. 6, July 1 1956 University of Canterbury Library Antarctic Collection
[366] Ross Sea Committee, To all Appeal Committee Chairmen and Secretaries Newsletter No. 10, November 1 1956 University of Canterbury Library Antarctic Collection
[367] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 56

affairs. Additionally, their primary research station, Scott Base, which also housed the Department of Scientific and Industrial Research's IGY scientists from 1956-1958, but still functions today under the purview of the Ministry of Foreign Affairs and Trade was built partially funded through the donations of business and private citizens. And, unlike the base at Halley Bay which was only reluctantly taken over by the Falkland Islands Dependency Survey from the Royal Society in 1959, this was transfer was agreed upon in the early days of the expedition.

When the Ross Sea Committee could not reach its fundraising goals, the government intervened with more funding. In exchange for the purchase of radio equipment, the used ice-breaker, so criticized by Simpson, and help erecting a base on the McMurdo Sound, at the end of the expedition, all purchases by the committee would become the property of the Government.[368] Though throughout the Appeal and the Expedition "There were a great many people who thought-and did not hesitate to say so-that the Government should have shouldered all the financial burden. On the other hand, the many thousands of private contributors created an interest in the expedition which had not been shown, save in wartime, in any national enterprise."[369] Although Hillary "found the task of stumping around the country and trying to persuade the New Zealand public to dip into its pocket a somewhat distasteful business," he felt "redeemed by the generosity of our many supporters and the unselfish members of the various Appeal Committees."[370] This campaign showed the government that New Zealanders felt that Antarctica was worth investing in. And we cannot forget, in terms of New Zealand success,

[368] Minutes of the Ross Sea Committee April 23 1956 New Zealand Alexander Turnbull Library Arthur Helm Paper 73-132-2/01
[369] A. S Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 58
[370] Edmund Hillary, *No Latitude for Error*. (New York: Dutton, 1961). 19

despite all of the numerical wins of the British Party, it was Hillary who was the first to the Pole, in his donated and modified Ferguson tractor, which was memorialized 1999-2015 on the New Zealand five-dollar note.

Conclusion

Antarctic science, still in a liminal space in the late 1950s, did not have a clear method for funding itself. Therefore, it became a site for numerous private expeditions before being taken over by Government expeditions. In the United Kingdom, the TAE was not meant to build a permanent British presence in their territories and in fact, the Base they built in the Weddell Sea, Shackleton Base, has long since fallen into the ocean. The Royal Society, which was funded separately from FIDS, using mostly its own resources, did fund a two year expedition (1956-8) to Halley Bay, but while ostensibly a private venture through their own funds built from years of corporate, private, and legacy giving, they are an enormous recipient of government grants. In fact, the Treasury set aside £550,000 **(GB £12,600,000)** for the British participation in the International Geophysical Year, £250,000 **(GB £5,729,000)** of which was earmarked for an expedition to the Vahsel Bay region.[371] But beyond this grant, Royal Society reached into its own established coffer for to build its base, not requiring the support of individuals or smaller bodies to complete their mission. Indeed, they could not really even count on too much forgiveness for using government resources beyond their initial grant. For example, the Royal Society Advance Party required a member of the Royal Navy, Surgeon Lieutenant Commander David C. Dalgliesh, to serve as their Base Leader. When they reached out to the First Sea Lord, Mountbatten of Burma, to make such a request, he responded favorably, but with the following caveat: "we must ask that his full pay…should be bourne by the Royal Society…We should very

[371] Minutes of the Antarctic Subcommittee of the British National Committee for the International Geophysical Year August 8, 1955 Royal Society Archives ARF1090 Box 10A

much like to have been able to offer his services without charge, particularly as the Navy…has always been wholeheartedly interested in enterprises of this nature, but financial restrictions are so tight these days that we just cannot do it."[372] Finally, the Royal Society quietly relinquished their base to FIDS in 1958, at the end of the highly publicized IGY. Unlike the numerous private New Zealand expeditions or the Commonwealth Trans-Antarctic Expedition, neither the Royal Society Expedition nor official government expeditions needed to find hybrid or private manners of funding.

The fundraising for the British party of the TAE, in contrast, while relying greatly on government funds, which gave the expedition the air of legitimacy necessary to receive large gifts from private sources, also depended on a variety of funding sources ranging from the extremely large and encompassing gifts of British Petroleum, to fundraising lectures conducted in the colonies. This wide ranging assortment of funding sources first complicates the common narrative that Post World War II science was primarily funded through either the government or large industries. Antarctica as a liminal space with no clearly established rules for scientific research, enjoyed a nascent period where a wide variety of peoples could get to the Antarctic-so long as they secured the requisite funding. This represents a continuation of the organization of scientific expeditions in the long nineteenth century, where it was not uncommon for science and exploration to have private patrons. This, as Bowden and Fuchs both observed, was especially the case in Antarctic research. For example, even as late as the South Georgia Survey, a series of four expeditions to South Georgia between 1951-57, funding came from a combination of sourced including FIDS (government), The Royal Geographical Society (private foundation), Odhams Press (private company) as well as numerous other private sources. And while it is

[372] Letter from Mountbatten of Burma to Lord Adrian September 19, 1955 Royal Society Archives ARF1090 Box 10A

conceivable that scientific research could have an undue influence from companies due to their patronage, what seems to happen is that the diversity of sponsors meant that no single patron could direct either the organization or the type of research that scientists chose to conduct. While the widespread fundraising was difficult, it gave the scientists some degree of intellectual freedom. But this period was at its close, as scientific expeditions to the Antarctic from the United Kingdom were entirely managed by the government by the start of the 1960s.

New Zealand, in contrast, used the language of austerity to force public interest in the Antarctic. They used the language of New Zealand nationalism in the late Dominion, a period when much of the Commonwealth was beginning to forge their own identity outside of Britishness,[373] to domesticate Antarctica, very much the same way that colonies had been domesticated by imperial powers before the Second World War. By framing Antarctic exploration, and to a lesser extent, science, as an object of national interest, depending on the support of individuals, it is no wonder that after the conclusion of the TAE, small, private expeditions in the form of the Federated Mountain Clubs, the New Zealand Alpine Club, and the Victoria University of Wellington continued to press for their own inclusion in Antarctic research. While private expeditions to Antarctica had a longer life in New Zealand than in the United Kingdom, a symptom of the Ross Sea Committee's successful public relations campaign around the country, and only possible from the geographical proximity of New Zealand to the Antarctic, with the exception of the continuing Victoria University of Wellington Expeditions, private expeditions vanished from New Zealand.

But looming over Antarctic funding in this period, both from the perspectives of New Zealand and the University Kingdom, stood the specter of the United States. The United

[373] Jatinder Mann, *The Search for a New National Identity: A Comparative Study of the Rise of Multiculturalism in Canada and Australia, 1890s-1970s* (University of Sydney, 2016).

Kingdom was generally terrified and annoyed by the thought of US support for their expeditions particularly in the case of the Trans-Antarctic Expedition. Fuchs in particular worried about Hillary's general acceptance of gifts from the US to help with the TAE and even "told him that on no account must we invoke American aid with supply unless there is a real emergency. This Expedition was conceived as a Commonwealth effort in 1948 before I.G.Y. and American activities had been mooted. We have planned throughout that it is to be purely British and I have no intention that we shall sacrifice the honours now …. Indeed I would rather bypass such a depot and take a chance than let it be said that we could not do it without American aid."[374] This reflects an awareness of the United Kingdom's relative decline in world power, and an attempt by British scientists to assert their authority in their largest remaining territorial claim. In this period, both the British government and the scientific community repeatedly placed their faith in "science and technology as the solution to economic woes, and as a new focus for national self-esteem in a country retreating from empire."[375] Britain displayed "enormous pride in technological breakthroughs, which might be seen to leapfrog the efforts of these nations more ploddingly productive…or irritatingly wealthy, such as the Americans."[376] In fact, Britain was particularly interested in investing in Antarctic science "precisely because it offered solace to those seeking reassuring signs of national heroism and scientific acumen."[377] In the years leading up to the IGY, British worries that the United States and the Soviet Union might make their own territorial claims, in addition to the looming threat of Argentine and Chilean claims, "far from

[374] Vivian Fuchs, TAE Journal April 29, 1957 Scott Polar Research Institute Archives MS 1425; BJ
[375] Robert Bud and Philip Gummett, "Introduction," in *Cold War, Hot Science: Applied Research in Britain's Defence Laboratories, 1945-1990*, ed. Science Museum (Great Britain), Robert Bud, and Philip Gummett (London: NMSI Trading Ltd. : Science Museum, 2002). 3
[376] Robert Bud and Philip Gummett, "Introduction," in *Cold War, Hot Science: Applied Research in Britain's Defence Laboratories, 1945-1990*, ed. Science Museum (Great Britain), Robert Bud, and Philip Gummett (London: NMSI Trading Ltd. : Science Museum, 2002). 3
[377] Klaus J. Dodds, *Pink Ice: Britain and the South Atlantic Empire* (I.B.Tauris, 2002). 75

impeding the progress of exploration, have tended rather to advance it, for there are few expeditions these days which do not rely heavily on government subsidies, and these are seldom granted unless some political advantage, such as the reinforcement of sovereignty, can be seen."[378]

New Zealand was in an entirely different position due to its size, leadership, and geography. The far smaller, poorer nation arguable could not have engaged with Antarctica as much as they did without the logistical support of the United States, who both used Christchurch as their point of departure to Antarctica and whose base at the McMurdo Sound was only a few miles from Scott Base. While Trevor Hatherton, the scientific leader at Scott Base expressed some embarrassment over the dependence of New Zealand on the American logistical and supply generosity, New Zealand built a strong relationship with the U.S. Arguably, the American support for New Zealand Antarctic research and exploration were essential to the rise of such a comparatively poor country's growth in Antarctic strength. Yet despite the dependence of New Zealand on American support, this period shows that New Zealand collectively determined that pledging themselves to support Antarctic research had value both in the present and future.

But in conclusion, despite the differences in funding and logistics achieved by the British and New Zealand Expeditions into the Antarctic, by the early 1960s, non-government funded expeditions were a thing of the past. In the 1959 words of the Secretary of the British Royal Geographical Society Laurence Kirwan "generally speaking, the day of the purely private Antarctic expedition is past."[379] While the VUW still continues with their expeditions, organized by the university, they still depend entirely on the logistical support of the government. Antarctica, by 1965, has become too important to risk the presence of scientific expeditions not

[378] Laurence Kirwan, *The White Road: A Survey of Polar Exploration.* (London: Hollis & Carter, 1959). 353.
[379] Laurence Kirwan, *The White Road: A Survey of Polar Exploration.* (London: Hollis & Carter, 1959). 353

organized and overseen by either the Ross Dependency Research Council or the Falkland Islands Dependency Survey. Additionally, "with distances so great, with the cost of chartering ships so high, with aids to speedier exploration such as aircraft so costly, an Antarctic expedition on modern lines is well beyond the means of any unsubsidized private organization, even with industrial and commercial backing."[380] The presents a remarkable and rapid shift in Antarctic research funding. Only fifty years before, British meteorologist Hugh Robert Mill, in his proposals for a long term, international Antarctic research, had stated that he would "say nothing as to how the funds might be provided, for the is a matter of finance which may be left to the wealthy individuals who abound, to any learned societies not too thickly crusted by tradition,, or even to intelligent statement who see that the glory of a country does not depend of talk, or trade, or fighting power alone. The responsibility of the scientific authorities lies in the economical and efficient expenditure of any funds that may be placed at their disposal."[381] In other words, funding, for even a large enterprise like the one he was proposing, could and would come from a variety of sources. But by the end of the 1950s, like many other projects of big science,[382] Antarctic science became wholly a state run enterprise, simply in another part of the world.

[380] Laurence Kirwan, *The White Road: A Survey of Polar Exploration.* (London: Hollis & Carter, 1959). 353
[381] Hugh Robert Mill, *The Siege of the South Pole* (New York, F.A. Stokes Company, 1905). 439
[382] See: Peter Galison and Bruce William Hevly, *Big Science: The Growth of Large-Scale Research* (Stanford University Press, 1992). Chandra Mukerji, *A Fragile Power: Scientists and the* State (Princeton, N.J.: Princeton University Press, 1989).

CHAPTER THREE: HOW TO SELECT A RESEARCH SITE

Introduction

During the International Geophysical Year, New Zealand operated two research stations in its territory in the Ross Dependency. Because the Commonwealth Trans-Antarctic Expedition required a base on the McMurdo Sound area, one base was built to meet both requirements. Scott Base, named for explorer Robert Falcon Scott, was shared between a five man research team devoted to IGY activities and a larger crew supporting the TAE. Establishing one base to serve both the TAE and the IGY was a practical and economic decision made by the New Zealand National Committee for the IGY in August 1955. Scott Base remains the primary research site for New Zealand Antarctic research and is somewhat facetiously referred to as the capital of the Ross Dependency.

During the International Geophysical Year, the men at Scott Base frequently found themselves frustrated by the constraints placed upon them by their geography. In the Antarctic, geographical limitations are often especial prescient, considering that like Stephen Bocking's arguments for the Arctic, polar "science has been in part a product of place."[383] Given little choice over how to manage their situation, they ultimately, created a hybrid space, where they did the best that they could to continue their work while adapting as necessary to both the geographical and political issues beyond their control. The scientists at this station also dealt with professional insecurities of being scientists engaged in a major research program, but like many other field scientists,[384] sharing their space with non-scientists and whose daily activities

[383] Stephen Bocking, "Situated yet Mobile: Examining the Environmental History of Arctic Ecological Science," in *New Natures: Joining Environmental History with Science and Technology Studies*, ed. Dolly Jørgensen, Finn Arne Jørgensen, and Sara Prichard (Pittsburgh, Pa: University of Pittsburgh Press, 2013).
[384] Henrika Kuklick and Robert E Kohler, *Science in the Field* (Chicago, IL: University of Chicago Press, 1996).

were being managed by both the needs of the US Navy and supervised directly by the needs of the generally non-science oriented Sir Edmund Hillary and the Trans-Antarctic Expedition.

The tensions among political demands, geographical limitations, and scientific requirements is not restricted to the Ross Dependency. On the British side of the continent, Halley Bay had these same issues, both in its initial construction, and when it was threatened with closure at the conclusion of the International Geophysical Year (although not while facing the same professional insecurities as the New Zealand IGY Party at Scott Base). Ironically, the incremental meteorological research conducted at this base retroactively affirmed the Royal Society's initial selection of the site as well as the Falkland Islands Dependency Survey's decision to keep the base open, when Joseph Farman discovered the ozone hole in 1985 based on research done at Halley Bay. In this chapter, I will discuss the conditions for establishing the Scott Base research station, paying particular attention to how a combination of political and geographical issues determined the location of the site, issues which took priority over any scientific demands. Scott Base, located on Ross Island, is an unideal site for research in geology and geophysics. Yet the convenience of its proximity to the United States' base at McMurdo Sound and relatively easy accessibility to the Polar Plateau, made it convenient for the Commonwealth Trans-Antarctic Expedition. Finally, I will briefly compare the establishment of Scott Base with the opening and the threatened closure of the British research station at Halley Bay in the Weddell Sea.

Some might argue that due to the philosophical universalism of science, the place in which it is conducted matters very little. Laboratories, as sites of standardization, control, and exclusion, allow scientists to claim that the knowledge produced there is unaffected by local

circumstances, arguing that all laboratories are equivalent and therefore are located nowhere.[385] Bruno Latour and Steve Woolgar's seminal 1979 text *Laboratory Life*, instead argues that there is nothing universal about scientific knowledge but rather that facts and techniques are created within a laboratory, occasionally to the point that they are unique to a specific laboratory.[386] Other scholars have taken this geographical study of science even further, such as historian Peter Galison, who wrote that "the turn toward local explanation ... may well be the single most important change in the last thirty years." Galison further names the term 'locality' as one of the most important problems in the history and philosophy of science."[387] If studying local science cannot tell us something larger about science as a whole, why bother to do it? One could literally do the exact same project as Latour and Woolgar, even go to the same lab, and based on their theories, the experience would be different. No, because just as the specific circumstances of establishing Scott Base or Halley Bay are unique, their experience tells us something larger about the nature of polar exploration and scientific fieldwork in the period.

In recent years many historians have examined the relationship between space, place and science, exploring how social and political circumstances, institutions, and research sites present scientists with constraints and opportunities, thereby shaping scientific agendas, methods, and knowledge. They have shown that "geographic proximity is vital for the production of scientific knowledge and for the authorization of that knowledge as credible,"[388] thereby legitimizing their research. Robert Kohler has shown in several works how the scientific practice has reworked

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[385] Steven Shapin, "Placing the View from Nowhere: Historical and Sociological Problems in the Location of Science," *Transactions of the Institute of British Geographers* 23 (1998): 5-12

[386]Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts*, 2nd edition (Princeton, N.J: Princeton University Press, 1986).

[387] Peter Galison, "Ten Problems in History and Philosophy of Science," *Isis* 99, no. 1 (2008): 111–24.119

[388] Christopher Henke and Thomas Gieryn, "Sites of Scientific Practice: The Enduring Importance of Place," *The Handbook of Science and Technology Studies*, ed. Edward J. Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman, 3rd ed. (Chicago: MIT Press, 2008), 356

nature, but also how the material environment works as an aggressive force that contributes to the construction of scientific activity. Specifically, by locating the laboratory inside the field, scientists create hybrid environments.[389] Finally, choosing a site for a research station is an important step in the establishment of field research programs. This selection "involves justifying [the] choice of [the] research site, by demonstrating that it presents phenomena of interest to scientists elsewhere and is conducive to producing credible knowledge."[390] Using the two examples of Scott Base in New Zealand and Halley Bay in the United Kingdom, this chapter will demonstrate some of the difficulties that come with selecting a site for a research station particularly when those involved have different or even conflicting priorities. In both cases, the sites presented a number of logistical and political challenges which displayed the underlying tensions between scientists in the field and those making the decisions on behalf of scientists in the field.

Selecting Pram Point for Scott Base

When the New Zealand government decided in 1955 to participate in both the Trans-Antarctic Crossing and the International Geophysical Year, to save on most economic and logistical costs, they opted build a research station to be shared between the five men of the IGY and the larger TAE Party. This decision was not lauded by all. In fact, Charles Fleming, an officer of the New Zealand Antarctic Society wrote privately to the Scott Polar Research Institute in June of 1955, feared that through combining the two teams, "The British Commonwealth commits N.Z. to a base in the best-known part of the Ross Sea, not the area we would necessarily

[389] Robert E. Kohler, *Landscapes and Labscapes: Exploring the Lab-Field Border in Biology* (University of Chicago Press, 2002).
[390] Stephen Bocking, "Situated yet Mobile: Examining the Environmental History of Arctic Ecological Science," in *New Natures: Joining Environmental History with Science and Technology Studies*, ed. Dolly Jørgensen, Finn Arne Jørgensen, and Sara Prichard (Pittsburgh, Pa: University of Pittsburgh Press, 2013).166

choose as a base for the next activity in the Ross Dependency, and limits objectives and activities even at such a base."[391] Before the expedition, the Ross Sea Committee, which organized the majority of New Zealand Antarctic activity, addressed these fears and assured the public that "the I.G.Y group's work will be quite separate from that of the exploring party, consisting mainly of taking scientific observations at or near the base." But they added "the two groups will assist each other wherever possible."[392] And, rather than the Scientific Leader of the IGY Party, Dr. Trevor Hatherton, taking charge, the operation of the station would be under the authority of Sir Edmund Hillary. Concurrently, the United States would be setting up a massive base in the McMurdo Sound, near to the planned site of the Scott Base, but the Ross Sea Committee promised that "there will, however, be no overlapping of functions," although again, "Co-operation between the New Zealand and United States expeditions has been very close, and is expected to be equally close when they are both operating in the Ross Dependency." [393]

The downsides of being at the logistical mercy of both the United States Navy and the TAE, neither of which had the same exact goals of the IGY team, was apparent almost immediately. The first sign came from the selection of a site on which to build the station. Responding to an offer from the United States' Navy, the New Zealand government sent Hatherton, TAE geologist Bernard Gunn, and Lieutenant Commander Wilber J.L. Smith RNZN to the Ross Dependency aboard a US vessel a year before the IGY to locate a site for the base. Hatherton, Gunn, and Smith decided that it would be eventually constructed on Butter Point, which "would be the best site for transport if the Piedmont ice-shelf were easily negotiable."[394]

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[391] Letter from Charles Fleming to Brian Roberts June 13th 1955 Scott Polar Research Institute Archives MS 1281 ER Brian Roberts CTAE Volume 1
[392] Ross Sea Committee "The Trans-Antarctic Expedition and the International Geophysical Year" 1955 University of Canterbury Library Antarctic Collection
[393] Ross Sea Committee "The Trans-Antarctic Expedition and the International Geophysical Year" 1955 University of Canterbury Library Antarctic Collection
[394] Personal Diary of Trevor Hatherton December 25th 1955, Curtesy of Kate Carnaby

Some forty miles from across McMurdo Sound from the American station that was being erected at Hut Point, during reconnaissance Hatherton that at Butter Point "the lower level might be suitable for an aircraft runway and most of the spring and early summer the bay ice could be used as an airstrip. The camp and antenna systems could be on the upper slopes and a tractor should be able to climb the slope easily…Conditions looked favorable."[395] It did have some drawbacks. Shifting ice in the future would make it unsuitable for long-term occupation, but it would serve as a "suitable base for the present."[396] He offered his opinion, that this site, on a hillside at the junction of the Ferrar and Bowers Piedmont glaciers near Butter Point, would be an ideal location for Scott Base since "it seemed feasible as a tractor and weasel route...to the inland plateau."[397] Despite the shortcomings, of the five locales that he surveyed, "BUTTER POINT is certainly the most convenient site."[398]

A year later, when scouting Butter Point and preparing to build the Base, Hillary observed several problems with Hatherton's selection. He found it lacking a suitable access point to the polar plateau as well as a satisfactory surface for aircraft operations, in addition to "large melt pools which were not in evidence during the previous summer."[399] TAE pilot John Clayton called the site "impossible from the expedition's point of view."[400] As Hillary bluntly put it, "The situation was far from satisfactory…It seemed likely that we could build a base here that would be quite satisfactory for static scientific work, but it would be quite inadequate for my plan of widespread surface traveling with aerial support. I decided we would have to look

[395] Personal Diary of Trevor Hatherton January 1st 1956, Curtesy of Kate Carnaby
[396] Quoted in Norman Kemp *The Conquest of the Antarctic* (Philosophical Library Inc., New York. 1957). 80
[397] Walter Sullivan, *Quest for a Continent* (New York: McGraw-Hill, 1957). 347
[398] Trevor Hatherton "Preliminary Report on the Base Site Reconnaissance Journey, McMurdo South" New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-5/02
[399] Personal Diary of Roy Carlyon January 7th, 1957 University of Canterbury Library Antarctic Collection
[400] Quoted in David Harrowfield, *Scott Base Antarctica: A History of New Zealand's Southern-Most Station 1957-1997* (New Zealand Antarctic Society, 1997). University of Canterbury Library Antarctic Collection

elsewhere for a base site."[401] N.H. "Neil" Stanford, the ionospheric observer, noted that "The site at Butter Point seems quite good," but he acknowledged that "access is very difficult… None of us here are happy about the prospect of a shift in the site… but of course nothing is certain in the Antarctic. No doubt it will all work out but whatever is decided will have to be decided quickly - this fine weather can't last. Strange as it seems this fine weather is probably causing a lot of the trouble. If the temp was lower the route may have been a lot better to Butter Point."[402]

In response, after his reconnaissance, Hillary "went to sleep with the conviction that we would have to abandon our preconceived ideas and look elsewhere for a base site."[403] He had struck up a friendship with Admiral George J. Dufek, the commander of US Naval Operations at McMurdo Sound. After being approached by Hillary, Dufek, "with his usual friendliness he expressed his hope that we would become neighbors on Ross Island and even suggested that there were plenty of sites at Hut Point if we'd like to erect our base there."[404] Dufek even "generously offered us the use of a helicopter for further reconnaissance purposes."[405] While scouting around the Hut Point peninsula on Ross Island, Hillary landed on a small rocky outcrop known as Pram Point and "The more we walked around Pram Point the more my interest and enthusiasm grew…the views were magnificent…it had all of the advantages of close proximity to the American base and yet was still fresh and untouched…so without much ado I decided that this was the site for Scott Base."[406] After just two hours of scouting Pram Point, Hillary returned

[401] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 75-6
[402] Personal Diary of Neil Stanford, January 9th, 1957, courtesy of the New Zealand Antarctic Society
[403] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 85
[404] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 77
[405] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 86
[406] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 77

to the *Endeavour,* "decided and enthusiastic about the site."[407] Once Hillary decided that they were to be neighbors on Ross Island (the two bases are approximately two miles from each other), Dufek "co-operative as ever, sent a 35-ton bulldozer and a team of "seabees"…to level the site."[408] Scott Base was constructed at this location shortly thereafter.

The Scientific Consequences of Selecting Pram Point

That site at Pram Point was an extremely baffling choice to many scientists, even those who agreed that Butter Point's inaccessibility made it an unrealistic option. The Ross Sea Committee tried to put a bright face on this change of site. Arthur Helm, the Secretary of the Ross Sea Committee, reported that "Care was taken to confirm with all available members of the expedition, particularly with the I.G.Y. members, that the site would meet their needs" though he conceded that "From the first visit it was obvious that Pram Point would comply with all of the…scientific requirements, excepting seismology and to some extent magnetic surveys."[409] After the conclusion of the IGY, Helm wrote that since Hatherton had not accompanied Hillary in his reconnaissance of Pram Point "his expert appraisal from the IGY angle was not available, but while earth's magnetism and seismology might be somewhat affected by the volcanic origins of the rock of the peninsula, all other sciences would be unaffected."[410] It might be fruitful to note that there were only five men in the IGY party, including a magnetician and seismologist. Hillary made this decision knowing that it would seriously cripple the work of at least 2/5 of the IGY scientists. And in contrast to Helm's hope that the change would not affect the work of the

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[407] *H.M.N.Z.S Endeavour Report of Proceedings to the N.Z.N.B. on the Antarctic & Naval Operations in Support of the British-New Zealand Trans-Antarctic & I.G.Y Expedition December 1956-March 1957* January 8th, 1957 University of Canterbury Library Antarctic Collection

[408] L.B. Quartermain *New Zealand and the Antarctic* (Wellington: Government Printer, 1971). 97

[409] Letter from Arthur Helm to J.H. Hall January 16, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers Messages from the Ross Dependency 73-132-1/11

[410] A. S. Helm and J. H Miller, *Antarctica: The Story of the New Zealand Party of the Trans-Antarctic Expedition* (Wellington, N.Z.: R.E. Owen, 1964). 152

TAE, almost immediately Hatherton telegraphed to the Department of Scientific and Industrial Research in Wellington that "Change in site affects disciplines in varying manner[s]."[411]

Hatherton's telegram was an understatement, and Pram Point's selection highlights the tensions which gripped Scott Base. The site was practical for the TAE since it offered relatively easy access to the polar plateau and nearby sheltered sea ice that could conceivable be used as a runway year round. Clayton said the choice of site "was rather a blow to the scientists as the rock slopes surrounding the base were volcanic with a rather unstable magnetic field; however from the Expedition point of view,"[412] it was completely adequate. According to physicist Vern Gerard, "the proposed site did not suit us scientists" and "From my point of view it was terrible because Ross Island is a magnetic volcanic island, produced by the eruption of Mt. Erebus and a couple of other volcanos so it wasn't very good from my point of view."[413] Importantly, nearly all of Pram Point is a series of "beach terraces of loose basalt lava,"[414] with Mt. Erebus acting as a giant magnet. When Gerard "tested a sample with a pocket prismatic compass and got a deflection of several degrees, I promptly declared that the site could not be worse for geomagnetism…the Scott Base magnetic observatory must easily be the most poorly sited magnetic observatory in the world."[415] It was "one hell of a place for a geo-magnetic observatory being on the lower slopes of Mt. Erebus, an active volcano and thus the source of strong

[411] Telegram from Trevor Hatherton to DSIR February 7 1957 New Zealand National Archives CAHU CH 370 Box 21
[412] David L. Harrowfield. *Call of the Ice: Fifty Years of New Zealand in Antarctica*. (Auckland, N.Z: David Bateman, 2007). 27
[413] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997
[414] Letter from Arthur Helm to J.H. Hall January 16, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers Messages from the Ross Dependency 73-132-1/11
[415] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 32

magnetic anomalies."[416] While it affected Gerard's observations, "We just had to put up with it. Didn't have any option really and it did make a bit of difference at that."[417] Hatherton also took a similar attitude about "the deficiencies of the site," but concluded that "we cannot do anything about [it]."[418]

Figure 6. Vern Gerard taking magnetic observations at Scott Base[419]

The seismologist, R.H. "Herb" Orr, was also unhappy with the location, preferring to be both further away from the active Mt. Erebus and on the Antarctic continent itself rather than on an island and his final report recoded that "for three months of the year teleseism detection was

[416] Quoted in Stephen Haddelsey. *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica*. (Stroud: History Press, 2011). 105
[417] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997
[418] Letter from Trevor Hatherton to E.I. Robertson February 15 1957 1957 New Zealand National Archives CAHU CH 370 Box 21
[419] Photo by John Clayton, Antarctica New Zealand Pictorial Collection

seriously hindered by microseisms…"[420] The IGY scientists gave Hillary their misgivings regarding the site, but "we had to agree with him that the site was quite good from a non-scientific point of view…"[421] Bernard Gunn, one of the TAE geologists, although not part of the IGY team, also had a strong response to this location: "To say some of us were appalled is an understatement. Ross Island is fifty miles from the mainland, and cut off from it for half the year….Our IGY scientists were also taken aback, what meaning would seismic data have for example, if the instruments were located on a volcano? Our geological program was immediately cut in half, no work could be done during the whole six winter months… As a scientific base it was hopeless… here was no discussion on this point, Pram Point it was to be!"[422] Guyon Warren, the other TAE geologist concurred that "Living on Ross Island will be a terrible blow to geological work,"[423] since "it all boils down to the fact that geologizing on the mainland from a Ross Island Base is virtually impossible without transport, which we haven't got." He also lamented the blow to his early career as "ideas of getting ourselves established in the geological world with a worthwhile attack on some of the problems down here are fact vanishing…the winter will be completely wasted, and all our thin sectioning gear and microscopes and all the rest of it."[424] In the end, Hillary and the majority of the TAE personnel "did not attach much importance to the wishes of the IGY in the matter of base selection. This was in spite of the fact

[420] Trevor Hatherton. *New Zealand IGY Antarctic Expeditions, Scott Base and Hallett Station.* Department of Scientific and Industrial Research 140. (Wellington: R.E. Owen, Govt. Printer, 1961). 111
[421] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 32
[422] Bernard Gunn. "Land of the Long Day." Chapter 8
[423] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 50
[424] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 57

that the base was going to be occupied for scientific purposes for years after the trans-Antarctic crossing was a thing of the past."[425]

Hillary's tendency to put the needs of the Trans-Antarctic Expedition above the Hatherton's desires was a running theme in the early days of Scott Base. All of the men consistently worked extremely hard to get the base rapidly constructed while the weather was still relatively good but the scientists had the added task of installing and constructing their equipment before the official start of the IGY on July 1 1957. Vernon Gerard even compared his task of setting up a magnetic observatory to the experience of a Christchurch acquaintance and "it was a great hustle to do in three months what someone else had done in two years, back in New Zealand."[426] Hatherton telegraphed the Department of Scientific and Industrial Research just before the start of the IGY noting that "Will and capacity to work certainly most important factor in selection of person[n]el for here and any idiosyncrasies forgiven except shirking. Workload on Stanford self and to certain extent Orr prohibitive any leisure."[427] Given the additional workload on the scientists, which "necessitated an extremely long working day,"[428]… "At an early state Hatherton approached Hillary to see whether, because of the significance of their work, the IGY staff could be exempt from domestic chores. However, Hillary would not hear of this and duties were shared by all."[429] At the conclusion of the IGY, Hatherton wryly reported that although "The base was operated in the principle that domestic chores should be

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[425] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 32

[426] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997

[427] Trevor Hatherton. Telegram to the New Zealand Department of Scientific and Industrial Research June 29 1957 New Zealand National Archives CAYP CH3805 2802 Box 22 International Geophysical Year: Scientific Programme and Equipment

[428] Trevor Hatherton. *New Zealand IGY Antarctic Expeditions, Scott Base and Hallett Station.* Department of Scientific and Industrial Research 140. (Wellington: R.E. Owen, Govt. Printer, 1961). 18

[429] David L. Harrowfield. *Call of the Ice: Fifty Years of New Zealand in Antarctica*. (Auckland, N.Z: David Bateman, 2007). 30

shared by all, scientific staff included...The refreshing change of occupation, the increased familiarity with the problems of base operation, and above all the avoidance of an occupational split between support and scientific workers are to be commended and fully compensate for the lessening time spent on scientific work."[430]

Although nearly any expedition is likely to include gripes of some personages failing to carry their weight in the field, Hatherton was very often at odds with Hillary. Hatherton, whose responsibilities were almost entirely centered at Scott Base and "responsible for co-ordinating and organizing" the entire IGY program,"[431] complained in his personal diary of Hillary encouraging and even demanding distractions from the scientific work and even construction and other chores. For example, in March 1957, "Ed, Peter Mulgrew, and Murray Ellis set off at 1000 on their tractor jaunt to Cape Mackay. Ostensibly the trip is to test snow surfaces and the radio-equipment though the latter will serve no purpose at all as it will almost be line of sight over short distances. The real reason for the trip appears to be Peter Mulgrew's desire to climb [Mt.] Terror. For this purpose, Jim [Bates] and Murray Ellis have worked hard over the past fortnight overhauling the tractors and building cabs on them while other, more urgent jobs (e.g. generator maintaining, the very urgent job of bringing fuel from Hut Point) are neglected."[432]

This was not the last time that impromptu field journeys upset Hatherton. In September, he complained that a spring tractor journey "is no part of the planned activities...it is a liability rather than an asset…and the removal of our two engineers, most of the tools welder etc., the best of the transport [and] ½ of the radio operators jeopardises that success of the planned

[430] Trevor Hatherton. *New Zealand IGY Antarctic Expeditions, Scott Base and Hallett Station.*. (Wellington: R.E. Owen, Govt. Printer, 1961). 19
[431] Letter from G.W. Markham to the Ross Sea Committee April 29 1956, New Zealand National Archives CAHU CH 370 Box 21
[432] Personal Diary of Trevor Hatherton March 19, 1957, Curtesy of Kate Carnaby

activity-at the very least it puts IGY to inconvenience in having to remedy most of these deficiencies."[433] In late March 1957, he even wondered "what sort of line to take with Ed if he asks for IGY assistance" hauling fuel drums, noting that members of the IGY team were often distracted from their research responsibilities by camp duties which could have easily been done by members of the TAE, especially members who embarked on a "useless trip to Cape Crozier when they could have been engaged in fuel activities."[434] It should be noted that some TAE members were aware that their presence was hindering the work of the TAE and tried to make conciliatory adjustments. Roy Carlyon, for example, had been doing much of his survey plotting in the scientific hut, but in May "I shifted from the scientific hut to the hospital as there definitely was not enough room in the scientific hut and I only hindered their work."[435]

Hatherton continued his complaints regarding several members of the TAE Party who "casually shed responsibility and go off sledging come back and sit around and read."[436] Gerard also noted that for much of 1957, for the non-IGY Party members, "It was pretty slack time I think…they didn't have any great pressures on them really, except to get ready for this summer activity which was some little way in the future then. So they were just eating three meals a day and then deciding what they were going to do next that day. There was no pressure."[437] Hatherton wrote that "certainly things would have been different if I had been in charge of [the TAE's] scientific work"[438] and he justified allowing three of his own men to join short field expeditions because "In an expedition such as this where the scientists is considered very much a second class citizen, particularly if by the very nature of his work he is confined to base, it does

[433] Personal Diary of Trevor Hatherton September 11, 1957, Curtesy of Kate Carnaby
[434] Personal Diary of Trevor Hatherton March 26, 1957, Curtesy of Kate Carnaby
[435] Personal Diary of Roy Carlyon May 9th, 1957 University of Canterbury Library Antarctic Collection
[436] Personal Diary of Trevor Hatherton April 27, 1957, Curtesy of Kate Carnaby
[437] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997
[438] Personal Diary of Trevor Hatherton May 19, 1957, Curtesy of Kate Carnaby

no harm to show that apart from performing his own task the scientific member is also capable of existing in the field too."[439]

It is possible that some of this animosity came from clashes in authority between Hatherton, the Scientific Leader and leader of the small IGY Party, and Hillary, as the overall leader. But it can also be seen as a culture clash between two men that had fundamentally different ideas regarding the purpose of Antarctica. On one hand, there was Hatherton, the University of London trained geophysicist who, following the IGY, served as the chairman of the Ross Dependency Research Committee and the geophysics director of the Department of Scientific and Industrial Research's Geophysics Division, and the apiarist Hillary, who never disguised his relative disinterest in scientific research, preferring adventure and exploration. The two even had profoundly different perspectives on what Antarctic exploration should look like. Hatherton bemoaned New Zealand's "lack of an effective "field" contribution" and "lack of investigations indigenous to the Antarctic" focusing on topography, gravity, and seismicity. But when Hillary complained "what a pity the Americans don't devote say 5% of their effort to "explorations," Hatherton wondered "What is this "exploration that people talk about? Is it anything concrete?"[440] After his experience working with Hillary, Hatherton even vented: "Much talk if sending Alpine Club people down for summers? Sterile Groups and if I had any say it would be over my dead body."[441] Hatherton's frustrations with his uncertain status certainly contributed to the facetiously titled lecture that he gave to the men at Scott Base on July 9th as

[439] Trevor Hatherton "Report for Quarter Ending 30th September-Scott Base and Cape Adare" October 1 1957 New Zealand National Archives CAYP CH805 2802 Box 22
[440] Personal Diary of Trevor Hatherton April 29, 1957, Curtesy of Kate Carnaby
[441] Personal Diary of Trevor Hatherton April 29, 1957, Curtesy of Kate Carnaby

part of a weekly lecture series: "'Is the I.G.Y. party at Scott Base really necessary?' by Dr. Hatherton. (This is a rhetorical question. Any resemblance to fact will be purely coincidental."[442]

Hillary too was disappointed that his efforts to expand New Zealand's reach in the Ross Dependencies were not met with enthusiasm. He proposed an expanded gravity survey and mapping program beyond the Ross Sea Committee's proscription and received "a long cable putting a damper on my summer plans" from the chairman, Charles Bowden, responding that "the programme was too ambitious and might stultify or periodically affect the primary and paramount objective of the New Zealand Party." Additionally the resources that Hillary would require depriving the IGY scientists "whose work would suffer…and in fact the Government would not agree to the work being jeopardised in this way."[443] But given the somewhat independent status afforded Hillary due to his celebrity and his particularly brazen personality, he "resolved to go ahead with my full plans for widespread exploration." But while preparing for this journey by bringing the expedition's tractors to the Polar Depot, Hillary recognized Hatherton's differing polar priorities and specifically noted that "Hatherton decided that the responsibilities of his scientific task were too great to allow him to travel with us."[444] This was however a sanitized recollection of this endeavor. In fact, when Hatherton announced that he was unable to accompany Hillary, supported by a telegram from E.I. Robertson, the Chairman of the IGY Committee, Hillary reacted with rage: "To hell with all of them," he wrote in his diary, "I'll get this tractor trip going yet despite them all."[445]

[442] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 107
[443] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 103
[444] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 112-13
[445] Quoted in Stephen Haddelsey. *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica*. (Stroud: History Press, 2011). 173

Gerard and Gunn also noted their frustrations with Hillary's lack of priorities for scientific research. Besides Gerard's which I have recounted above, Gunn joked that Hillary cared little for his "poor, slighted, science degree," preferring Gunn's experiences climbing the Franz Josef Glacier. When Gunn expressed enthusiasm to Hillary for exploring the McMurdo Dry Valleys, ""Really?" said he, indifferently, "So what's so special about Dry Valleys?"" After giving some explanation, Gunn noted Hillary's "obvious indifference" and remarked that "Sir Ed obviously was bored with the whole conversation."[446] Gunn, who had accompanied Hatherton on the original reconnaissance of Butter Point in 1956 (he disagreed with Hatherton's selection of a base site and felt that it would be better located at the Northern Foothills to the west),[447] submitted reports on his observations, only for "Sir Ed… to declare emphatically that neither he nor any other member of the RSC had read them!... I have never again put in four months hard work to find the results quite so completely wasted."[448]

Beyond simply a cultural clash between science and adventurism, a clash that would be eventually magnified during the Trans-Antarctic Crossing when Hillary was at odds with the science-minded Vivian Fuchs, Hillary's domination at Scott Base was also criticized by those outside of the scientific community. Henry Kirkwood, the commanding officer of the HMNZS *Endeavour,* was sympathetic towards the IGY Party and wrote privately that "Ed Hillary is a good mountaineer but when you have said that you have said all. He is not interested in science …The few IGY scientists that are at the base are good chaps but they are not getting a fair crack of the whip at things and are too subordinated to the Trans-Continental journey."[449] He also

[446] Bernard Gunn. "Land of the Long Day." Chapter 7
[447] BM Gunn "Preliminary Account of the Suggested New Zealand Base Site, Northern Foothills, New Harbour" March 1 1956 New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-13/08
[448] Bernard Gunn. "Land of the Long Day." Chapter 4
[449] Letter from Henry Kirkwood to Brian Roberts October 15 1957 Scott Polar Research Institute Archives 1308/22/9/ER Antarctic Falkland Islands Dependencies Survey Correspondence and Committee Papers

commented a bit more subtly on this problem in his official report to the New Zealand Naval Board, writing "The scientific work was slowed up in the first few weeks…It was a bit frustrating for the scientists…despite this, a considerable amount of scientific work was achieved and although the glamour of the Trans-Antarctic journey may at times, blind people to the fact that New Zealand is making a big contribution to the International Geophysical Year, it is in the field of science that the expedition will also live."[450]

Figure 7. The Scott Base TAE and IGY Parties in the Winter of 1957. Front left to right: Vern Gerard, Bernie Gunn, Ron Balham, Bob Miller, Ed Hillary, Trevor Hatherton, George Marsh, John Claydon. Middle row: Jim Bates, Herbie Orr, Neil Sandford, Harry Ayres, Selwyn Bucknell, Guy Warren, Peter Mulgrew, Murray Ellis.

[450] *H.M.N.Z.S Endeavour Report of Proceedings to the N.Z.N.B. on the Antarctic & Naval Operations in Support of the British-New Zealand Trans-Antarctic & I.G.Y Expedition December 1956-March 1957* University of Canterbury Antarctic Collection

Back row: Wally Tarr, Ted Gawn, Peter Macdonald, Roy Carlyon, Murray Douglas, Richard Brooke, Bill Cranfield[451]

The Political Ramifications of Selecting Scott Base

Hillary's decision to move the base site to Ross Island and Pram Point from Hatherton's choice at Butter Point demonstrates strongly Hatherton's lack of operational authority. Hatherton had already expressed strong reservations about Ross Island, mostly unconnected to science actually, but to nationalism. Of his explorations a year prior, he wrote that "The Ross Island sites have been treated as the 'last resort' by the observers in their search for a base…Of the three possible sites on Ross Island the Americans…have decided to occupy Hut Point, probably the of desirable of the sites, and space, scientific and nationalistic consideration preclude the sharing of Hut Point as a Base Site."[452] Many were in fact disappointed by Scott's nearness to the US Base, as "to live in amongst a tribe of Yanks would be close to unbearable."[453] While Hillary found the resources of the very near American Base to be useful, it meant that contrary to the Ross Committee's assertions that the New Zealand and American programs would be kept separate, those stationed at Scott "feared that we might become merely a kind of suburb of the big city around the corner."[454] British surveyor Lieutenant Richard Brooke summarized the feeling of many when he observed "I wasn't enchanted with…the close proximity of the American base, which is so big and, in my view, so out of keeping with the …magic of polar regions."[455] It was even pointed out that "From a lot of people's point of view the main disadvantage of Pram Point

[451] Depicts the 1957 Wintering Party, Photograph by John Clayton, Antarctica New Zealand Pictorial Collection
[452] Trevor Hatherton "Preliminary Report on the Base Site Reconnaissance Journey, McMurdo South" New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-5/02
[453] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 48
[454] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 32
[455] Quoted in Stephen Haddelsey. *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica*. (Stroud: History Press, 2011). 104

is that we were close to the Americans. We didn't want to be close to them really. It was our expedition. We had a feeling we'd get submerged…It was never quite an ideal situation, but after all, it was the Antarctic, and you had to put up with a lot."[456]

Hillary's friendship and good relationship with Dufek also guaranteed a steady supply of American assistance that only started with the construction of Scott Base both in terms of recreation and logistical aid. Prime Minister Walter Nash even wrote: "In no field of Antarcic endeavour has there been closer and friendlier co-operation than that which has existed between New Zealand and the United States."[457] Beginning with New Zealand's arrival on Hut Point "The Americans have been extremely generous in assistance of various kinds since our arrival here. Nothing seems to be too much trouble, and they are taking a great interest in our activities."[458] This assistance made life more comfortable for many of the New Zealanders. In fact, despite the Ross Sea Party's concerns about being overwhelmed by the sheer weight of the American presence, at no point during the planning and execution of the expedition had these reservations manifested themselves as a reluctance to take full advantage of the American's resources."[459] If they wanted a change in diet, there was always enough food for them to sample what the US Navy was serving: "A short half score extra are not such an overburden to the kitchen staff…who normally provide generously for their full complement of eighty-five."[460] Men at both bases often made "sorties" in one direction or another to play chess or bridge with

[456] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997
[457] "Foreword by the Prime Minister Mr Nash" *Ice-Bound: The Story of the United States and New Zealand in the Antarctic* Auckland: Progress Advertising 1960. University of Canterbury Antarctic Collection
[458] Letter from Arthur Helm to J.H. Hall January 16, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers Messages from the Ross Dependency 73-132-1/11
[459] Stephen Haddelsey. *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica*. (Stroud: History Press, 2011). 104
[460] Letter from Arthur Helm to J.H. Hall January 16, 1957 New Zealand Alexander Turnbull Library Arthur Helm Papers Messages from the Ross Dependency 73-132-1/11

Kiwis venturing to Hut Point on Tuesdays, and Americans making the opposite journey on Fridays. Gerard recalled, "Frequently we would walk over to Hut Point to see a movie or just a change of food and faces. The Americans were very good to us and gave us anything we were short of."[461]

More essentially than recreation and commissary treats, the small team at Scott Base used American lubricant, fuel, tools, and vehicles either out of convenience or because they were lacking: "We received all sorts of gifts from them ranging from Weasels and drums of fuel, to water biscuits and frozen strawberries. In return they received two tins of bath cleaner and some welding rod."[462] Carlyon noted in his diary in the Winter of 1957 that "Our relationship with the Americans is very congenial and their equipment which has been placed at our disposal, has been of great assistance to us…The great attraction is their recreational facilities which include films (twice a day), billiards, table tennis, record library, etc. They also have a chapel which numbers of us have attended."[463] While it was officially proclaimed that the proximity of the two bases is "proving a boon to the occupants of both villages" and "That the advantages are both material and social is apparent and as much appreciated by the Americans at Hut Point as by the Kiwis at Pram Point," it was apparent to all that New Zealand was almost universally the target of "traditional American open handed hospitality."[464] And, as was feared, they were soon

[461] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 83
[462] Vernon Gerard. *With Hillary at Scott Base: A Kiwi Among the Penguins* (Wellington: Bateson Publishing 2012). 83
[463] Personal Diary of Roy Carlyon May 3rd, 1957 University of Canterbury Library Antarctic Collection
[464] J.H. Miller Press Statement June 10, 1957 Messages from the Ross Dependency New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-1/09

dependent on the goodwill and public relations with the United States for "New Zealand's Status and activities in [the] Ross Dependency."[465]

Much of this assistance was a relief to the stretched coffers of the New Zealand Government. In fact, during the early planning of the IGY, "For a time it had looked as if the high cost of meteorological and other scientific equipment needed to man effectively the IGY station site in Antarctica…would be more than that New Zealand government would be willing to undertake."[466] But not everyone was thrilled with the level of American assistance. Hatherton specifically mentioned an "embarrassing moment" when the US Navy "brought over a sledge-load of food and clothing which had been apparently bludged by us. There is an incredible lack of independence and dignity in this NZ desire to strip the Yanks of everything they have. What on earth the Yanks think of us I don't know. There is nothing 'wrong' with the food we have or dangerous in our clothing that makes it essential that we accept their gifts."[467] The American eagerness to accommodate transportation requests from New Zealand also provided distractions at Scott Base, and, for example, "We get rather fed up …[with] the influx of summer visitors…who have bludged rides down from the Americans. They visit the base and disrupt the work…and yet they have nothing to offer the expedition in the light of experience, advice or assistance."[468] While Hatherton had some experience dealing with "useless summer personnel…the one the Americans have brought in have been much more of a nuisance."[469]

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[465] Telegram from Minister of External Affairs to High Commissioner of New Zealand March 8 1957 Trans-Antartcic expedition Telegrams to London Committee Dependency New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-8/01

[466] John Hanessian Jr. "New Zealand and the Antarctic: Polar Interest and Activities" *American Universities Field Staff Service Reports* 1962 13. University of Canterbury Antarctic Collection

[467] Personal Diary of Trevor Hatherton April 27 1957, Curtesy of Kate Carnaby

[468] Letter from Trevor Hatherton to E.I. Robertson February 15 1957 New Zealand National Archives CAHU CH 370 Box 21

[469] Letter from Trevor Hatherton to E.I. Robertson February 15 1957 New Zealand National Archives CAHU CH 370 Box 21

Others, like Guyon Warren, felt that the occasional assistance did not merit the "indescribable rot" broadcast by the press that the New Zealand Party was completely dependent on the Americans as they "are certainly helpful but it somehow galls to hear all the nonsense about carting our gear in for us."[470]

The United States also collaborated with New Zealand to build a base at Cape Hallett in North Victoria Land, but again, this was an unequal partnership. The station was designed and built by the US Navy, which also provided all of the support staff. The US National Academy of Science provided all scientific equipment and one meteorologist. New Zealand provided a scientific staff of three men for the geomagnetic, auroral, ionospheric, and seismological program. The United States, for its part, did not offer this assistance solely based on kindness to the much smaller and poorer country. Although the 1951 ANZUS Treaty agreed for cooperation in military matters between the US, New Zealand, and Australia, New Zealand agreed to a much broader arrangement regarding Antarctic exploration. In exchange for providing "all possible logistic support to New Zealand Antarctic operations," the United States was given "wide authority to continue the establishment of operation headquarters and a military radio station in New Zealand and to the free transit of United States personnel, ships, and aircraft through New Zealand without recourse to passport, visa, and other immigration laws and regulations." The New Zealand government also "waived concurrent jurisdiction in all but major criminal matters over American Antarctic personnel while in New Zealand."[471] Not only was Scott Base overshadowed and very soon dependent on their wealthier neighbours, they received such aid at a cost to New Zealand sovereignty.

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[470] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 62

[471] John Hanessian Jr. "New Zealand and the Antarctic: Polar Interest and Activities" *American Universities Field Staff Service Reports* 1962. 13 University of Canterbury Antarctic Collection

Currently, Antarctica New Zealand's website boasts "Scott Base: Delivering world-class science and environmental stewardship since 1957."[472] New Zealand's only Antarctic Base (Cape Hallett was closed in 1974), made permanent in 1962, Scott Base remains the key site of New Zealand science production in the Ross Dependency. The Americans on the McMurdo Sound remains "genial and accommodating neighbours in the least hospitable place on Earth."[473] It would be wrong to suggest that Scott Base has not enjoyed several decades as being a site for the production of valuable and legitimate knowledge about the Ross Dependency, indeed, often through collaborations with the Americans at McMurdo Sound who number at over 1000 during the summer seasons. Yet the founding of Scott Base was fraught with conflicts over the quality of science that could be produced in such a difficult location as well as fears that any New Zealand program would be overrun and overshadowed by the much larger nearby American Base. These tensions largely arose when Hatherton and the other four IGY scientists found that their desires to produce nationalistic prestige building research deprioritized in favour of Hillary's Trans-Antarctic Expedition goals.

Although today New Zealand is heralded as a leader in Antarctic science, at the start of the IGY their government was so little concerned with developing an independent and strong research program that during its planning, interested scientists found "very little sympathy forthcoming from the government" and were "cramped by the niggardliness and lack of imagination in the Cabinet."[474] It was not until May of 1955 that the New Zealand Government declared that New Zealand had an "inescapable geographical interest in Antarctica."[475] The Ross

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[472] Antarctica New Zealand http://www.antarcticanz.govt.nz/scott-base/
[473] Neville Peat *Antarctic Partners: 50 Years of New Zealand and United States Cooperation in Antarctica* (Wellington: New Zealand Ministry of Trade and Foreign Affairs, 2007).
[474] John Hanessian Jr. "New Zealand and the Antarctic: Polar Interest and Activities" *American Universities Field Staff Service Reports* 1962. 10 University of Canterbury Antarctic Collection
[475] John Hanessian Jr. "New Zealand and the Antarctic: Polar Interest and Activities" *American Universities Field Staff Service Reports* 1962. 13 University of Canterbury Antarctic Collection

Sea Committee was so worried that the New Zealand public would be so uninterested in Antarctica that despite his lack of scientific training, as detailed in the previously chapter, Hillary was chosen as leader since "his popular name would give much impetus to the forthcoming appeal for public financial support."[476] Vern Gerard, despite his work being some of the most impacted by Hillary's disregard for his geomagnetic research, was resigned to the deficiencies because "the TAE gave us [the IGY Party] a lot of impetus because Hillary was very much a charismatic figure and what Hillary did was considered important. The IGY was to some extent tacked on."[477]

The experience of the New Zealand scientists at Scott Base demonstrates two major themes in the history of field science. First, like many other historians have argued, the quality and type of research produced in any geographical locations is greatly influenced by geographical and environmental factors out of their control. The volcanic Ross Island made research in seismology, geomagnetism, and geology far more difficult than expected. This site was chosen by a person with no background and little demonstrated interest in the work of the IGY scientists, a lack of interest which manifested itself again and again and resulted in a strained relationship between Hillary and Hatherton. Scott Base's geographical nearness to the American Base also meant that New Zealand was forced into an interdependent relationship with the United States, one which sometimes overshadowed their own accomplishments. Second, it demonstrates that the geographical sites of research stations, even those that stand for decades, are the results of political, personal, and geographical contingencies; contingencies that often get forgotten as time passes.

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[476] John Hanessian Jr. "New Zealand and the Antarctic: Polar Interest and Activities" *American Universities Field Staff Service Reports* 1962. 13 University of Canterbury Antarctic Collection

[477] Quoted in David L. Harrowfield. *Call of the Ice: Fifty Years of New Zealand in Antarctica*. (Auckland, N.Z: David Bateman, 2007). 27

Selecting the Base Site at Halley Bay

On the other side of the continent, Halley Bay could easily be regarded as one of the unabashed successes of the International Geophysical Year. Not long after its construction, it was announced that its position was chosen since it "lies in a zone of intense magnetic and auroral activity."[478] Its location, indeed the expense of maintaining the base, was legitimized when, in 1985, Joseph Farman published evidence for his discovery of the ozone hole based on measurements taken from Halley Bay beginning in 1957. [479] So valuable is Halley Bay to the British Antarctic program that it has been rebuilt six times, as each previous building was destroyed by the elements. But the success of Halley Bay, or Halley, as it is known today since the bay no longer exists, makes it easy to forget its own precarious history. First, like Scott Base, it was built some distance from its planned site, due to a hostile reception at their originally planned location. Second, in contrast to Scott Base, while there had been some discussion of the TAE and IGY parties sharing facilities in the Weddell Sea, the TAE and IGY remained mostly separate. Finally, at the conclusion of the IGY, the Royal Society was unwilling to maintain upkeep for their base, and scientific leaders found themselves frantically finding both political and scientific justifications for their base to remain open. In many ways, the early days of Halley Bay was as fraught with tensions as Scott Base, but due to different outcomes of historical contingencies,

In 1954, the International Council for Scientific Unions[480] decided that a during the upcoming IGY base near 77° S 35° W (Vahsel Bay) would be ideal for collecting scientific data.

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[478] Norman Kemp *The Conquest of the Antarctic* (New York: Philosophical Library Inc, 1957). 105

[479] J. C. Farman, B. G. Gardiner, and J. D. Shanklin, "Large Losses of Total Ozone in Antarctica Reveal Seasonal ClOx/NOx Interaction," *Nature* 315, no. 6016 (May 1985): 207–10.

[480] In 1958, at the conclusion of the IGY, the ICSU established an interdisciplinary committee to further coordinate Antarctic research, the Scientific Committee for Antarctic Research (SCAR).

As this location fell within the area governed by the Falkland Islands Dependency Survey, the Royal Society determined that they should build a British research station in this area. In December 1955, the Royal Society sent an Advance Party aboard the m.v. *Tottan*, headed by Surgeon Lieutenant Commander David Dalgliesh RN, to establish a base, "as far south as possible in the Weddell Sea"[481] and begin setting up the necessary equipment. It was essential that the Royal Society Base balance the suitability for the various scientific projects against estimates of accessibility over the next two years. Dalgliesh was instructed to find a site that was located, if possible on the rock of some suitable nunatak in the Vahsel Bay. If no exposed rock was available, "the site should be on inland ice rather than one the ice shelf… If any of the above sites are found impracticable, the base would then be erected on the… ice shelf but this should only be done as a last resort."[482] Even if severe conditions required that they land on the ice shelf, Dalgliesh was instructed to attempt to move to either inland ice or a nunatak. Floating ice was undesirable as first, it would not have proper electrical "grounding," and second, it was unknown if instruments would function in this environment. Vahsel Bay was determined to be the ideal site because "from the meteorological, geomagnetic and auroral point of view, no site would be as valuable as Vahsel Bay…any deviation from the Vahsel Bay would diminish its scientific value."[483]

Like the Scott Base Party in the Ross Dependency, initially the Royal Society planned that they would establish a base adjacent to that of the TAE. If this was possible, again like at Scott Base, the TAE was to be the overall leader: "Fuchs will be in over-all comment until he

[481] Letter from David Martin to David Dalgliesh February 1955 Royal Society Archives ARF 1083 Box 19A RSAE
[482] Letter from David Martin to David Dalgliesh February 1955 Royal Society Archives ARF 1083 Box 19A RSAE
[483] Minutes of a Meeting of an Ad Hoc Committee April 5th 1955 Royal Society Archives ARF 1090 Box 10A Halley Bay General

leaves for home."[484] But unlike Scott Base, this plan did not come to fruition. As the *Tottan* was set to follow Vivian Fuchs' TAE Advance party aboard the m.v. *Theron,* which had an Auster aircraft on board for aerial reconnaissance, it was assumed that Fuchs would be able to find a place suitable for setting up a research station, at least a week before the Royal Society arrived. But on December 29th, the *Theron* became stuck in the pack ice where they remained caught fast for nearly a month, daily striving to "dislodge the ship from some position in which she had become perched, unable to move forward or backward."[485] While the *Theron* was struggling to free herself, drifting through the pack-ice, the *Tottan* entered the Weddell Sea a few days behind, far to the east of where Fuchs' Party was having so much trouble. Dalgliesh was forced to select a site himself without either input from Fuchs or aerial reconnaissance. There is some poetry in the *Theron* being trapped in the ice of the Weddell Sea for nearly a month. The Commonwealth Trans-Antarctic Expedition was after all an attempt to repeat Ernest Shackleton's Imperial Trans-Antarctic Expedition, whose hopes of crossing the continent when their ship, the *Endurance* was beset by pack ice in the Weddell Sea.

Figure 8. *Theron* caught in the ice of the Weddell Sea[486]

[484] Letter from David Martin to David Dalgliesh February 1955 Royal Society Archives ARF 1083 Box 19A RSAE
[485] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 17
[486] Antarctica New Zealand Pictorial Collection

As he completed this work, Dalgliesh noted the difficulties with finding a base site in the Vahsel Bay area that would also comply with the Royal Society's desires that he avoid the ice shelf: "looking at this coast it is hard to imagine any landing place in that area other than the ice shelf and distance would then probably dictate that it should be on the ice shelf and not piedmont ice."[487] He resolved to look elsewhere. The party first examined several landing sites along the Dawson-Lambton Glacier Area. This site proved unfavorable due to heavy crevassing along the ice and a bay "much longer than shown on maps, being at least four miles across and chocked with old bergs and bay ice."[488] They moved along the coast, searching for a suitable landing place. They entered the bay south of Cabo Dedo, which initially looked like a better location, but while on "a recce, this time on skis, [they] found that they country was very uneven with more bays and broken ice…unsuitable for a base site."[489] Dalgliesh requested that the captain of the *Tottan* attempt again to enter Vahsel Bay, which was surrounded by heavy unbroken ice, but was refused as the "Captain stated that it would be very dangerous to try to enter" without being trapped in the ice and since "he had shown such knowledge and experience in the ice that it would have been folly on my part to have tried to force him against his judgement."[490] Both he and Dalgliesh agreed that they might have proceeded if they had the aerial support that they expected from the *Theron,* but it would continue to be trapped in the ice for many more days.

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[487]David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 3rd 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR

[488] David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 4th 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR

[489] David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 5th 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR

[490] David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 5th 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR

On the morning of January 6th, after examining Emperor Bay, named for the large population of penguins that they observed, the *Tottan* moved slightly north and landed at 75°31' S 26 °36' W, about 150 miles north of Vahsel Bay. After a morning search for crevasses, Dalgliesh "found this to be an ideal landing site and the ice sheet was quite flat and not crevassed,"[491] and subsequently "took formal possession of the land in the name of the Queen…which I thought was the proper thing to do."[492] Dalgliesh was pleased with his choice, believing that it fit all of the Royal Society's qualifications, being relatively near their ideal location at Vahsel Bay and "the gentle upward trend of the ice and the absence of any signs of activity of the ice sheet makes me think that this area is low piedmont or grounded shelf ice."[493] Additionally, importantly for both the TAE, there was "no apparent obstacle to access continental plateau."[494] It was also south of the 75th parallel, the northern limit of the southern aurora, a requirement so serious for the IGY that he had been instructed "If unsuccessful in finding a site in these latitudes, you and your party are to return to the United Kingdom."[495] During the year, the Base was referred to as Royal Society Base, and the Bay where the expedition landed was named Halley Bay, "to commemorate the tercentenary of Edmond Halley, who had at one time been Secretary of the Royal Society."[496]

The Scientific Ramifications of Halley Bay's Geography

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[491] David Dalgliesh Halley Bay Annual General Report 1956 British Antarctic Survey Archives AD6/2HB/1956/A
[492] David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 6th 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[493] David Dalgliesh "Confidential Diary by Surgeon Lieutenant-Commander D. Dalgliesh, R.N. during the voyage of M.V. "Totton" to Halley Bay, Coats Land, Antarctica" January 7th 1956 Royal Society Archives ARF 1094 Box 23B IGY/SCAR
[494] Telegram for David Dalgliesh to the Royal Society January 19th 1956 British Antarctic Survey Archives AD8/1/63
[495] Letter from David Martin to David Dalgliesh February 1955 Royal Society Archives ARF 1083 Box 19A RSAE
[496] Robin Smart "The Royal Society International Geophysical Year Expedition to Antarctica" 1958 Royal Society Archives ARF 1085 IGY SCAR Files

When Fuchs arrived on January 27th, he was less pleased with Dalgliesh's selection. At first, he was optimistic and noted that at Halley Bay "we were certain of a good landing place and the co-ordination of the two expeditions at one site would have advantages," even if Dagliesh's failure to make it to Vahsel Bay would add 200 miles to the Trans-Antarctic Crossing. Therefore it was "of the first importance to establish from the air whether we could use Halley Bay as a site for our base [and]…whether there was a practical route inland."[497] Fuchs and RAF pilot John Lewis began an air reconnaissance and found themselves "flying over a heavily crumpled and crevassed zone which extended eastward…Nowhere was a rock visible…we could see the inland margin of the ice shelf marked by a belt of wide crevasses running from north to south," matching the east-west over which they flew. On this first flight, Fuchs found it clear that "to establish our base here might prejudice the trans-continental journey at the very beginning. I therefore decided, while still in the air, that only in the very last resort would Shackleton Base be set up at Halley Bay."[498] After his return to Halley, the *Theron* proceeded south and was able to set up over one hundred miles to the South, close to the initial goal at Vahsel Bay. This move likely pleased several officials in the UK scientific community who believed that since the TAE and the IGY had different goals, sharing any facilities would undermine the scientific legitimacy of the Royal Society Base,[499] the fate the ended up occurring at Scott Base.

In addition to being wrong about the crevasses, Dalgleish found his assumption that his base was located on piedmont ice to be extremely off balance. During Fuchs and Lewis' recce,

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[497] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 25
[498] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 26
[499] Letter from Colin Bertram to Crispin Tickell May 1st 1955 Scott Polar Research Institute Archives MS1308/51/ 7 CC Brian Roberts IGY Great Britain

they found the site was "definitely shelf ice."[500] Yet Dalgliesh was still confident that his site would suit since his observations of stranded tabular bergs, echo soundings, and rising in the ice along the coast made him "conclude they all indicate grounding."[501] Once a team of experts arrived, including Geoffrey Pratt, a geophysicist on loan from the TAE, it was clear that the station rested on a floating ice shelf rather than the grounded ice that the Royal Society had hoped for. After two years of taking observations, the meteorological assistant James Burton concluded that in the case of the station at Halley Bay, "to the east-north-east the ice-shelf is grounded, at least partially, but to the south it is floating."[502] Though it was possible that north of the bay the ice was grounded "the whole of the coast from Emperor Bay round the cape and across Halley Bay lacked tide marks and was, therefore, judged to be to be afloat."[503] This shelf was made of compacted snow, about 470 feet thick above nearly 300 feet of water, 100x35 miles in extent, pinned to the shore by rocks deep beneath the surface, and both moving forward almost 400 yards each year and "gently undulating."[504]

Meteorologist and later Base Commander Joseph MacDowall detailed both in his memoir and his publications how some of his work was particularly challenging due to the situation of the base: "It was already known that the base at Halley Bay might be located on a large floating iceberg, which was not exactly an ideal site for a major seismological installation."[505] He found that "The level of microseismic and the efficiency of earthquake recordings were greatly affected

[500] David Dalgliesh Halley Bay Base Diary 1956 British Antarctic Survey Archives AD6/2HB/1956/B
[501] David Dalgliesh Halley Bay Annual General Report 1956 British Antarctic Survey Archives AD6/2HB/1956/A
[502] J. M. C. Burton, "The Ice-Shelf in the Neighbourhood of Halley Bay," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 197–200.
[503] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.
[504] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.
[505] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 8

by the situation of the observatory on the floating ice-shelf."[506] When the "seismograph was installed at Halley Bay it was not known whether the situation would permit fruitful work but it was found that *P* waves, particularly at first, were record from shocks at most epicentral distances. Shear (*S*) waves were not well recorded, or were absent altogether, even in the case of the closest shocks."[507] He had similar concerns for his geomagnetic studies as geomagnetic instruments "had never been set up in the conditions prevailing at Halley Bay. [They] needed a firm, solid and dependable base …it was the first time they had ever been installed on a floating ice shelf."[508] Despite this hiccup, MacDowall made an extremely detailed geomagnetic study, which "was the first time such sophisticated, continuous recordings had been made from a floating ice shelf."[509] Though MacDowall seemed to be quite successful with his geomagnetic research, publishing multiple articles based on his work, the unusual location of Halley Bay made an enormous impression on him. The title of his memoir of the time he spent with the Royal Society Expedition during the IGY?: *On Floating Ice.*

[506] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.
[507] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.
[508] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 9-10
[509] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 50

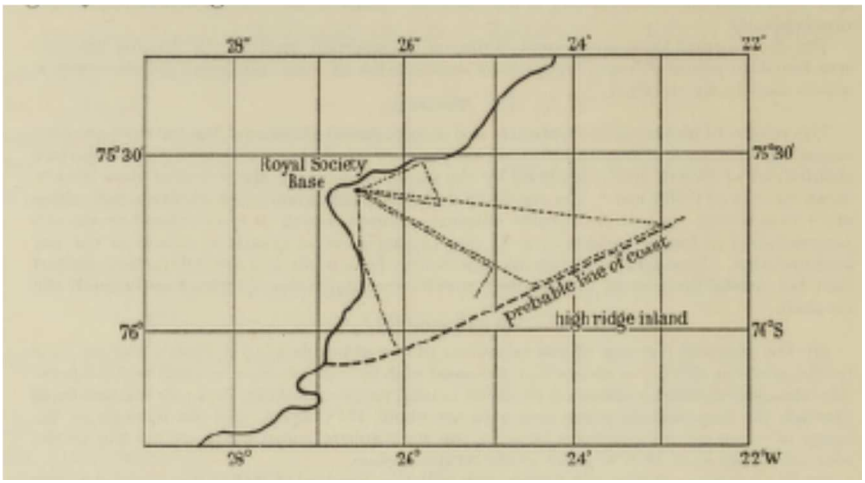

Figure 9. The position of the Royal Society Base (75° 31' S 26° 37' W) with respect to the ice-front[510]

Additionally, the location of Halley Bay also meant that it was extremely difficult for the scientists to measure the movement and velocity of the Brunt Ice Shelf on which they rested. First, there were not surface rock features that could be used as fixed reference points for absolute movement measurements. In 1959, Scientific Leader M.J. Blackwell attempted to compare sun sights taken in 1957-9, and determined that the ice shelf was moving "550 ± 150 m. $yr.^{-1}$ in a west-north-west direction." When Blackwell repeated this survey a year later, he reported that the ice shelf's velocity was actually "460 ± 200 m. $yr.^{-1}$ in a west-north-west direction." David Limbert, a meteorologist at Halley Bay in 1959, attributed this larger error to "the use of too widely spread grid of stations for the survey" in a 1964 article in the *British Antarctic Survey Bulletin.* But more ominously, he informed the reader that "there were several anomalous results not adequately accounted for." In fact, "Bearing in mind the inaccuracies

[510] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.

involved in astronomical fixes made in polar regions, Blackwell's error could be much greater."[511]

While the base at Halley Bay had its share of problems with instrument use (detailed in more depth in the next chapter), inadequate food (not English) and clothing (wrong sizes), and even personnel conflicts (the Stores Officer, George Hemmen conflicted with both Dalgliesh and Colonel Robin Smart, his immediate successor), the Royal Society Party at Halley Bay was extremely successful despite Dalgliesh's unorthodox choice for a base site. But this was not due to superior actions or knowledge on their part. In fact, in 1955, David Brunt, then the Vice-President of the Royal Society, warned against a research station in the region to begin with because "The brutal fact is that we have no direct knowledge at of as to conditions at Vahsel Bay. My original opinion was that to try to send a scientific IGY expedition there was stark madness in view of our ignorance. I still think this."[512]

Dalgliesh, for his part, was commended for his leadership in Antarctica: "Much of their success is undoubtedly due to the leader Dalgliesh…A greater responsibility that we foresaw on his departure fell on his shoulders [when]…it fell to Dalgliesh himself to select a site…Over a year's experience shows that it was well-chosen."[513] Stanley Evans, one of the TAE scientists marveled that "This expedition achieved all the objects set out in the RS plans, on time, and without loss or damage to persons or goods; 90% of the credit for this goes to David Dalgliesh."[514] But Robin Smart, the Base Commander for the first year of the IGY, argued that his successes were "partly due to luck, in that none of the things which could have gone wrong,

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[511] D.W.S Limbert, "The Absolute and Relative Movement and Regime of the Brunt Ice Shelf near Halley Bay," *British Antarctic Survey Bulletin* 3 (May 1964): 1–11.
[512] Letter from David Brunt to David Martin March 11 1955 Royal Society Archives ARF 1089 Box 10 A Halley Bay General
[513] Letter from David Brunt to Lord Mountbatten of Burma April 4 1957 Royal Society Archives ARF 1094 Box 24 RSAE
[514] Stanley Evans "Royal Society IGY Expedition to Antarctica" Jesus College Cambridge Annual Report 2012

did go wrong."[515] Dalgliesh was certainly lucky in his selection. He chose a site without the anticipated aid of aerial reconnaissance or the expertise of Fuchs, over 150 miles from his planned destination. It was located on a floating ice shelf, in contrary to the Royal Society's explicit instructions that it be either on rock or grounded ice, and so surrounded by crevasses that Fuchs could not build the TAE Base nearby. George Hemmen later remarked that "the answer to the question 'why there' is, quite simply, because *Tottan* could not get much further south at that time. As it happened, the location proved to be very good from the point of view of the scientific observation programme."[516] Like the Scott Base party, their site was selected by a non-scientist (Though Dalgliesh did get the approval of Dr. Stanley Evans, a physicist and auroral researcher in the Advance Party).The Royal Society Party, while substantially larger than the team at Scott Base, did the same sort of incremental research as their corollaries in the Ross Dependency. Yet through a combination of factors, both based on geographical luck and on human relations, the Base at Halley was proclaimed an immediate triumph.

Threatened Closure and the Political Value of Halley Bay

But despite the consensus that Halley Bay was a successful research station during and immediately after the IGY, this did not guarantee that it would either continue after the conclusion of the IGY or that it was considered successful enough to be worth the financial costs of its operation. Indeed, Dalgliesh pointed out the extremity of the conditions in an early telegram to the Royal Society, stating that "Everyone must appreciate that the conditions here are much different and more severe than those at any F.I.D.S. base. We are 600 miles further south

[515] Robin Smart "Annual General Report: Main Party, Royal Society IGY Antarctic Expedition, November 1956-December 1957" British Antarctic Survey Archives AD6/2HB/1957/A
[516] Talk given by George Hemmen October 2006 at the Halley Bay 50th Anniversary Reunion, Northampton

and on the edge of the main continent."[517] Even before the end of the IGY, some expressed concern regarding its physical location. In a 1957 assessment of the future of the Falkland Islands Dependency Survey, the writers stated that at least from a geological perspective, some bases had more value than others. If FIDS chose to maintain a base on the Weddell Sea, "From the point of view of accessibility to the hinterland, the "Halley Bay" base does not appear to be satisfactory sited,"[518] in contrast to the TAE base further South. The Royal Society did not want to continue sponsoring work at this location because "they do not consider that the recording of observations in Antarctica have much value except in conjunction with similar observations being made in the rest of the world"[519] during the IGY, observations which were likely to cease at its conclusion. While the majority of consulted scientists saw value in continuing various research programs at Halley Bay,[520] the Foreign Office was initially against its maintenance since "As for Halley Bay the current of financial policy would be against increasing our commitments in the Antarctic which is what taking it over would amount to."[521] But they noted the political pitfalls that could come with abandoning it since "there is an Argentine base in the neighbourhood, so that we would not be keeping up with the principle of balancing the level of their activities if we did not take the base over."[522]

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[517] Memorandum to Mr. G.E. Hemmen October 4th 1956 Royal Society Archives ARF 1082 Box 5B Antarctic General Pre 1959
[518] Note on the Future Policy of the Falkland Islands Dependencies Survey. July 3rd 1957 Scott Polar Research Institute Archives 1308/22/9/ER Antarctic Falkland Islands Dependencies Survey Correspondence and Committee Papers
[519] Copy of Minutes [undated, but accompanying notes signed January 1957] Scott Polar Research Institute Archives MS1308/51/7CC Brian Roberts IGY Great Britain
[520] British National Committee for the International Geophysical Year: Suggested Subjects for Future Antarctic Research April 28th 1958 ARF 1096 Box 27A
[521] Copy of Minutes [undated, but accompanying notes signed January 1957] Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain
[522] Copy of Minutes [undated, but accompanying notes signed January 1957] Scott Polar Research Institute Archives MS1308/51/7 CC Brian Roberts IGY Great Britain

Although in 1958 the Falkland Islands Dependency Survey agreed to take over the base, threats of closure for Halley Bay continued, with many doubting both the financial and scientific value of staying in such a site. In the January of 1960, the governor of the Falkland Islands, requested that Gordon de Quetteville Robin, the director of the Scott Polar Research Institute "acquaint himself with the general work and facilities of the base with a view to advising on the problems connected with the permanent occupation of the Halley Bay site."[523] In terms of its scientific program, Robin concluded that it was costly to maintain and worthwhile only if "full support be given as the work must be well done, or if not it should not be attempted."[524] He noted the danger of the Base, sitting so near the edge of an actively calving floating ice sheet, but even though "The idea of shifting the base a few miles further in to increase safety was considered," this "would be expensive and disrupt the programme with very little gain for safety."[525] He believed that they should have at least twelve months warning for any calving of this magnitude.

He also noted the difficulties in keeping quality personnel at the Base, since the glamor of the IGY had subsided since "Compared with life at other F.I.D.S. bases, the individual at Halley Bay faces a more difficult task adapting himself to the conditions of life. The climate is more severe generally, the winter darkness more complete and in particular the surroundings are more desolate…the remoteness from other bases and the small chance of additional visits during several summer months adds to the isolation."[526] Finally, he argued that "The caliber of the

[523]G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[524] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[525] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[526] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2

personnel at Halley base…during the IGY…has been responsible for most of the success of the station."[527] In order to maintain that success, "FIDS will need to get a reputation among such people of giving liberal provisions of good equipment and adequate assistance in the working up of results, as well as providing sufficiently attractive salaries."[528] Additionally, supporting scientific staff needed better training before entering the field, writing that "The training of the 1960 meteorological assistants for Halley Bay could have been much more complete."[529]

Although overall Robin believed that Halley Bay should be kept open, nearly all of his proposals for its future involved much higher expenditures for an already expensive base. In May 1960, Fuchs, who was by now the Director of FIDS, wrote to David Martin, Assistant Secretary of the Royal Society, for "advice and assistance concerning this future of Halley Bay." The Treasury was threatening to reduce FIDS' annual budget and "From the purely administrative point of view Halley Bay has a disproportionate cost to the other FIDS activities and it is quite necessary that I am able to justify this if we are to continue to maintain the Base….If we withdraw from Halley Bay, I think it is likely that either the Americans, Argentines or Russians would take the opportunity to occupy the site…and if we show signs of abandoning our responsibilities in this area … it could only reflect upon our national attitude to science in this field."[530] The urgency of this support also came from the fact that the nearby American and Argentinean bases, both relatively nearby, were also being threatened with closure. The very next day, Martin sent a flurry of letters to "several Fellows of the Royal Society and other senior

[527] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[528] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[529] G. de Q. Robin "Report on F.I.D.S. Base at Halley Bay" I.G.Y. Halley Bay Transfer to F.I.D.S British Antarctic Survey Archives AS/173/B/2
[530] Letter from Vivian Fuchs to D.C. Martin May 10, 1960. Royal Society Archives ARF 1089 Box 9B "Antarctic General"

scientists best qualified to give an opinion on its value from the scientific standpoint,"[531] attempting to garner support for Halley Bay and mirroring a similar scientific poll that the Royal Society conducted in 1958.

G.E.R. Deacon, an oceanographer who had been on the *Discovery* expedition in the 1930s, returned to Martin with the somewhat deflating belief that "it is rather difficult to find strong arguments for more oceanographic work at Halley Bay…Although it is a pity to see what was a good base given up, it might be worse to maintain it if there are not enough first rate scientists who really want to go there to study specific problem …Outstanding scientific achievements will in the end be better politics than bases with post offices."[532] This mirrors the comments of Robert Stoneley, a seismologist at Imperial College London who had spent some of his early career conducting geological survey work for the Falkland Islands Dependency Survey who had written to Fuchs in 1959, advising caution: "I would like more emphasis on the quality of the stations in view of the number of stations now operating. With regard to Halley Bay…as a permanent station it would probably give less information than a station on land…and the operation of the seismographs at Halley Bay might be discontinued after December 1959"[533]

However, Deacon and Stoneley's sentiments were definitely in the minority. Sir Graham Sutton, the Director of the Meteorological Office for the Air Ministry, admitted though that radiation work at Halley is "hardly good enough…to constitute a serious scientific argument for the maintenance of the station by the U.K," considering the "particularly British interest in the ozone,…If we could be assured that the site would be reoccupied by a nation which is not only

[531] Letter from D.C. Martin to Vivian Fuchs May 17, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"
[532] Letter From G.E.R. Deacon to D.C. Martin May 12, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"
[533] Letter from Robert Stoneley to Vivian Fuchs June 23rd, 1959 Royal Society Archives ARF 1083 Box 19A RSAE

capable of making reliable observations but is also prepared to publish the data, we could view the departure of the U.K. team with equanimity, but not otherwise." [534] Other scientists, spoke strongly both of the scientific and political advantages to maintaining the base. James Paton, of the University of Edinburgh, argued that due to the favorable work on airglow done at Halley Bay, "It is surely imperative that this study should be continued by scientists from the U.K."[535] Joseph MacDowell, argued that "The closing of Halley Bay would be widely regarded as the end of our scientific interest in Antarctica irrespective of any conceivable expansions in Graham Land."[536]

The most extreme emotion came from Sir David Brunt. Brunt, a prominent meteorologist and the Vice President of the Royal Society, for whom the Brunt Ice Shelf where Halley Bay sat was named, wrote " I should regard it as deplorable were we to withdraw entirely from the Weddell Sea area… were we to withdraw from Halley Bay it is extremely probably that either the Americans, Argentines or Russians would take the opportunity to occupy the site…Speaking for myself personally I should dislike intensely the idea of abandoning Halley Bay and for it to be taken over by either the Americans, Argentine or Russians. If I were free to take such action as I would like to, I should prefer to blow the Halley Bay Station sky high with a powerful dose of H.E. rather than leave it to either of those three nationalities…I believe that our continued activity at Halley Bay would be of high value to our prestige, and that for us to abandon Halley Bay would be, in fact, equivalent to placing ourselves on the same level as the Americans,

[534] Letter from Graham Sutton to D.C. Martin May 16, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"
[535] Letter from James Paton to D.C. Martin May 13, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"
[536] Letter from Joseph MacDowell to D.C. Martin May 13, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"

Argentines and the Russians."[537] The sentiment if in fact a continuation of Brunt's conception of non-British science, as in the summer of 1955, even before the construction of Halley, he argued that although Argentina had recently begun construction of a base nearby, "their results were not as likely to be as reliable as those obtained by a British station."[538]

When Martin returned to Fuchs, ostensibly with a summary of the responses that he received from polar scientists supporting the maintenance of Halley Bay, his missive contains none of the measured caution that he received from scientists like Deacon, Stoneley or even Sutton. Instead, he emphasized that "There is no doubt whatsoever that the geographical position of the station and the work carried out there make it one of the most important and most highly regarded stations in the whole Antarctic continent. If it were to be closed I'm afraid that this would be widely interpreted in international scientific circles, as the abdication of our serious scientific interest in Antarctic, irrespective of any conceivable expansions in Graham Land…on scientific grounds alone…Adding to this its political value, especially with the proposed treaty in view, surely puts beyond question whether this country can afford to spend this amount." He then goes onto suggest that FIDS receive even more money, as this would "speed up scientific progress, interest the better quality scientists, ensure the best use of the results and would do much to keep this country in the foremost of Antarctic research…To relinquish Halley Bay at this juncture would, in truth, be a blunder and a blow to our Antarctic scientific endeavors from which we would scarcely recover in some decades ...."[539]

[537] Letter from David Brunt to D.C. Martin May 12, 1960. Royal Society Archives ARF 1089 Box 9B "Antarctic General"
[538] Notes from the Sub-Committee on Antarctic and Sub-Antarctic Regions Meeting July 26, 1955 Royal Society Archives ARF 1094 Box 23B
[539] Letter from D.C. Martin to Vivian Fuchs May 17, 1960 Royal Society Archives ARF 1089 Box 9B "Antarctic General"

Martin's intervention, along with some pressure from the British National Committee for Antarctic Research, had its desired effect, and Halley Bay remained open-in fact it was made bigger and every time the base has been threatened with environmental hazards, it has been rebuilt. This set of letter exchanges regarding the potential closure of Halley Bay in 1960 highlights the patriotic underpinnings among those actually conducting scientific research. While it is true, as Martin ultimately argued, that Halley Bay had several advantages for scientific reasons, and in fact, the ozone hole was discovered only a few years later from data acquired there, most scientists expressed the worry that its closure would affect British science, not science as a whole, as a member of an international scientific community. The British occupancy of this specific location mattered not just because of the valuable research that it could produce, but because of the political ramifications of closing such a site. Halley Bay's location was chosen by accident, with little heed to the scientific requirements of the base and stayed open because of the political ramifications that could come with abandoning it.

Conclusion

The scientists at Scott Base, New Zealand's IGY station, supported by the Royal Society of New Zealand, had an extremely different experience from their British counterparts, despite a number of similarities with their founding, and relatively similar research programs. Both were forced to construct a station in an area that was less than ideal for research, unplanned by the scientists who would be working there. Both were held back from their original destination by climates even more hostile than expected; rougher seas and no plateau assess at Butter Point and dangerous ice conditions at Vahsel Bay. Both had scientific limitations based on their geography. At Pram Point, their location on an island made from volcanic rock made geomagnetic and seismological work challenging and cut off from the continent, severely curtailed geological

research. At Halley Bay, the crevasses surrounding their site restricted field work off of the station and curbed geological research entirely. Additionally, the location of the station on a floating ice shelf meant that scientists were unsure if they would get any results at all with their instrumentation and, according to MacDowall, impacted his seismological studies. Yet the unorthodoxy of these sites also provided opportunities. At Scott, because of their nearness to the American Base which made transport between their base and Christchurch relatively easily "hundreds of scientists of many nations passed through …and visited Scott Base…benefit[ing] greatly from discussions held during such visits."[540] At Halley Bay, their nearness to a large Emperor penguin rookery, while providing the men with amusements, allowed Robin Smart to study the physiology of Emperor penguins, a bonus to the otherwise strictly geophysical work. Additionally, as the first major geophysical station on floating ice, when their instruments functioned, provided data unique to that type of geography.

Both too owe their successes and even continued existence on complicated political relationships both separate and deeply entwined with their research. At Scott Base, while the relationship between Hatherton and Hillary was certainly taut, it is likewise true that the IGY team in Antarctica would likely have never existed without Hillary's endorsement and leadership during the TAE. Additionally, the ongoing existence of the base depended largely on their relationship with the United States, which continued to provide logistical support for New Zealand in the Antarctic for many more years. On the British side of the continent, any base site would have political ramifications, considering their enduring sovereignty dispute with Argentina and Chile over the Falkland Islands Dependency. Even when Halley Bay was threatened with closure due to its high fiscal cost and unspectacular scientific output, it was

[540] Hatherton, Trevor. *New Zealand IGY Antarctic Expeditions, Scott Base and Hallett Station.* (Wellington: R.E. Owen, Govt. Printer, 1961). 14

saved by the invocation of the political messages that closure would send: that the United Kingdom, for long the international leader in polar research, was unable to maintain a base in conditions where Argentina and the United States stayed open.

Yet the early days of Scott Base and of Halley Bay are widely dissimilar in terms of their optimism for the future. Hatherton expressed worries that he, as a scientist, was treated as a second class citizen compared to the more nationalistic, but less scientific, goals of the TAE. The needs of the five IGY scientists trying to conduct a major program were often distracted, or even in the case of Base selection, ignored by the eighteen man TAE party. When Hillary did in fact beat Fuchs to the Pole, it did keep New Zealand's national interest focused on Antarctica, but rarely on their small research program. Selecting a site for research turned out to be the start of a conflict between two men with vastly different priorities why they, and indeed New Zealand, were in Antarctica. Being located immediately next to the American base helped matters little because although Scott could get logical support from the United States, New Zealand's presence was often overshadowed by the sheer size and vast expenditure of their neighbors which sometimes gave the impression that they could not function without American aid. On the other hand, Halley Bay, though not entirely without discord, had fewer conflicts within its leadership. Dalgliesh's Advance Party, there to select the site and build the Base only, only had two scientists, one of which gave input about the site selection. Though the floating ice was unideal, the Main Party had nearly a year of preparation of knowing where their station would be located and that it would be fully constructed before they arrived. They did not have any competing priorities with the TAE Party, located nearly 200 miles away, only because of Dalgliesh's lack of air support when he made the selection. Though they were frequently threated with closure, most notably in 1960, FIDS and the Royal Society both drew on a larger network of scientists who

could argue that the base's closure would have negative scientific and political consequences for the United Kingdom.

Although many of the issues regarding politics and geography were the same at both sites, in Smart's words, at Halley Bay, nothing that could have gone wrong, did go wrong. And still, this was not enough to guarantee the Base's future, and the extremely harsh and isolated conditions made it expensive to maintain, undesirable to staff, and not worth it either scientifically or financially if the Falkland Islands Dependency Survey did not improve the quality of its personnel. Both conducted the same sort of geophysical research in the same stead, incremental way, with new staff members coming down each year, but Halley Bay became retroactively more successful when, in 1985, the ozone hole was discovered there, building on research that began with MacDowall's first report that at Halley Bay, "…the distribution of ozone…appears to show a marked difference... from that observed in the northern hemisphere."[541] Although many, including MacDowall, believed Halley Bay to be an interesting site for meteorological research, none predicted a discovery of this magnitude.

But both the similarities and differences regarding the early days of Scott Base and Halley Bay highlight key generalities regarding field research stations. First, it is not always possible to have a site which speaks to everyone's priorities, scientific or otherwise. In the case of Halley Bay, it was one of the best places in the world to conduct auroral research, even if it was less ideal for seismology or paleomagnetism. Second, scientists often do not have a choice in their base site. The environmental conditions both at Butter Point and Vahsel Bay forced the respective teams to look elsewhere and despite the original locations being vetted and selected by

[541] J. MacDowall, "Some Observations at Halley Bay in Seismology, Glaciology and Meteorology," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 256, no. 1285 (June 21, 1960): 149–97.

scientific personnel, they were abandoned relatively hastily replaced by leaders with weaker science backgrounds (although Dalgliesh, as a medical doctor, was likely more sympathetic to the scientific goals of the expedition). These sites, one made of volcanic rock and another that is essentially a large iceberg, made for baffling choices, but ones where their very uniqueness could justify their selection in the years afterward. In both cases, the environment did affect their ability to work, but as discussed in the next chapter, the men often found ways to make behavioral and technological adaptions to negotiate with their surroundings.

It also shows that research stations are often constructed in specific locations for reasons unrelated to science. Adrian Howkins has argued that in the case of meteorological stations, Britain, Argentina, and Chile chose sites along the Antarctic Peninsula that would best strengthen their claim to the area.[542] Scott Base was chosen almost purely for non-scientific, nationalistic reasons. New Zealand's success in the TAE was determined to be far more vital to the country's future in Antarctica than the work of the five IGY scientists. Therefore, Hillary selected a point where, even if science suffered, he would easily be able to reach the polar plateau. While an argument that Halley Bay was chosen for political reasons is somewhat weaker, it is impossible to deny the political ramifications of its selection and the fact that it has stayed open since despite its costs due to its political value. Through a careful examination of Scott Base and Halley Bay, it is clear to see that science, as it is conducted in the field, often requires adjustments to expectation and methods, as both the material environment and other forces outside of a scientist's grasp, mold what sort of work they are able to do and how they do it. It also shows that sites are rarely inherently valuable alone, but only have value when they are connected to a network of political allies that advocate for its value.

[542] Adrian Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939--1959," *History of Meteorology* 4 (2008): 27–40.

CHAPTER FOUR: EXPERIMENTS IN MEASURING

Introduction

In 1958, members of the Royal Society Expedition to Halley Bay wrote up two reports. The first, a single page handwritten account, provides a summary of common electrical and mechanical faults of their record player. Its most common troubles came from the gradual

deterioration of its parts from frequent usage and users "changing speeds while the player is in operation."[543] The second report, typed and also one page, concerns the writer's Rolex wristwatch. The unknown writer wore his timepiece, No. 268.768, continuously for eleven months, noting that it was "steady between extreme limits of minus five seconds to minus nine seconds per day… Despite the fact that the watch was protected by…he found that in the most severe conditions, when the air temperature dropped below -32°C, the Rolex lost, within two hours, a mean average of 4/10ths seconds, found by comparing it to an indoor chronometer. Watch No. 268.752, similarly, for two months "kept a steady rate of between minus three and minus five seconds per day."[544]

Although these two reports seem to be unnecessary observations, taken by an overzealous, or perhaps bored researcher, they actually exemplify one of the chief concerns for scientists and explorers in this era: How the extreme material conditions impacted their ability to perform useful and accurate research. Perhaps unsurprisingly, considering the relative inexperience of scientists in Antarctica, a major concern for many was the functionality of instruments in this new environment. While "much preparatory work had to be carried out in connexion with the choice, modification, and efficient operation of all the equipment concerned,"[545] few materials had been designed with Antarctic conditions in mind. Trevor Hatherton, the Scientific Leader at New Zealand's Scott Base telegrammed home that "At Scott we have had considerable teething troubles where man and instruments not mated on operational basis prior [to] installation."[546] Even the most necessary tools like "Ordinary lubricants, even of

[543] "Gramophone and Wristwatch Reports 1958" British Antarctic Survey Archives AD6/2HB/1958/U
[544] "Gramophone and Wristwatch Reports 1958" British Antarctic Survey Archives AD6/2HB/1958/U
[545] D.L Pratt. "Fuels and Lubricants for the TransAntarctic Expedition," *Journal of the Institute of Petroleum.* 45, no. 422 (1959): 19-41. 20
[546] Telegram from Trevor Hatherton to G.W. Markham August 15 1957 New Zealand National Archives CAHU CH 370 Box 21

the highest grade, proved useless at negative temperatures."[547] Additionally, "much increased time [was] needed for even the simplest tasks while encumbered with polar clothing, and [there was] great difficulty of performing accurate delicate movements…while wearing several layers of gloves."[548]

Therefore, it fell to many men to observe how their equipment functioned and make technological and behavioral adaptions to continue their research when it failed. As early as Robert Falcon Scott's *Discovery* Expedition (1901-04), Scott noted the difficulty in carrying out experiments in an extreme environment: "It was suggested in our Antarctic Manual of Instructions that a block of ice should be suspended in the sea and its rate of increase in winter and decrease in summer should be measured. Had we attempted to do this, probably we should have arrived at an utterly false conclusion because in no two places would the result be the same. . . . It shows the impossibility of carrying out experiments of this sort, however easily they may be conceived in the quiet of an English study."[549] Peculiar difficulties with instruments in Antarctica, it seems, endured in the first sixty years of Antarctic research. As literary scholar Francis Spufford noted, "polar history…is technical history."[550]

While the historiography of instrumentation is extensive, until recently, few historians have studied the role of instruments in exploration and scientific expeditions. In fact, despite the 'technological turn' within the historiography of science, "researchers have hardly glanced at the instrumental devices which explorers employed to obtain the facts of geography."[551] Studies of

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[547] Hal Lister. "Summary of Tests Made in Frigidaire Unit" Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

[548] A. F. Rogers and R. J. Sutherland. "Antarctic Climate, Clothing and Acclimatization." Bristol University Department of Physiology, November 1971. Part IV. 13

[549] R. F. Scott, *The Voyage of the Discovery* (1905; London: Wordsworth, 2009), 214–215.

[550] Francis Spufford, *I May Be Some Time: Ice and the English Imagination* (New York: St. Martin's Press, 1997). 6

[551] Fraser MacDonald and Charles W. J Withers, "Introduction," in *Geography, Technology and Instruments of Exploration*, ed. Fraser MacDonald and Charles W. J Withers (Surrey, UK England ; Burlington, VT: Ashgate Publishing Ltd, 2015). 5

the history of instrumentation in polar regions is similarly neglected, an odd discrepancy considering that like oceans and other extreme environments, polar research requires "almost constant intercession of technology between the observer and the observed…he or she will be viewing some aspect of the…environment facilitated, yet limited by, the…capabilities of a specific technology."[552]

At the same time that the observance of some environments are impossible without the intercession of technology, using instruments in a particular setting actually changes the identity of that environment. In the words of science studies scholar Chandra Mukerji, "In the acts of gathering and measuring, nature is laden with the culture of science," gaining "a scientific identity based upon quantitative and qualitative measures."[553] So, just as the research conducted in Antarctica was often determined by the limitations of their instruments and other technologies, the cultural meaning of Antarctica was determined by measurements gleaned from by these same instruments. Further, any act of measurement, even with an instrument as simple as a ruler, is often subject to personal biases. For example, as documented by historian Jimena Caneles, English astronomer Francis Baily (1774-1844) spent his life trying to create a solution for the fact that "Each individual has some real or imaginary cause of preference for selecting the precise portion of the line or dot under consideration which may differ from another person."[554] Despite attempted controls of the physical environment in which the work was undertaken, and the behavior of the scientists, there has never been a solution for this problem. In fact, while measuring may seem an easy or straightforward activity, the privilege status of exact

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[552] Helen M. Rozwadowski, David K. Van Keuren, and Keith Rodney Benson, "Introduction," in *The Machine in Neptune's Garden: Historical Perspectives on Technology and the Marine Environment* (Sagamore Beach, MA: Science History Publications, 2004). xiii

[553] Chandra Mukerji, "Scientific Techniques and Learning: Laboratory 'Signatures' and the Practice of Oceanography," in *Invisible Connections: Instruments, Institutions, and Science*, ed. Robert Bud, Susan E. Cozzens, and Roy F. Potter (Bellingham, Wash.: SPIE Optical Engineering Press, 1992), 102–29. 102

[554] Quoted in Jimena Canales, *A Tenth of a Second: A History*, (Chicago, Ill.: University of Chicago Press, 2011). 39

measurements in science were themselves a result of a history of complex negotiations. But despite this problem, without an instrument to measure the exact temperature or a chronometer to determine the exact coordinates, any person not there would have no context or basis for imagining the continent.

Bruno Latour has argued that an instrument is "any set-up, no matter what its size, nature and cost, that provides a visual display of any sort in a scientific text"[555] whose role is to translate knowledge from place to place. But, for the purposes of this chapter, the definition of scientific instruments, will extend to any use of technology that allowed for either the practice of science, or continued survival and comfort for the men at each station. As there is no singular definition for "scientific instrument," [556] by vaguely assuming that instruments are "crafted artifacts"[557] that serve as "the technology of science" and are designed to convey authority and meaning to audiences[558] able to interpret their readings, this chapter will be able to address a variety of aspects in the history of Antarctic technoscience.

This chapter examines how scientists used instruments on two bases during 1956-8. At Shackleton Base, for the TAE, I will discuss the usage of four specific pieces of equipment, thermometers, watches, and microscopes, all of which seem most basic and ordinary, and the IMPS, a cutting edge physiological device, to highlight ways that manufacturers saw Antarctica as a laboratory, to study improvements to their wares, and the ways that researchers determined the accuracy of instruments in the field. At the Royal Society Expedition to Halley Bay, I

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[555] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Milton Keynes ; Philadelphia: Open University Press, 1987). 68
[556] Deborah Jean Warner, "What Is a Scientific Instrument, When Did It Become One, and Why?," *The British Journal for the History of Science* 23, no. 1 (1990): 83–93.
[557] Davis Baird, *Thing Knowledge: A Philosophy of Scientific Instruments* (Berkeley, Calif.: University of California Press, 2004). xv
[558] Albert van Helden and Thomas L. Hankins, "Introduction: Instruments in the History of Science," *Osiris* 9 (1994): 1–6. 5

examine equipment usage more broadly, arguing that at Halley, the science workers adapted a culture of improvisation which applied to their equipment, and extended as far as medical treatment and ink. It is necessary to tread lightly with the question of how instruments fail in extreme environments such as Antarctica. For instance, it is not always possible to trust those writing about the functionality of their instruments. For example, George Lowe, the photographer for the TAE, wrote in autobiography published shortly after the expedition that he used Kodak on all of his cameras because he "found it excellent under all conditions…the most adaptable to all temperatures."[559] But that this praise for Kodak, along with other passages praising Kodak's reliability, could be in thanks for their free supply of not only film, but a "small and beautifully equipped darkroom."[560] Roy Carlyon, a surveyor in the New Zealand Party countered Lowe's comments, writing in his diary that he believed Kodak had "too course a grain for plotting purposing and I intent to use my own…next summer."[561] After all, as Steven Shapin has argued, it is trust, and not empirical verification, that is the basis of knowledge.[562] We know that Kodak worked well in Antarctica, because the most famous photographer on the continent proclaimed its benefits. It can get tricky to choose whom to trust in regards countering claims about equipment.

But more importantly, the history of instrument use in extreme environments can, if not treated carefully, easily become tedious. In the words of historian Stephen Pyne, "they soon all look alike…there is a limited repertoire of tropes and breakdowns possible; only so many times can the wheel of a Mars rover stick in the sand, only so many capacitors can malfunction, only so

[559] George Lowe, *Because It Is There.* (Portway, Bath: Cedric Chivers Ltd., 1965). 210
[560] George Lowe, *Because It Is There.* (Portway, Bath: Cedric Chivers Ltd., 1965). 213
[561] Personal Diary of Roy Carlyon June 14th, 1957 University of Canterbury Antarctic Collection
[562] Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: University of Chicago Press, 1995). 36

many ways can a spacecraft or submersible exhaust its power reserves."[563] It is easy for a chapter about malfunctioning instruments to turn into a boring litany of devices breaking and then being fixed. But this chapter is not just a story of equipment breaking and then being fixed. While this chapter will highlight the importance of instruments to Antarctic science and exploration in the 1950s, it will show how the success and failure of instruments in the field were not necessarily due to the technology itself, but were products of particular institutional, environmental, and human relations. As a result, instrumentation in Antarctica reveals how scientific knowledge is in fact a creation, born of negotiations between social, environmental, and technological negotiations.

Shackleton Base and the Trans-Antarctic Expedition

As expounded in greater depth in Chapter Two, dozens of other firms donated, loaned, or drastically reduced payment for equipment to be used on the well-publicized Trans-Antarctic Expedition, eager to see how their instruments would hold up in Antarctic conditions. For example, R.W. Addie Philips Electrical LTD donated tape recorders, "wondering for a long time how these two tape recorders were getting on in the extremely severe conditions."[564] Hanne Nielsen has shown that manufacturers and corporations often used products taken to the Antarctic for advertising purposes.[565] Anticipating the conditions of the expedition, H.C. Troldahl, a firm of Frigidaire units, primarily serving the north of England, lent a refrigeration unit with a thermoset control, capable of dropping to -43°C to the TAE glaciologist Hal Lister, in order to test equipment functionality at extremely low temperatures.[566] But even with simulating

[563] Stephen Pyne, "Extreme Environments" *Environmental History* 15 (July 2010): 509–513. 511
[564] Letter to C.R.L. Parry from R.W. Addie Philips Electrical LTD 23rd Sep 1957 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[565] Hanne Nielsen. "Not For Sale?: Representations of Antarctica for Commercial Purposes." Unpublished Dissertation. (University of Tasmania 2017).
[566] Letter from Letter from Hal Lister to H.C. Troldahl Ltd 20th July 1956 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

Antarctic conditions, there was nothing like the real thing, often to the chagrin of TAE members. Geoffrey Pratt, the geophysicist on the TAE, recalled in a lecture to the Physical Society's Expedition in January 1959, when recounting the vast array of instrument malfunctions on the expeditions, "equipment which worked in a cold chamber would refuse to do its duty in Antarctica at considerably higher temperatures."[567]

The McArthur Microscope

One person which was interested in capitalizing on the publicity of the TAE both for marketing purposes as well as to study how his device held up under Antarctic circumstances was Dr. John McArthur, the creator of the McArthur microscope. McArthur, a Glasgow born physician, designed a very portable microscope which used folded optics in the form of prisms to miniaturize the optical path. This instrument was stimulated by his study of malarial parasites and his need for a portable microscope which could be used in any climate and was further inspired by the newly invented compact camera. He subsequently came up with many other features which made his microscope a most practical instrument, especially in harsh environments. In McArthur's words: "A portable microscope, to justify its existence, should have the following qualities; It must be light; it must occupy little space; and at the same time must be sufficiently robust to meet the extra strains imposed upon a portable instrument. It should, if possible, be operable in the hand without a table; [and] it must be ready for use without a great deal of setting up and adjustment."[568] To meet these necessities for a microscope which could be used in the field, he designed an instrument "small enough to go into the pocket,"[569]

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[567] J.G.D. Pratt, Speech delivered at the Physical Society's Exhibition on January 21st, 1959 Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE

[568] John N. McArthur. "A New Type of Portable Microscope" *Journal of the Royal Microscopical Society* no. 54 (1934): 182-5. 182

[569] John N. McArthur. "A New Type of Portable Microscope" *Journal of the Royal Microscopical Society* no. 54 (1934): 182-5. 183

consisting of an eyepiece looking downwards and two reflecting surfaces which pass light from the object of study into the eyepiece.

By the 1950s, the primary way that McArthur advertised his microscope was in terms of its capacity for use in an array of extreme environmental conditions. He boasted that his microscope had been "tested in practical medical and scientific work under every variety of circumstances… from the tropics to below-zero conditions…Among its more spectacular experiences…it was used successfully by the 1954 Everest Expedition-and so proved its ability at below-zero temperatures-in the search for the "Abominable Snowman", and it was inconspicuous enough to be smuggled past Japanese sentries in a prison-camp during the war…It has been used in an African dug-out canoe, in an open boat in the Atlantic, and on health survey in the interior of Sarawak. It has identified malaria parasites while in mid-air over the South China Sea, pathological specimens over the Alps, and medical histology slides in the London "Underground". It has been carried by breeches buoy to a lighthouse in the Atlantic, dropped from a high shelf, and run over without damage by both wheels of a motor car… while it has been said that it would not be out of place-so small and attractive it is-in the handbag of the lady of fashion."[570] But, argued McArthur's marketing material, "in addition to its more adventurous career it provides all the advantages described for original research, and an image which satisfies the most critical microscopist."[571] Despite all of the experience that the McArthur telescope had in a number of projects around the world and its assurance that it was "tropicalized and arcticised,"[572] its creator was eager that his instrument be tested in that most remote and extreme

[570] John N. McArthur. "Introducing the McArthur Microscope: A revolutionary high power research microscope with unique abilities." Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[571] John N. McArthur. "Introducing the McArthur Microscope: A revolutionary high power research microscope with unique abilities." Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[572] John N. McArthur. "Introducing the McArthur Microscope: A revolutionary high power research microscope with unique abilities." Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

of locales. For McArthur, the TAE represented an opportunity for the perfection of the instrument that he had dedicated his life to improving, a virtual geographically laboratory, as well as an international stage in which to publicize his business.

In September 1955, McArthur, who had previously supplied the British North Greenland Expedition (1952-4), contacted Vivian Fuchs with a proposal. He wrote "regarding a completely new form of high power microscope which I have designed for field and laboratory work under conditions such as will be experienced in the Antarctic…This microscope has been designed among other things particularly for work at extremes of temperatures and under very difficult conditions, and I think a number of its applications would interest you…"[573] Nine days later, after a telephone conversation with Fuchs, McArthur agreed to loan "one basic microscope ready for your Expedition in November, equipped for medical work" which would accompany the TAE's Advance Party aboard the *Theron* and be used by Dr. Rainer Goldsmith, the Party's physician. Within six months, McArthur would have ready "for the same microscope, equipment for glaciology and petrology, including electric illuminator for work at extremely low temperatures…" He added that in his own cold chamber tests, "the microscope appeared to work satisfactorily, mechanically, optically and electrically at - 40 degrees."[574]

Having provided the Advance Party with the use of a microscope, within a year's time, McArthur was eager to discover how it had performed in the Antarctic. In October 1956, he corresponded with Dr. Allan Rogers, scheduled to soon depart to the Weddell Sea as the physician for the Crossing Party, writing "I understand that you will be leaving for the Antarctic in the middle of November. I haven't liked to bother the Expedition with enquiries about how the

[573] Letter from John McArthur to Vivian Fuchs September 10th 1955 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[574] Letter from John McArthur to Vivian Fuchs September 19th 1955 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

microscope behaved, and will be glad to know in due course." In fact, wrote McArthur, he had spent the year making improvements to his microscope, and wondered if Rogers would like to have a new model to take with him "just in case the instrument sent there has developed any unexpected fault, due for example, to the extreme cold…I would be very happy to make the exchange, for I would much rather be confident that you have a sound instrument; and from your point of view it would have the advantage of having a more up-to-date illuminator, for the earlier one was a rough prototype…" So that McArthur could see the effects of Antarctica on the microscope, "I would be glad to let you have a new instrument to take with you, and you could then have the previous one, now in the Antarctic, returned to me later, especially if it is found in any way to have deteriorated."[575] Rogers and the TAE agreed to McArthur's proposal and departed for the Antarctic with a new microscope.

When Rainer Goldsmith returned to the UK aboard the *Magga Dan*, McArthur requested both the microscope and the doctor's opinion of its functionality at Shackleton Base. Goldsmith thanked McArthur for the "loan of this ideal expedition instrument" and further requested that he keep the device a bit longer, just to use in lectures about his work in Antarctica. As far as the microscope's functionality, while he had "little opportunity to use it during my year... It does seem to be the ideal instrument for this type of work." The young and healthy expedition members had minimal need for a doctor,[576] but "I did however try the microscope on a number of occasions and it worked well, as did the light unit which was particularly welcomed in our non-electric days.,"[577] hence even being used for functions for which it was not intended.

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[575] Letter from John McArthur to Allan Rogers October 2nd, 1956 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

[576] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958*. (Boston: Little, Brown, 1959). 121

[577] Letter from Rainer Goldsmith to John McArthur April 30th, 1957 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

Although McArthur "was glad the microscope gave you good service" and "delighted" to lend it to Goldsmith for lecture purposes, he requested "that you let me have it back to check over to see that all is well still. This would be valuable to me to see whether there are any effects of cold on it."[578] Armed with Goldsmith's testimony, the international attention being paid to polar research during the IGY, and the first model he sent to Antarctica, McArthur continued to tinker with his microscope.

After the conclusion of the TAE, where the microscope had been primarily used by Rogers, glaciologist Dr. Hal Lister, and the South African meteorologist Johannes LaGrange, McArthur reached out to the Management Committee of the TAE, reminding the committee of their relationship: "In 1955 I supplied you with a microscope….As a precaution lest the microscope had suffered damage due to the cold…. and sent a further microscope, which was taken by Dr Rogers..." Again, he requested that they send him their used microscope, writing "I understand that the second microscope was used on the journey across the Antarctic, and that it did its work satisfactorily. This instrument would be of great interest to me for study to see how both the mechanism and optics should up to the conditions of cold and travel." Rather than just take the microscope, he offered to exchange the microscope for "a more recent model which has now been completed." Not only would McArthur "prize the older instrument highly as my small contribution to the scientific work of your expedition… my study of the instrument used would be of value for further polar work."[579] Rogers agreed to this exchange and sent McArthur the microscope which had made the Antarctic Crossing.

[578] Letter from John McArthur to Rainer Goldsmith May 2nd, 1957 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[579] Letter from John McArthur to the TAE Headquarters December 4th 1958, Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

Armed now with this new information, McArthur continued to give "a good deal of thought to the designing on an instrument definitely for polar work, which will not only survive the cold, but which can be used under the most adverse conditions." He conceptualized an instrument that it should be capable of highpower work while held in gloved hands at the lowest temperatures and in high winds, with its internal illumination for darkness, and with batteries kept warm and therefore live in the clothing." He wrote, in 1959 to Vivien Fuchs for his "criticism and advice before it is regarded as finished."[580] For McArthur, Antarctica represented a living laboratory for testing his magnum opus. Before it accompanied the members of the TAE to the continent, he boasted that his microscope could withstand the most extreme of conditions. Studying the instrument itself as a record of the difficulties Antarctic research, he created a device that he truthfully could claim to withstand any environment. By sending two microscopes to the test site of Antarctica, he adjusted the instruments to what he believed were ideal polar conditions. Notably, McArthur never visited Antarctica. Staying in the UK, his microscopes experienced the Antarctic conditions, allowing him vicariously visit the continent and to conduct polar research without ever leaving home, making a long-term contribution to the future of polar research.

Although, for many scientists, microscopes represent the most mundane of scientific equipment, they actually come freighted with cultural meaning. Donna Haraway famously argued that instruments that aid in vision "have been used to signify a perverse capacity-honed to perfection in the history of science tied to militarism, capitalism, colonialism, and male supremacy."[581] In fact, in 1900, British medical doctor Ronald Ross expressed the idea that "in

[580] Letter from John McArthur to Vivian Fuchs March 9th, 1959, Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[581] Donna Haraway "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14, no. 6 (Autumn, 1988): 575-599. 581

the coming century the success of Imperialism would depend largely upon success with the microscope."[582] Microscopes and other instruments of sight like telescopes, have the ability to turn things too large, small, or distant to be comprehended into data that can be catalogued and processed. Microscopes make manifest the allegory of *La Nature se dévoilant à la Science,* which makes, according to Carolyn Merchant[583]and Lorraine Daston and Peter Galison,[584] a natural world that is passive, feminine, and able to be revealed through the right instruments. Yet in the case of McArthur's microscope, the microscopes serve a different purpose. For Goldsmith, while he admitted that the microscope never malfunctioned, the most useful aspect of the instrument was its built-in flashlight. For Lister and Stephen's work on glaciology, McArthur's microscope gave them the ability to capture and analyze snow crystals. But on a larger scale, the men at Southice were constantly threatened by engulfment by snow crystals, and they, rather than simply passively revealing themselves to scientists, represented the biggest threat to their safety. Nothing about understanding the structure of snowflakes, would make them less of a threat. A microscope creates the image of dominating an unknowable object from nature, but that power is ultimately an illusion.

Watches and the TAE

McArthur was not the only instrument maker eager to provide his wares for the TAE. But while the microscope company was relatively small and specialized, many larger corporations, with a more regular market for their supplies, believed that they could greatly benefit from the publicity associated with their products engaging in a Trans-Antarctic voyage. One such instrument, with a market well beyond academics and explorers, is the watch. For the TAE, three

[582] "The Malaria Expedition to West Africa." *Science* 11, no. 262 (1900) 36-37. 36
[583] Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution*. (New York: HarperOne, 1990). 189–190
[584] Lorraine Daston and Peter Galison, *Objectivity*. (New York: Zone Books, 2007). 244.

major watch companies vied to supply Fuchs' men with their time pieces: Messers. Baume & Co., Rolex, and Smith's of England. Of course, to accept one offer would mean to decline all others; exclusively was a prerequisite for donation.[585] Baume's offer of Longines wrist watches for each man was dismissed almost immediately; despite their firm's operation in London since 1840 and their experience supplying watches for the South Georgia Survey, since they were not British, they could not be seriously considered. George Lowe, acting for Hillary, rejected the same offer on behalf of the New Zealand Party.

R.A. Winter, Director, the Managing Director of the Rolex Watch Company in London made an extremely dogged fight to supply the TAE with a self-winding Oyster model wristwatch. While eventually, his firm ended up supplying the Royal Society Expedition, he wrote to Fuchs enquiring if "you are interested in my Company's offer to supply these watches entirely free of charge for the use of your expedition"[586] With apparent chagrin, Fuchs responded that since he was fielding the same offer from many different firms, he could not possibly make a commitment to Winter. He wrote: "I may say that I have used a Rolex watch for many years in various parts of the world including Africa and the Antarctic so I am well acquainted with their excellent performance" but, "In the case of certain articles, several firms have made identical or nearly identical proposals and it happens that this is the case with watches."[587] He requested that Winter keep his offer open a bit longer. Winter continued to press his case, noting that while "Rolex is not a big Company in comparison with certain others and we are not in a position, I am afraid, to assist on the financial side of your Expedition… but what we are in a position to do is

[585] Letter from D.H. Barrett to David Stratton August 8th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[586] Letter from R.A. Winter to Vivian Fuchs March 8th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE
[587] Letter to R.A. Winter from Vivian Fuchs March 15th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE

offer your and the members of your team what we consider (and what is really considered, I suppose, by the world) to be the finest wrist chronometer time piece for your job you are going to do."[588] He also sent Fuchs a self-winding Rolex Oyster "Turn-O-Graph" model, which sold to the public for approximately £60, to wear and test until a formal decision regarding wristwatches had been made.

Fuchs opted to retain the watch for testing and between March and September 1955, Winter continued to write to Fuchs, not only arguing for the physical attributes of Rolex timepieces: "really, in my opinion, the answer to personal wear timekeeping on such a rigorous expedition and test. For example, the very fact that it is self-winding means a lot when temperatures are well below Zero…", but also its history of use in similar expeditions: "I do know, nevertheless, that Brigadier Sir John Hunt, Sir Edmund Hillary, Dr. Charles Evans, Mr. Eric Shipton and many more leader of expeditions have had nothing but praise-not just for the use of our watches, but for the service we have been able to give them during and since their expedition."[589] Even after Fuchs' formally declined Rolex's offer in September, returning the borrowed Oyster, Winter did not give up writing "I do feel that the advantages which our type of watch offers to such an Expedition as yours should outweigh, possibly, any agreement made." He requested an in-person meeting with Fuchs when he could both present the borrowed Oyster as a gift, and also "without wishing to extol the virtues of my own products, I could at least demonstrate to you the advantages of a perpetual watch."[590]

[588] Letter from R.A. Winter to Vivian Fuchs March 21st, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE
[589] Letter from R.A. Winter to Vivian Fuchs July 26th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE
[590] Letter from R.A. Winter to Vivian Fuchs September 6th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE

The Rolex Oyster "Turn-O-Graph", which Winter eventually successfully supplied to the International Geophysical Year Royal Society Expedition, would surely have the physical qualities most important to the men of the TAE. A consummate salesman, Winter pontificated that "The use of a waterproof watch which winds itself is surely of paramount importance to people in Polar conditions-particularly to those engaged in navigation-who must have an accurate knowledge of the time without being in a position, physically, to wind their watches. One can well imagine that, after a hard day's work and wearing several pairs of mittens, these people might not be able to carry out this simple task-particularly if they were exhausted-with the result that their work the following morning might well depend upon the receipt of possibly non-existent time signals."[591] Fuchs did agree to a luncheon with both Winter and his father, and while he was forced to decline Rolex's offer, he wrote to Winter just before departure south, praising his watch: "The 'Turnograph' is first class; I have not altered or wound since our luncheon."[592]

While Fuchs clearly liked and perhaps even preferred the Rolex watches, a much larger company, Smith's English Clocks Ltd, a subsidiary of Smiths of England Group of Companies, one of the largest instrument firms in the world, made the TAE a virtually indeclinable offer, where they "should have the exclusive opportunity of supplying the Expedition with all instruments etc. in our field, which is a comprehensive one as we cover motor transport, aviation, marine and industrial instruments, apparent from all forms of clocks and watches."[593] Smith's campaign to supply the expedition, while having much more to offer, had begun in a similar way

[591] Letter from R.A. Winter to Vivian Fuchs September 6th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE
[592] Letter to R.A. Winter from Vivian Fuchs November 12th, 1955, Scott Polar Research Institute Archives MS 1326 Box 6 Instruments CTAE
[593] Letter from D.H Barrett to David Stratton August 3rd 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE

to Winter's attempt. As early as January 1955, W. Hutton, Smith's Advertising Manager, reached out to the President of the Royal Geographical Society writing that to "immediately offer you my firms help by supplying Watches, Clocks and any other timing equipment that may be necessary. I have no doubt that the other divisions of Smiths group of Companies will likewise give their support… as the proposed Expedition is a British venture, we do hope that as far as possible British made equipment will be used."[594]

Besides their ability to provide the TAE with most of their instrument needs ranging from wall clocks to tide gauges, Smith's could also claim a history of providing for historic British expeditions including: Kangchenjunga Reconnaissance, British South Georgia Expedition, Cambridge Himalayan Expedition, Oxford University West Nepal Expedition, and British Mount Everest Expedition. More poignantly, Smith's had provided the instruments for Scott and Shackleton's polar expeditions during the Heroic Age. While Shackleton famously dropped his watch in the Weddell Sea, a symbolic gesture to his men, Smith's actually possessed Scott's watch, which, after at least forty years in their museum, was still in good working order. Not only could Fuchs continue with Scott and Shackleton's legacy if he used instruments from Smiths, he would even have the opportunity to carry "this historic watch to use on the expedition. It will thus make its second journey to the Antarctic and on this occasion we sincerely hope it will cross Antarctica."[595] Beyond their Britishness and connections to instruments beyond watches, Hutton also believed that his watches would have the ability to

[594] Letter from W. Hutton to Laurence Kirwan January 12th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[595] Letter from D.H. Barrett to David Stratton August 8th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE

survive in cold climates: “These watches have been tested under severe conditions, and we are sure they will stand up to the extreme condition which will be imposed on them.”[596]

Through the combination of their extremely financially valuable offer, as well as their historical connection to the very expedition that the TAE sought to emulate, it was determined that Smith’s would provide forty wristlet watches “with screwback waterproof cases, luminous dials, unbreakable mainsprings, strengthened bars, and solid leather straps. The movements will be specially timed and lubricated.”[597] Regarding Scott’s watch, David Stratton, Fuchs’ second-in-command, accepted on his behalf, reflecting that “As far as Captain Scott’s watch is concerned I don’t know which is greater-the honour or the responsibility.”[598] Smith’s almost immediately capitalized on their association with the TAE. Besides presenting Fuchs with Scott’s watch in a formal ceremony, they requested that Fuchs be a part of an advertising campaign for their de Lux watches featuring the hands of famous people. Fuchs, while not “particularly enamoured of having my large and unlovely hands publicised as you suggest. However, we are much indebted to the Smith’s Group and if you cannot think of a prettier set of digits, I will cooperate.”[599]

For the New Zealand Party, it seemed that these watches were adequate for the purposes of expedition members, despite that Smith’s sledge meters had “travelled in the “Endeavour” submerged in about four feet of salt water. The die-casting around the windows of the meters

[596] Letter from Vivian Fuchs to W. Hutton January 16th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith’s Instruments CTAE
[597] Letter from D.H. Barrett to David Stratton August 8th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith’s Instruments CTAE
[598] Letter to D.H. Barrett from David Stratton August 10th 1955, Scott Polar Research Institute Archives MS 1326 Box 16 Smith’s Instruments CTAE
[599] Letter from Vivian Fuchs to W. Hutton September 20th 1956, Scott Polar Research Institute Archives MS 1326 Box 16 Smith’s Instruments CTAE

had, in some cases become corroded with the action of the salt water."[600] Perhaps in atonement for this carelessness by the New Zealand Party, in the Autumn of 1957, Hutton was forwarded a telegram from Edmund Hillary reading "Expedition members using Smiths watches find them very satisfactory despite rough handling and cold temperatures stop alarm clocks have been particularly useful for sledging parties."[601] Neil Stanford, an IGY scientist at Scott Base who was provided a watch as well, wrote in his diary about his watch stopping, the face cracking, and gaining 19 seconds per day, both in the field and at the base, but did not indicate any serious frustrations.[602] But for the British Party, their wristwatches caused no end of trouble from almost the beginning. As early as April 1956, the TAE headquarters in London reported to Smith's that "I am afraid we had a considerable account of trouble with our watches for the Advance Party."[603] Later they even received a telegram from the Advance Party: "one Smith's watch useless and two giving much trouble can you please replace?"[604] Stratton even called the watches "defective" and "disappointing."[605] Memoirs from Fuchs, geologist Jon Stephenson, and photographer George Lowe, all mention requiring repairs to clocks and watches at some point during the expedition.

The watches' defectiveness seemed to stem from its general "stopping without provocation at odd times during the day" perhaps due to "that the 'gravel pin' is too long causing

[600] Letter from C.R.L. Parry to S. Cope October 22nd 1957, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[601] Letter from C.R.L. Parry to W. Hutton Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[602] Personal Diary of Neil Stanford, Curtsey of New Zealand Antarctic Society, Christchurch, New Zealand
[603] Letter from David Stratton to W. Hutton April 10th 1956, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[604] Letter from David Stratton to W. Hutton September 17th 1956, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[605] Letter from David Stratton to W. Hutton September 17th 1956, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE

locking of the balance wheel."[606] These problems persisted throughout the entire expedition. Upon the Party's arrival in Wellington after their successful crossing, Mr. Randall, the Export Director of Smith's Clock and Watch Division arranged a cocktail party in honor of the men. At this event, Fuchs confronted Randall "concerning the behaviour of the products supplied by the Smiths Group during [our] long and gruelling journey."[607] His assessment of the watch was so condemning that when the company offered each expedition member an engraved golden watch in acknowledgement of their achievement, Fuchs telegrammed the TAE headquarters. He wrote that he "fe[lt] embarrassed by report given Randall of Smiths by which I stand and request you ascertain if they wish to withdraw"[608] their offer. Geoffrey Pratt, who, was described as "something of an instrument freak, proud of his very accurate watch,"[609] completely declined the offer. As the geophysicist, Pratt was responsible for all tidal and seismic work, and he was perhaps the most frustrated by these malfunctioning instruments.

Fuchs' trouble and fairly open dislike of the Smith's watches resulted in a letter from Ralph Gordon-Smith, the Managing Director of Smith's and Sons Ldt. He wrote that he "was sorry to hear of the trouble you had with the watches and we have practically established this was on account of the oil gumming up." He defended his company's intentions, simultaneously reminding Fuchs of the costs that Smith's bore in connection to the TAE: "We anticipated the possibility of problems in this connection and went to a lot of trouble and, indeed expense, in an effort to avoid them." He then proposed that Fuchs's experience would improve the future of

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[606] Letter from Rainer Goldsmith to W. Hutton September 24th 1957, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[607] Letter from Ralph Gordon-Smith to Vivian Fuchs May 19th 1958, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[608] Telegram from Vivian Fuchs to TAE Headquarters April 28th 1958, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE
[609] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 33

Smith's products: "In consequence of this, we have now decided to employ our own lubrication experts and to set up a little oil refinery. It would be most helpful to us if the watches could be returned for examination. We would be happy to renovate them and return them in perfect working order."[610] In response, Stratton was "able to collect some of the wrist watches which failed also one which did well; perhaps your technical staff would be interested."[611]

Smith's, in the meantime, continued to use their connection to the TAE in their advertisement for their A460 'Antarctic' model, proclaiming "Fuchs and Hillary relied on Smith's. We are proud that Smith's watches, timing devices and instruments generally have aided the gallant members of the great Trans-Antarctic Expedition." Again, using affiliations with Antarctica to sell products, specifically watches, in fact, is not usual, as shown in greater depth by Hanne Nielsen.[612] Rolex, after providing material for the Royal Society Expedition also used their affiliation with the Royal Society Expedition in their advertising material. The same Oyster Perpetual that Winter gifted to Fuchs was marketed as "The Explorer" and advertisements claimed that "To the International Geophysical Year, Rolex makes important contribution. For example, Rolex is timing the intensive explorations of the universe by the Royal Society of London, world's senior scientific body. Rolex watches are always being found where frontiers are being advanced." Whether the watches behaved satisfactorily or not, for watch companies, while in part acting as a laboratory for improving their devices, Antarctica served as a tool of legitimization. Once their device had been in Antarctica, regardless of how it functioned there, it was superior, more masculine and heroic, than a watch which had not.

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[610] Letter from Ralph Gordon-Smith to Vivian Fuchs May 19th 1958, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE

[611] Letter from David Stratton to W. Hutton May 23rd 1958, Scott Polar Research Institute Archives MS 1326 Box 16 Smith's Instruments CTAE

[612] Hanne Nielsen. "Not For Sale?: Representations of Antarctica for Commercial Purposes." Unpublished Dissertation. (University of Tasmania 2017).

Watches have long been an important piece of equipment for polar travelers. On a featureless plateau such as the inland ice of Antarctica, knowing the time of day was vital in order to ascertain longitudinal geographical position. In Antarctica, this is compounded, as for half the year there is virtually no daylight, and half the year there is no darkness. Without a functioning timepiece, there is literally no way to ascertain time. Additionally, Antarctic research programs, particularly when they were in their infancy, required a great deal of coordination, which largely depended on timing. At Scott Base, for example, "The time service was provided by two independent systems," a quartz clock and a mechanical chronometer, which provided support "whilst the vagaries and irregularities of the base electrical system were being rectified."[613]

Historically, quality timepieces and survival were closely linked. In fact, during his daring escape from Elephant Island to the Island of South Georgia in 1916 during the Imperial Trans-Antarctic Expedition, navigator Frank Worsley used "This English chronometer, and excellent one of Smith's was the sole survivor, in good going order, of the twenty-four [timepieces] with which we set out in the *Endurance.*"[614] While her account can be criticized as hyperbolically hagiographic, Dava Sobel has credited John Harrison's invention of the chronometer with saving the lives of millions and solving the greatest scientific problem of his time.[615] While for many people, watches function as useful accessories, in the Antarctic, accurate time pieces were vital for survival, let alone scientific research. The malfunctioning Smith watches show, in stark reality, how an expedition and even the reliability of the knowledge that it

[613] Hatherton, Trevor. *New Zealand IGY Antarctic Expeditions, Scott Base and Hallett Station.* (Wellington: R.E. Owen, Govt. Printer, 1961). 18
[614] Frank Arthur Worsley. *The Great Antarctic Rescue: Shackleton's Boat Journey*. (London: Sphere, 1979). 101
[615] Dava Sobel, *Longitude: The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time* (New York: Bloomsbury Publishing USA, 2010)..

produces, can come perilously close to failure through the breakdown in even the smallest and most basic of the technology on which it relies.

Thermometers at Shackleton

Unsurprisingly in such a climate, one of the most important, if perhaps simplest instruments to travel to Shackleton were thermometers. Thermometers were so vital to the expedition that although the TAE successfully solicited donations from several different firms including Messers G.H. Zeal, The British Rototherm Co. Ltd, Short & Mason Limited, Messrs. C.F. Casella & Co. Ltd, and Evans Medical Ltd, they paid out the expedition funds to have the majority of them calibrated and certified by the National Physical Laboratory, the national measurement standards laboratory for the United Kingdom.

But just like the wristwatches, not long after arrival, it became clear that some of the thermometers were simply not constructed for working in such extreme climates. Any instrument left outside quickly became choked by ice and snow, and measuring humidity was extremely awkward in the cold. Thermometers in particular "become coated with ice so that their scales are no longer visible until you have scraped it all off (and warmed the thermometer in doing so)."[616] But besides the difficulties of working in the extreme cold, the expeditions was plagued with what geophysicist Geoffrey Pratt called "thermometer nonsense."[617] In February 1957, Fuchs, Pratt, and meteorologist Hannes La Grange began to doubt the accuracy of their thermometers, "especially those reading +50° to -90° F."[618] They decided to use nine of the Assman thermometers, corrected by the National Physical Library as a standard and compare fifty

[616] J.G.D. Pratt, Speech delivered at the Physical Society's Exhibition on January 21st, 1959 Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[617] Letter by Geoffrey Pratt Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[618] Journal of Vivian Fuchs February 26th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ

doubtful thermometers of various kinds to the mean reading of these. Pratt then began a series of experiments, which I will detail, attempting to gauge the accuracy of their thermometers.

Pratt took the troublesome thermometers and compared them in four batches of about twenty, using "one particularly self-consistent group of 9 …in all batches as a standard."[619] He clamped each batch into a wooden framework, heavily padded with felt, and arranged in two rows so that half the batch could be read from either side of the framework; the nine standards on one side and eight to twelve others on the other side. They were then immersed vertically for half their length into a bath holding four gallons of water or kerosene. Pratt then stirred the liquid with a wooden paddle until he received steady readings from the standard group. He read the standards, then the others, the standards, the others, and then the standards again, stirring the bath between readings. In this experiment, the comparisons were made at 32°F, 10° F, and 0° F. Pratt prepared the 32°F bath from water and snow, and made his measurements indoors on the dining room table. He filling the tank with water from the kitchen, and then added snow to it. When the snow had ended its first rush of melting, the thermometers were put in and "the snow-and-water mixture stirred with a wooden paddle for 20 minutes or half an hours-roughly speaking."[620] Reading the thermometers two and a half times, as explained above, took Pratt "another half hour at least."[621]

For measurements at 10° and 0°, the baths were "of plain kerosene plus a little drift snow which got in willy-nilly; they were used out of doors in the shade at the ambient temperature."[622]

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[619] Geoffrey Pratt "Examination of Thermometers at Shackleton Base" Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[620] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[621] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958 Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[622] Geoffrey Pratt "Examination of Thermometers at Shackleton Base" Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE

Like the indoor measurements, the thermometers were left in the kerosene bath for half an hour's stirring, but the comparison readings were taken more slowly "because it is a clumsy business to carry out when lying in the snow in the cold."[623] Pratt added a cooling correction to the outdoor measurements, assuming that the baths were cooling at the rate of 1° to 2° per hour. For the outdoor measurements, Pratt acknowledged that he could have taken readings at lower temperatures later in the year, but "as so often happens, having something once dropped the temperature business and gone on to something else I never got back to the original job."[624]

While Pratt noted that "this procedure does not enable one to calculate corrections for the thermometers with any confidence," (testing the thermometers vertically, for example, when they are often used horizontally), they believed that if it they were at least deviating consistently at a somewhat lower temperature than the standard, they could be used confidently, taking account an appropriate correction. If they read higher, then he suspected that it might have an altered calibration and would still be useless. At the conclusion of the experiment, Pratt wrote that "It is hard to give any useful summary of the results of the comparisons, beyond saying that a considerable proportion of the thermometers examined appear to have suffered a change in calibration."[625] Fuchs' sentiment was stronger and he wrote that Pratt "found at the first test that at 32°F two of the minimum thermometers were reading 2 ½° too low! As we are reading to the 1/10th° this is not acceptable!"[626] Pratt even had tried testing the thermometers which had not been certified and calibrated by the National Physical Laboratory not "to see if their calibration had changed (since they never had any calibration), but were tested to see if any good ones could

[623] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[624] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[625] Geoffrey Pratt "Examination of Thermometers at Shackleton Base" Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[626] Journal of Vivian Fuchs February 26th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ

be found amongst them to bolster up the very meagre supply of trustworthy certified ones. As the figures show, no help was forthcoming in this way!"[627]

For Pratt, there were a number of lessons to be learned from his tests on the malfunctioning thermometers. First, he believed that many of the problems were caused by spirit (in alcohol thermometers) remaining on the walls of the thermometer's capillary; essentially "troubles arose from liquid being trapped in the wrong place,"[628] either in the safety bulb or on the capillary walls. Pratt was even more convinced of this theory since after he sent the misbehaving instruments to the National Physical Laboratory "Hannes tells me that some of the more outrageously low-reading thermometers were still misbehaving in much the same way when you received them, but that you managed to recover some liquid which had been well concealed in the safety bulbs and that they thereafter behaved well."[629] Pratt found the "magnitude of the wall-wetting drainage problem rather alarming. Our thermometers dropped about 25F° when going into the snow-and-water bath, and an hour later were still as much as ¼° out,"[630] a really drastic deviation. Second, the nine Assman thermometers which were being used as a standard functioned very well through the experiment and "it was obvious that these instruments always agreed well with each other, whatever bath they were in, and furthermore that they read convincingly close to 32° when in the snow-and-water baths."[631] These were

[627] Geoffrey Pratt "Examination of Thermometers at Shackleton Base" Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[628] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[629] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[630] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[631] Geoffrey Pratt "Examination of Thermometers at Shackleton Base" Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE

thermometers on which the TAE could rely and "can provide an excellent check for trapped fluid under Antarctic conditions."[632]

Since most of the problems with thermometers came from this "wall-wetting," not only should thermometers be stored in the cold outside before being checked, future expeditions should be equipped for drying out the inside of a thermometers. Fourth, since Pratt believed that most of the "deranged thermometers probably came to grief" in their voyage from London to Antarctica, it was necessary for greater care and knowledge to be taken for their safe shipping. Finally, as Pratt described himself as an "amateur" managing this project, "that there should be someone on the spot who is more than usually knowledgeable about thermometers."[633] He believed that "If these five lessons are not taken to heart then temperature readings are likely to be +1 F° or even more uncertain,"[634] an alarming prospect for those whose research depended on accurate temperature measurements.

The problematic thermometers were particularly troublesome at a facility like Shackleton Base where the instruments were literally built into the station. On the north facing wall of the building, in Fuchs' cabin, David Stratton arranged four thermometers along the wall. Five more were similarly arranged on the south wall of the living room and "Readings were taken at irregular hours day and night, but normally during the day at 2 to 4 hour intervals, at night less frequently,"[635] taking note of whether or not the window was open or closed. They also dotted the landscape, dwelling inside the meteorological screen, the snow "cavern" tunnelling from the

[632] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[633] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[634] Letter from Geoffrey Pratt to the National Physical Laboratory September 16th 1958, Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[635] Scott Polar Research Institute Archives MS 1326 Box 2 Indoor Climate Register CTAE

surface to the building's entrance, the bath waste pipe, and any other ventilators that they opened in the floor.

Consistent measurements of temperature in Antarctica really began for the first time during the International Geophysical Year. Many facts about Antarctica, such as its gradual warming, is based on comparing temperatures taken today to those gathered during and immediately after the IGY. The fact that the TAE was troubled with such ubiquitous problems with its thermometers suggests that these troubles were not unique to their expedition. This complicates, if not the veracity of temperature measurements made in this period, the stability of measurements taken by instruments not specifically designed for research in any specific geography. Since modifications of thermometer use were largely determined by a failure for technology to integrate with its environment, factors in the environment actually contributed to how temperature could and would be taken in the future. Finally, Pratt's thermometer experiments reveals several somewhat complicated problems in the nature of thermometry. It is, as termed by historian Hasok Chang, the problem of nomic measurement.[636] How could thermometers be tested for correctness when they need to be tested with help of other thermometers? As detailed by Chang, and demonstrated by Pratt, thermometers could be tested using the criteria of comparability. But how do we know if comparability is equal to accuracy? Ian Hacking might argue that an instrument consistently yielding expected results in a laboratory setting contributes to what he called its "self-vindication."[637] But regardless of the control thermometer's consistency or even accuracy, the TAE's "thermometer nonsense" troubles the

[636] Hasok Chang. *Inventing Temperature: Measurement and Scientific Progress*. (Oxford ; New York: Oxford University Press, 2007). Chapter 2.
[637] Ian Hacking. "The Self-Vindication of Laboratory Sciences." In *Science as Practice and Culture*, edited by Andrew Pickering, 29–64. (Chicago: University Of Chicago Press, 1992). 60

idea that instruments can tell scientists anything about their environment which does not fit into its design and function.

IMPS

While the bulk of this section has addressed relatively common instruments such as thermometers and clocks, the TAE certainly used more specialized and even cutting edge devices in their research. One such device was the Integrating Motor Pneumotachograph (IMPS). A physiological instrument, the IMPS measured the energy of men at work and rest. This device, worn over the face took samples of exhaled breath, and measured its total quantity. Chemical analysis subsequently undertaken combining the subjects' energy output with their energy input (calculated from caloric consumption), and considered in relation to their output, measured from body weight, fat thickness, clothing record, sleep record, meteorological data, and activity level. The calorie expenditure of the body would then be reflected over any period of time in the consumption of oxygen and the production of carbon dioxide. The IMPS collected a representative sample of expired air and storing it in glass ampoules for later analysis in the United Kingdom. Allan Rogers, the expedition's doctor and physiologist, had very high hopes for this device, which had only recently been developed by the Medical Research Council. In his proposal for ""The Physiological Programme for the Trans-Antarctic Expedition, 1955-58," he argued that the TAE was a unique opportunity for physiological work, little of which had been done on the continent. This sort of metabolic study, previously could only be done with "large, cumbersome" equipment, through the newly invented and "readily portable" IMPS, "a measure

of the calorie cost of Antarctic life and work [would be] obtained, it is believed, for the first time."[638]

Despite his high hopes, Allan Rogers had great difficulty getting the IMPS to work, "particularly the flowmeters which comprise a very delicate potentiometer actuated by the exhaled breath. Out of doors the whole thing would freeze up; in doors during sedentary occupations or whilst asleep the rate of flow fell and the instruments response became non-linear."[639] Rogers, "a master technician who could carry out the minutest repairs to the most delicate parts,"[640] and respected for "his ability to repair small instruments…had to make some modifications to his IMP equipment."[641] By the beginning of April 1957,"[642] after weeks of labor, he made these instruments work properly. Pratt, who was similarly interested in instrumentation, praised Rogers' success in "perfecting the flowmeters so as to behave properly under all conditions-a problem which had apparently been too much for people in England with good working conditions."[643] Very soon many members of the expedition submitted to the device, which functioned as a mask over the nose and mouth, where a small sample representative of the whole was collected in a plastic bag from which it was transferred to a glass ampoule for storage and analysis. His subjects would wear the mask into which they would breathe, while wearing a backpack and carry out their chores and responsibilities around the base while the equipment monitored their breath exhalations. According to Fuchs, it "was not

[638] Allan Rogers "The Physiological Programme for the Trans-Antarctic Expedition, 1955-58," Scott Polar Research Institute Archives MS 1326 Box 38 Physiology
[639] J.G.D. Pratt, Speech delivered at the Physical Society's Exhibition on January 21st, 1959 Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE
[640] Lowe, George. *Because It Is There.* (London: Cassell & Company, 1959). 160
[641] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 56
[642] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 56
[643] J.G.D. Pratt, Speech delivered at the Physical Society's Exhibition on January 21st, 1959 Scott Polar Research Institute Archives MS 1326 Box 49 Geoffrey Pratt CTAE

considered a popular pastime, but many submitted with fair grace."[644] In fact, he submitted to the instrument himself, and even though "It has the result of drying up the inside of the mouth…it has to be worn for only a half an hour this is of no matter though slightly uncomfortable."[645]

While the IMPS was only a minor inconvenience for most TAE members, Geoffrey Pratt again, found himself to be the "chief sufferer"[646] in regards to instrumentation. The inventor of the IMPS, H.S. Wolff, wrote that analysis of results "may be impossible to apply of access to the subject is limited," and if a subject could wear the instrument for at least 24 hours, "a more reliable estimation of energy expenditure could be obtained."[647] Since the longer the IMPS was worn, the more accurate the results, in August, Pratt "undertook to wear the 'IMP' (except for meals) night and day for a whole week."[648] Rogers too had an exhausting week, "doing everything that his energetic patient did, besides staying awake to make sure that the mask remained in place as he slept."[649] This last equipment was certainly a necessity as Pratt was both an extremely deep sleeper "who can be pushed and punched and shouted at in the morning without effect"[650] and additionally suffered from somnambulation.[651] Although Rogers "had to dance attendance on Geoffrey day and night, adjusting the 'IMP', changing it with every change of clothing, sealing off glass air samples, checking 'IMP' performance, weighing every item of

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[644] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958*. (Boston: Little, Brown, 1959). 121
[645] Journal of Vivian Fuchs April 13th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[646] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958*. (Boston: Little, Brown, 1959). 121
[647] H. S. Wolff, "The Integrating Motor Pneumotachograph: A New Instrument for the Measurement of Energy Expenditure by Indirect Calorimetry," *Quarterly Journal of Experimental Physiology and Cognate Medical Sciences* 43, no. 3 (July 1958): 270–83. 270
[648] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958*. (Boston: Little, Brown, 1959). 121
[649] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958*. (Boston: Little, Brown, 1959). 121
[650] Journal of Vivian Fuchs May 9th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[651] Lowe, George. *Because It Is There.* (London: Cassell & Company, 1959). 157

Geoff's food and assessing its calorie value," at the end of the ordeal, he had "a satisfactory piece of work completed."[652]

The same cannot be said for Pratt of the same experience. In fact, "Geoff can only look back on a period of irritation and waste of time."[653] For Pratt, wearing a face mask day and night was not only uncomfortable and restricting but a source of mental irritation, difficult to bear. Though Fuchs' commented that Pratt "stood the ordeal exceptionally well,"[654] it was clear that the whole experience was very irksome. Pratt actually submitted written comments to Fuchs and Rogers detailing the physical and mental toll that the IMP device took on both his work and physical comfort. For example, when strapped into the IMPS, the losing the regular use of his mouth meant that it was " impossible to blow away sawdust or filings, which greatly hinders work," and communication with other men was impossible because "You cannot call out to anyone to pass you something from the other end of the bench and when (as is often the case) two people are working together and more or less in each other's way, it becomes extremely difficult to achieve the close co-operation necessary in order to keep going."[655] It was also impossible to "smell or taste your fingers to see if they are clean,"[656] behaviour necessary during a water shortage, such as was the case at Shackleton. Further, "You never, for a single moment, escape from a suffocating feeling and a very conscious effort in breathing" and "It is not possible to move the head naturally; all movements have to be slowed to avoid swinging the mask off."[657]

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[652] Journal of Vivian Fuchs August 29th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[653] Journal of Vivian Fuchs August 29th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[654] Journal of Vivian Fuchs August 29th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[655] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ
[656] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ
[657] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ

Figure 10. Geoffrey Pratt[658]

Pratt, someone whose deep sleeping habits were widely joked about, found an excuse for "the string of breakfast[s] which I have missed or been late for," since "Sleeping with the 'IMP' is difficult and it is necessary to make great efforts to sleep very deeply if one is to sleep at all."[659] He also blamed a series of mishaps with his own research on wearing Rogers' instrument. He claimed that while suffering "continual nagging discomfort," his mental faculties were considerably impaired, and "Addition sums, which I normally get right nine times out of ten, only come out right two times out of ten."[660] In the course of Rogers' experiment, Pratt professed to "have done a remarkable number of stupid things, all apparently due to lack of adequate care and attention" including breaking compasses and thermometers, faultily loading camera film, upsetting bottles of ink, and knocking over stores. He chalked this up to the IMPS because while "Any of these things might be done any time, but not so many in a constant succession day after

[658] Depicts Geoffrey Pratt, Antarctica New Zealand Pictorial Collection
[659] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Scott Polar Research Institute Archives MS 1536/1; BJ
[660] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ

day for a whole week."[661] In sum, besides the general discomfort that he experienced, while wearing the IMPS, "one is quite unfit to do satisfactory seismic work."[662] When the experiment finally ended, both Rogers and Pratt were "greatly relieved that it is over [and Fuchs] told both of them not to discuss the subject until some time has elapsed and the 'full fresh horror' is over!"[663] But all of IMPS work came to little fruition. Though Rogers claimed in 1971 that the results would be soon published on his work at Shackleton where "an energy balance was carried on one man for a week,"[664] he suffered a massive stroke in 1981, causing him to be bedridden until his death in 1990.[665] As for the IMPS results, they "were corrupted by contamination of the breath samples from his subjects."[666] This work was never published.

The IMPS is an interesting example of a scientific instrument for several reasons. First, it represented a cutting edge technology which transitioned initially rather unsuccessfully into the Antarctic. Allan Rogers, in his capacity as a well-regarded instrumentalist, managed to adapt this instrument to polar conditions. When it was first brought south, it even required that its wearer be clean-shaven![667] Second, while generally the conditions of Antarctic living required the intercession of technology in order to both live comfortably, as shown by Rogers' research on acclimatization, and to conduct research, as shown elsewhere in this chapter, sometimes instruments could prove a hindrance to both mental and physical peace and successful

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[661] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ
[662] Geoffrey Pratt "On Being 'IMPED'" Journal of Vivian Fuchs Scott Polar Research Institute Archives MS 1536/1; BJ
[663] Journal of Vivian Fuchs August 29th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[664] Rogers, A. F., and R. J. Sutherland. "Antarctic Climate, Clothing and Acclimatization." Bristol University Department of Physiology, November 1971. Part II. 3
[665] Jane E. Buikstra and Charlotte Roberts. *The Global History of Paleopathology: Pioneers and Prospects*. (Oxford University Press, 2012). 179
[666] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 135
[667] Journal of Vivian Fuchs April 13th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ

interactions with the environment. Pratt imputed the IMPS with both a failure to navigate the base overall and to successfully conduct his research. Then, after all of the trouble not only for Rogers and Pratt, but for the many other IMPS volunteers, this research yielded few long-term results. For the TAE, which is often castigated for its lack of scientific achievement,[668] this experience can be seen as symbolic for their much of their experience with scientific research. It, like the TAE, started with the best intentions to do research that had never yet been accomplished, and resulted in uncomfortable and questionable results, only serving to undermine Pratt's research, or, to continue the analogy, the larger research program of the United Kingdom generally in Antarctica.

Royal Society Expedition to Halley Bay

The Royal Society Expedition planned extensively for the extreme environmental conditions that they expected to encounter in Antarctica. The Advance Party, led by David Dalgliesh, transmitted "valuable information both about the conditions and the performance of instruments which enabled [the Main Party] to make improvements."[669] Even before leaving for Halley Bay, the Royal Society used the potential pitfalls of the environment to construct novel technological solutions. For example, other than many of the more obvious hazards of the cold, wind, and snow, one of the main problems in conducting scientific work in Antarctica is the lack of electrical earth. This problem was exacerbated by the presence of the Halley Bay site on top of an ice shelf, giving it essentially no contact with the terrestrial surface. This contact is necessary for radio operations and to minimize interference between various pieces of scientific equipment.

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[668] See, for example, Stephen J. Pyne. *The Ice: A Journey to Antarctica*. (Iowa City: University of Iowa Press, 1986). 114-15; Stephen, Haddelsey. *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica*. (Stroud: History Press, 2011).; Klaus Dodds, *Pink Ice: Britain and the South Atlantic Empire* (London; New York; New York: I.B. Tauris, 2002). 69

[669] Brunt, David, "Royal Society International Geophysical Year Antarctic Expedition." *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies*, 1955-1959. (London: Royal Society, 1960-64). 4

This interference meant that the measurements made on one piece of equipment, most seriously the radio astronomy radar and the ionospheric sounder, could be picked up on another, precluding their measurements. In preparation for this problem, the scientists and electricians gathered together all of the radio and radar equipment for five days the summer before departure to devise a pragmatic solution to this issue. Their final solution was to work out a schedule between all of the different scientist so that whenever mutually interfering equipment was being used, the other piece would be shut off.[670]

Yet despite their intense preparation, they still often found their work frustrated by the environment. For example, despite their plans to limit interference, for most of 1956, "electrical noise…caused considerable radio interference in the early days of the establishment of Halley Bay." Initially, when, in late January a small transceiver was installed, "good reception was obtained there being no apparent external noise with the exception of static produced by drifting snow from time to time." In February, the Party installed a generating set, connected to the receiver with a TRS cable and "there was an immediate and significant increase in the noise level on the receiver" and "proved to be quite disastrous in that non but the strongest signals could be heard above the noise level." After months of trial and error with the power unites and constructing filters, they decided to "float the mains symmetrically about a central earth return line…and it was found possible to operate our receivers on all frequencies in the spectrum 500 ko/s to 30Mc/s." This taught the Royal Society Party an early lesson that "no trials under the best obtainable controlled conditions in establishments possessing a 'real earth' can approximate to the experience gained at this station."[671]

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[670]Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 14-15

[671] G.E. Watson. "Electrical Interference Suppression at Halley Bay during the Period 21st January 1956 to 5th September 1956." December 15th, 1956 New Zealand National Archives CAYP CH3805 2802 Box 22 International Geophysical Year: Scientific Programme and Equipment

This problem was electronic resistivity was felt elsewhere in the Antarctic as well. For example, at Pram Point, on Ross Island where New Zealand's Scott Base is located, except for the top 5-10 centimeters for a short time during the summer, the ground is permanently frozen, increasing its resistivity to electrical currents.[672] And while "a knowledge of the ground resistivity at Antarctic stations is required in connection with the design of earthing systems, radio communication aerial systems, and earth current equipment, practically no measurements had been made before stations were established for the IGY."[673]

Another problem that they anticipated ahead of time was the difficulty constructing the geomagnetic observatory. In order to make geomagnetic observations, meteorologist and eventual base leader Joseph MacDowall used extreme sensitive La Cour magnetic recorders which were very delicate and sensitive to any vibrations-an enormous difficulty for a base constructed one what was really a large iceberg. First they had to construct a building free from any magnetic contamination and had to be built entirely using aluminum, brass, copper, sand, cement, bricks, and marble, pretested for magnetic properties. Next, through compiling advice from the Scott Polar Research Institute and Crown engineers, the scientists at Halley Bay drove wooden piles through the upper unstable snow layers. Then, on top of the piles, they built up brick pillars, and topped them with solid marble slabs. To keep the observatory at the right temperature, they shaped it like a Nissen hut with foot thick doors and electrical heating originating from the roof. Again, this was not a problem unique to the Royal Society, as at Scott Base, geophysicist Vern Gerard supervised the erection of prefabricated magnetic huts, keeping "a careful check on all materials to ensure that only non-magnetic materials were used in

[672] T. Hatherton. "Electrical Resistivity of Frozen Earth" *Journal of Geophysical Research* 65 no. 9 (September 1960) 3023-24

[673] E. I. Robertson & W. J. P. MacDonald "Electrical resistivity and ground temperature at Scott Base, Antarctica," *New Zealand Journal of Geology and Geophysics*, 5 no.5, (October 1962) 797-809. 797.

construction,"[674] despite building on being built on a site that "could not be worse for geomagnetism,… [and] the most poorly sited magnetic observatory in the world."[675] But notwithstanding the ability of Royal Society scientists to anticipate and forestall some of the environmental problems that they would soon encounter, they also encountered many unforeseen issues. For example, while constructing the hut, when the exterior was complete, six feet of snow forced itself into a tiny unnoticed hole during a moderate gale. In addition, even many of the foreseeable issues-e.g. the cold and snow-had unforeseeable consequences.

The cold and the snow had very severe physiological impacts on the scientists that where relatively unexpected. Soon after their arrival in Halley Bay, several people were incapacitated by snow blindness, and needed to wear specialized snow goggles to protect against the fierce sun reflecting off the white snow surface of the Antarctic summer. Alas, these goggles frequently steamed up, making it temping "to push the goggles up to the top of one's head." This meant that the "damaging power of the sun was one of the more tedious aspects of the Antarctic summer, particularly when you had detailed scientific work to perform, like reading the dials of a theodolite or thermometers…mak[ing] repairs to outdoor equipment, replacing the worn out brushes of the radiation fluxplate or one of the innumerable precise jobs so necessary to keep up the schedule." [676] Snow blindness was, as a result, one of the more common complaints suffered by the men at Halley. These sort of precise scientific duties were also disturbed by the frigid Antarctic condition as most "jobs of this type just cannot be done whilst wearing the bulky gloves required… [and] the more fiddley things are even too difficult tie accomplish when

[674] *Scott Base Observatory: Magnetic Results for International Geophysical Year 1957-58.* Department of Scientific and Industrial Research 140. Wellington: R.E. Owen, Govt. Printer, 1961. 2 University of Canterbury Library Antarctic Collection
[675] V. B. Gerard, *With Hillary at Scott Base: A Kiwi among the Penguins* (Wellington, N.Z: Bateson Pub, 2012). 32
[676] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 46-47

wearing chamois leather or silk..."[677] The result was that most of the researchers and support staff were plagued by superficial frostbite injuries. At Scott Base, Vern Gerald solved this problem in part by installing heaters in his magnetic huts because though "I had silk gloves for fine work but even that was a bit-your fingers would eventually freeze up even in silk gloves so it was fairly essential to have that hut heated."[678]

The extreme cold also had many unexpected impacts on the Expedition's technological equipment. For instance, MacDowall noted that on one of the coldest days of the year, -34° C, the thermometer seized up and needed to be repaired and trace oil on screw threads of the theodolite (common surveying tool) froze, rendering the device inoperable. In order to proceed, he needed to strip the theodolite of its oil, despite the fact that oil would be necessary in any other conditions.[679] In another occasion, the cold caused various electrical malfunctions with the interior equipment, solved by installing another 500 W of controlled heating to the structure.

Though these issues with oil on the theodolite and the malfunctioning electricity seem to be small problems with simple solutions, the expedition constantly improvised their way to results. MacDowall even noted that "Great efforts had been made by the designers and manufacturers of our meteorological instruments to adapt them, but the fact remained that nearly all of the equipment we used, versatile though it was, had not originally been designed for operation to the extremes common in Antarctica. We therefore had to solve innumerable problems for ourselves."[680] When the cold climate caused the weather balloons to burst at relatively low heights (under 15 km), they were able to, in collaboration with the US expedition

[677] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 84
[678] Vernon Gerard. Interview with Julia Bradshaw. New Zealand Antarctic Society Oral History Project. 30 September 1997
[679] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 67
[680] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 75

to the South Pole, almost double their height by soaking the rubber balloons in a mixture of lubricating oil and aviation turbine fuel.[681] This increased the weight of the balloons, making them more difficult to launch, requiring more hydrogen for liftoff. Producing hydrogen was occasionally problematic as the water from where they drew the hydrogen often froze. In addition, the increased weight could, like on May 10th 1958, lead to the balloon needing a second charge of hydrogen. On this particular occasion, the buildup of material within the generator led to an explosion, which injured a crew member. But fortuitously, this explosion allowed the team to devise a series of fixes to the generator, helping it to adapt to the cold climates, including thawing the values before use and regularly cleaning mineral deposits from the valve.[682] In another case of Antarctica unique conditions, the men often found themselves rebuilding their structures, when their foundations would literally melt away from the combined fierce sunlight and heat produced by their generator and other instruments or alternatively when their buildings would sink in the snow drifts.[683]

In August 1957, MacDowall noticed hoar frost forming on instruments meant for measuring solar radiation. Since this could adversely impact their recordings, David Tribble, a fellow member of the meteorological group set "his ingenious mind in motion."[684] Tribble, who "under the stimulus of the Royal Society Expedition, developed into an ingenious and original scientific instrument craftsman,"[685] installed a small amount of electric heat to the observing table which simultaneously drove off the offending hoarfrost while leaving the instruments

[681] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 75
[682] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 152, 166
[683] G.E. Hemmen and J. MacDowall. "Design and Erection of Buildings." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964). 392
[684] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 90
[685] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 29

unaffected. This turned out to be an absolutely necessary fix as later, in the next month, excessive hoar frost deposits on two rhombic aerials caused them to collapse under the weight of the ice deposits. In April 1958, MacDowall and Tribble encountered another similar tricky problem with their instruments. In temperate climates, measuring relative humidity is done fairly easily by measuring the air temperature with a regular thermometer, called a dry bulb, and also a thermometer covered by a dampened muslin cover, usually called a wet bulb, though they called it an ice bulb. The drier the air, the more the ice bulb temperature is depressed below air temperature. However, the depression of the ice bulb at Antarctic temperatures is so small that they found it difficult to measure humidity with any real accuracy. While they were offered alternatives by both the British Meteorological Office, which proved to be too unreliable and subjective for good results, and the US Blue Hill Observatory, which was overly affected by wind, radiation, and hoar frost. Their solution was to use the Assman psychrometer, an established hydrometer, and increase its range of operation with a thermopile, in addition to using shields to protect it from solar radiation.[686]

Though both of these instrument alterations were extremely complicated, many adaptations were actually remarkably simple. When the generator shed became regularly too humid, the diesel mechanic Ivor Beney simply cut a hole in the roof.[687] Likewise, when in the summer of 1958, condensation caused water to drip near instruments in the non-magnetic hut, the scientists erected Ventile umbrellas over them to prevent any damage.[688] Even more simple, but essential tools were jeopardized by the cold weather conditions. For instance, the freezing cold caused problems with the ink that they used to stamp their geomagnetic charts: "The ink we

[686]Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 142-43
[687] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 205
[688] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 234

were using was the Post Office standard stamping ink, which we found had not dried four months after use and therefore became prone to smudging…A black rubber-stamping ink had been concocted by two of the Davids [David Cansfield and David Tribble]. It was made by adding anti-freeze to Indian ink and then slowly boiling off the water in the Indian ink. This mixture dried in about half an hour and was judged to be fully satisfactory for our purposes of providing a permanent and smudge-f[r]ee notation for our chart records."[689]

While the improvisational culture of Antarctica is most clear in MacDowall's writings, where the author had the opportunity to relate more personal and informal details about life and work in Halley Bay, it also becomes apparent when looking closely at scientific publications. For example, when making Auroral observations, the wireless operator Ron Evans and the leader of the Auroral and Airglow research, Gwynne Thomas, noted several alterations that they were forced to make to their equipment. In order to get consistent data, which was also being recorded by at least three other nearby stations, it was necessary that Thomas and Evans examine the sky at least every fifteen minutes during periods of darkness. Since Halley Bay was situated far to the south of the Antarctic Circle, it experienced a wide range of results, even in the dark. Because of the difficulty in seeing aurorae except in the most ideal conditions, they could only make observations for six months out of the year.[690] In their tables, they recorded the date and time, sky conditions, and then the times of any and all auroral activity or photographical observation. However, the biggest issue with their work came from the steady accumulation of snow year round. While in the far northern auroral zones the heavy snow from the winter abates somewhat

[689] Joseph MacDowall, *On Floating Ice* (Edinburgh: The Pentland Press, 1999). 171-172
[690] S. Evans and G.M. Thomas. "Visual and Photographic Auroral Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt, Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1960). 27-33

in the spring, "It is necessary at Halley Bay to take action against the drifts of snow which gradually engulf all structures."[691]

Initially visual observations were made by a camera through a hatch cut into the roof of the main hut. They constructed small screens around it to shield the camera mirror from any external lights, and after issues with the damp air freezing solid on the alidade and horizontal circle (surveying tools), they fit each with a small 25 W heater and experienced no further trouble. Based on the position of the hatch, which was formed to look like a small chimney, as long as the building did not get buried, only minimal snow would leak into the hut. Nevertheless, soon the building became completely buried, requiring periodic building up of the hatch to keep it above the continuously rising snow levels. After an incident where "the whole instrument had to be dug out in darkness and set up again of the surface," Evans and Thomas opted to "place the whole instrument on top of a tower constructed of Dexion perforated steel angle, standing 15ft. above the level of snow existing at the time of construction."[692] This tower had three advantages. First, it meant that the camera would not have to be dug out of the snow for many years. Second, the plane of the instrument was above every light in the station, rendering their screens unnecessary, and third, the camera could even be operated while the snow was drifting to a moderate extent. In this way, Evans and Thomas were able to take the challenges presented by the conditions of Antarctica and make adjustments to their own work in order to capture the best results possible.

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[691] S. Evans and G.M. Thomas. "Visual and Photographic Auroral Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt, Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1960). 54

[692] S. Evans and G.M. Thomas. "Visual and Photographic Auroral Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt, Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1960). 54

These sort of adjustments also were noted in papers authored by MacDowall. In their work on ozone measurements, MacDowall and fellow meteorologist John Smith used electrochemical transmogrifiers to observe the vertical distribution of atmospheric ozone. Unfortunately, they came across considerable trouble with the transmogrifiers and on one occasion, could not achieve satisfactory liquid flow. They eventually found a treatment through washing the instrument first with a 5% caustic soda solution and then with a detergent, but even this cleaning failed to yield satisfactory results. Though they continued to use them, "At other times, the transmogrifier suffered from a flow irregularity called 'gurgling' which also resulted in extreme fluctuations. However, it was usually possible to select the most accurate observations."[693] This passage highlights the fact that despite their best efforts to accommodate their equipment and the environment, these scientists were not in control of their data production and could fail to make the proper technological intervention. Additionally, it draws attention to the phenomenon which many of these scientific papers make note of: data selection. When either their equipment failed or the environment proved to be too great of an obstacle for these scientists, they simply choose to use the data that they believed was the most relevant. While the idea of scientists choosing which data to use is not a new revelation, or one that only occurs in extreme environments, this anecdote highlights the way that scientific knowledge is produced, rather than discovered, and extreme conditions only magnify the conditions under which it is created.

In his observations of sun and sky radiation, MacDowall along with David Tribble also had trouble with operating their equipment at low temperatures. It was essential for them that

[693] J. MacDowall and J. Smith. "Ozone Soundings." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt, Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1962). 99

their radio meters stay well ventilated, which was achieved by a centrifugal blower operated by a d.c. motor. Regrettably, "Considerable trouble was experienced with the blower motors owing to excessive brush and commutator wear at low temperatures." [694] MacDowall and Tribble devised no solution for this problem. Likewise, they attempted to connect a spare total solarimeter to an integrating motor in the spring and summer of 1957. "This was totally abandoned, mainly because there was no convenient way of correcting daily or hourly totals for the effect of frost deposition on the outer glass solarimeter dome, an effect which greatly enhanced the recorded radiation."[695] It was at this point that Tribble developed the "ingenious" solution to remove frost delighted upon by MacDowall earlier in this paper. But, in general, to make solar measurements, they regularly cleaned the dome with "chamois leather as frost deposition occurred on exposed surfaces, particularly at times of calm or light winds near the equinoxes."[696]

Radio techniques were necessary in many of the projects conducted by the Royal Society Expedition. Unfortunately, many sites in Antarctica were spoiled by the lack of understanding of the site conditions and the inexperienced use of electrical power. In general, conducting so many geophysical experiments where many use electrical power can be very problematic. This is only exacerbated in an ice shelf, not only for the lack of electrical grounding which I already mentioned, but also because many voltages were built up on moving systems. For these two reason, in addition to numerous other ones, electrical interference was an enormous problem for the Royal Society Expedition. Ionospheric scientist William Bellchamber listed every cause of

[694] J. MacDowall and D.T. Tribble. "Radiation Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1962). 111
[695] J. MacDowall and D.T. Tribble. "Radiation Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1962). 111
[696] J. MacDowall and D.T. Tribble. "Radiation Observations." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1962). 111

electrical interference encountered by the Party members and their attempted solutions in his article "Electrical Interference."[697] In order to solve the most pressing issues involving the lack of electrical earth, the scientists formed a crude earth mat by placing metal screens under the huts. Electrical power supply generators also caused a high level of noise in the radio communications receivers. This was especially true during 1956 when the Advance Party used single phase diesel generators. Happily this was almost completely fixed when 3-phase diesel generators which produced far less noise and also had far more power. Man-made interference was also quite common through local electrical interference from electric sparks which was reduced by using capacitors to suppress any unavoidable sparks and keeping connexion leads as short as possible, as well as cleaning and keeping the wiring in as good condition as possible. Man-made interference was also caused by broadcast signals. Due to the remote location of Halley Bay, this only caused problems for the ionospheric group and the radio communications operator. There were also a number of problems with electrical experiments and radio communications. Most of this was solved by creating and then following a time-sharing schedule so that power supplies would not interfere with each other.

Snow also caused amounts of static especially in the winter when the driven snow is hard and the high winds are frequent. Drifting snow causes variable electrostatic charges which created a good deal of electrical noise. Their solution was to strategically install the aerials and feeders in order to minimize the snow static like burying them in the snow or placing them at the same height so that the feeder did not interfere with the aerial when the aerial was clear. Still, other than this, there was little that they could do to prevent this sort of interference. Solar noise

[697] W.H. Bellchambers "Electrical Interference." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964).

also created serious interference, particularly with the radio-star scintillation equipment. The use of highly directional aerials minimized this problem, but nothing could be done during the intense bursts when the sun was above the horizon. Atmospheric noise actually caused very little interference, and was never detectable in any of the experiments.

In general, the Royal Society Expedition preferred to prevent electrical interference than to oppress its effects because the "residual signal helps to raise the general noise level of the site and there is the risk of short or open circuits in the components used for suppression under the severe Antarctic conditions."[698] Additionally, Bellchambers strongly urges any future researchers to maintain their equipment for minimal interference because: "A good generator is of little use unless it is properly installed and maintained…and additional training should always be provided on the problems of electrical interference in Antarctica." Likewise, "any faults in electric circuits are liable to cause widespread interference which is very difficult to trace" and therefore he advises periodic checks because "experience has shown that even pedestrian traffic can cause connexions to work loose."[699] In the case of electrical interference, not only did the external environment contribute interfere with their work, but also the environment that they constructed for themselves. Therefore, they found it necessary to avoid these factors or at least try to mitigate them as best as possible.

A final area where the scientists were constantly making adjustments to their equipment was in regards to their tractors. Tractors were an essential piece of equipment and total failure would prove devastating for the team. Unfortunately, "Although these vehicles were reliable and

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[698] W.H. Bellchambers. "Electrical Interference." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964). 376

[699] W.H. Bellchambers. "Electrical Interference." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964). 376

gave satisfactory service, they were not designed for Antarctic conditions and were not an ideal means of transport on the soft snow surfaces. They even advised that "Where tractors are to operate on isolated detachments in such adverse climatic conditions, a spare engine and a collapsible or inflatable drift-proof shelter should be provided."[700] Because of the incessant issues with the tractors, the diesel mechanic Alf Amplett left a full list of problems and solutions that he encountered. He asserted that most of the "mechanical faults were due to the tractors being operated in temperatures lower than those for which they had been designed."[701] Some of this issues were caused by the snow and ice, which necessitated frequent removal, while others were caused by the hard conditions that the tractors where driven under. However, through a combination of mechanical repairs and methods for minimizing debris build up, they were eventually able to use the tractors well enough to load the ships when they finally departed in 1959.

At Halley Bay, members of the Royal Society Expedition were faced with a number of obstacles, many of which were caused by the extreme environment of the Antarctic. The way that this researchers overcame, or rather adjusted to the external conditions was through an informal system of improvisation where scientists and their support staff created either technological or behavior fixes to their work so that they could still produce the sort of results that that they arrived to do. Though one could argue that equipment could break down and need repair in field research in any part of the world, this paper does focus on not basic repairs to

[700] A. Amphlett. "Plant and Machinery Operation." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964). 386
[701] A. Amphlett. "Plant and Machinery Operation." In *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies, 1955-1959*, edited by David Brunt and Royal Society International Geophysical Year Antarctic Expedition. (London: Royal Society, 1964). 384

broken technology, but rather technological adaptations and behavioral readjustments forced by the extreme environment.

Although it is true that in any scientific setting, particularly outside of the more rhetorically stereotypical setting of a laboratory in the metropole, equipment is prone to breaking, but the unique conditions of extreme environments like the Antarctic created a setting where improvisation and negotiate with the natural elements became the norm. A motif constantly reiterated by members of the Royal Society Expedition is the unique difficulties that they faced due to the extreme cold or other environmental conditions-and the ways that they either overcame, readjusted, or simply failed. In many ways, this culture of improvisation became a form of knowledge-making in and of itself. This also becomes tricky when one considers the very thin line between improvisation and planning. If these scientists knew to some extent that they would be forced to improvise, and even accounted for it in their published papers, it implies that the improvisation was an important step in retrieving and interpreting their data, making it an essential step and even an added component of their methodological processes. Since they knew that these nonhuman actors such as snow or weather balloons could cause trouble for them, and worked around them rather than ignoring the trouble, it means that they tacitly acknowledged their lack of control over their work as well as the agency of these other actors. In this way, the conditions of Antarctica created a hybrid space where both scientific knowledge and the material world engaged and shaped one another physically and conceptually.

Conclusion

In Polar Regions, survival, let alone successful scientific research, is dependent on well-functioning instruments. Yet, from the most complicated, like the La Cour magnetic recorders, to

the most simple, like wristwatches, scientists during the IGY found their technologies ill-equipped for Antarctic work. In some cases, like the IMPS, the device could be argued to be problematic no matter where it was used. Other cases, like the McArthur microscope, functioned perfectly well in the Antarctic, making it a boundary object, which for Lister and Stephenson, allowed them to make the TAE "as successful in the field of science as it has been in the fields of exploration and of physical achievement,"[702] and for McArthur, demonstrable evidence of the superiority of his instrument compared to his competitors. In still other cases, devices on which a large array of activities were dependent on, like wristwatches and thermometers, failed to work at all in the extremities of Antarctica, forcing scientists to adapt. The propensity of instruments to fail in Antarctica resulted, in the case of Halley Bay, and, though less explored in this chapter, Scott Base, meant that scientists adopted a culture of adapting their instruments to the conditions, a culture which extended beyond just their instruments, to nearly every aspect of the environment that they constructed for themselves.

An environment such as Antarctica, perhaps more than a more traditional venue for research, reveals the human-technological-environmental interactions necessary for the production of scientific research. Instruments, intended to measure quantifiable aspects of the Antarctic landscape, are obviously created by humans in their initial construction and maintenance. They depend on people to give their readings value. But, in extreme environments, non-human actors such as the cold, darkness, ice, geomagnetism, lubricant, etc., can make those readings meaningless. It is then left for the scientists to either adapt the instrument to the conditions, adapt their behavior to the needs of the instrument, or adapt their research questions

[702] James Wordie, Charles Swithinbank, W. V. Lewis, Gordon Manley, H. H. Lamb and H. Lister "Geophysical Investigations of the Commonwealth Trans-Antarctic Expedition: Discussion." *The Geographical Journal* 125. No 3/4 (Sept.-Dec., 1959) 354-356. 354

to what was possible in the Antarctic. Through an examination of the usage of scientific instruments in Antarctica, it is clear that nature, rather than revealing herself before science, is created through a negotiation between scientists, actors in the non-human environment, and both the expected and unexpected performance of human constructed technology.

CHAPTER FIVE: THE TRAVELING ROCKS

Introduction:

In March 1957, just after Australian geologist P.J. "Jon" Stephenson picked up the rocks, a few people, including himself, had started to worry about his life. Stephenson was a newly minted PhD from Imperial College London and one of the nearly forty-five men who participated in Commonwealth Trans-Antarctic Expedition (TAE). One interested in geology could not help but be disappointed by the TAE's choice of base location on an ice shelf on the Weddell Sea as there were no rocks to be found and Stephenson had been hankering to do some geological fieldwork. Soon he was sent to Southice, a smaller base and depot 300 miles inland, constructed by glaciologist Hal Lister, surveyor Ken Blaiklock and himself. Stephenson, who "wanted to collect the rock specimens and see what was what," immediately skied to a nearby nunatak after arrival but found that "geologically it was most disappointing to find rocks of no great character."[703] Stephenson was closer to mountains, but it seemed, no closer to finding any interesting rocks.

In February 1957, Stephenson, who was "never happy out of sight of mountains, and was constantly thinking of ways to reach new rocks however inaccessible they might appear,"[704] began sending requests to Vivian Fuchs, the TAE's commander, for an opportunity to visit the nearby mountain range: "I wish to tell you a few ideas about the geology I had flying on the way up here, and also to make, if I may suggestions for geological projects, in the hope that opportunity may favour us in the carrying out of some of them."[705] He was not the only one getting tired of the routine of building and maintaining equipment rather than doing research. Lister, too, sent Fuchs multiple notes repeating the sentiment: "Would be sad if scientific gear

[703] George Lowe, *Because It Is There.* (Portway, Bath: Cedric Chivers Ltd., 1965). -4
[704] Vivian Fuchs and Edmund Hillary. *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958* (Boston: Little, Brown, 1959).
[705] Letter from Jon Stephenson to Vivian Fuchs from Southice to Shackleton February 9th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ

didn't get here. Would prefer less paraffin than no scientific gear." But, Lister added on Stephenson's behalf, "Jon asks if rather than a break he gets a trip to the mtns. We hope this can be managed please. To get a bit of geology done would give Jon a terrific boost for the winter."[706]

Jon Stephenson did eventually get to gather some rocks while on TAE in 1957. Today, a collection of his specimens, along with a set gathered at the same time by New Zealand geologists Bernard "Bernie" Gunn and Guyon "Guy" Warren on the other side of the continent, are among the 80 million specimens in the British Museum of Natural History in London. This chapter examines the story of these rocks, including the context for their gathering, the initial research done on them, and how they made their way to London. Using these rocks as a lens, I will examine the inherent instability of scientific research in extreme environments and the role of non-human actors in the production of scientific knowledge, the gendered nature of scientific research, and the post-imperial politics of science in Britain.

Gathering Geological Specimens in the Theron Mountains

Before the late 1950s, very little was known about Antarctic geology. While British scientists had maintained a presence throughout the Antarctic Peninsula since the mid-1940s, their presence was less for doing research, and more for establishing legitimate British occupancy of the area; something that the British government believed would strengthen their claim to the region.[707] In 1955, Dr. W.J. Pugh, the Director of the Geological Survey of Great Britain prepared a report that summarized the "scanty information concerning the geology" of the continent. Dividing Antarctica into three major regions: Eastern Antarctica, Western

[706] Letters from Hal Lister to Vivian Fuchs from Southice to Shackleton February 1957 Scott Polar Research Institute Archives MS 1536/1; BJ
[707] Adrian Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939--1959," *History of Meteorology* 4 (2008): 27–40.

Antarctic and the Southern Antilles, and the Ross Weddell Depression, he speculated that they might be similar to parts of South Africa, India, and South American, but ultimately concluded that any hypotheses on the geology and mineralogy of Antarctica is "an argument by analogy and is purely theoretical."[708] Considering the general lack of knowledge regarding the geology of Antarctica, other than in some coastal sections, many others, scientists and politicians alike, in New Zealand and the United Kingdom were keenly interested in geological research and what it could reveal about the mineral values of the continent in addition to how it fit with the geology of the greater world.

While the majority of the scientific activity of the TAE was in line with the activity emphasized by the International Geophysical Year, the IGY did not do much geological work overall, other than in glaciology. IGY scientists at Scott Base and Halley Bay, for example, did not engage in geological research. That is not to say that others were not doing geological work in the Antarctic. In the Ross Dependency, for instance, Victoria University Wellington and the New Zealand Geological Survey were all conducting geological fieldwork concurrent to the IGY. However, in the case of the TAE, Fuchs' PhD in geology likely put his sympathies with the geological community as a whole, who were in a flurry to learn more about the nature of the Antarctic continent. While Fuchs himself had "become somewhat divorced from real geological work-both in the field and at home, [and not] competent to give papers on Antarctic geology,"[709] he made certain that he was accompanied by a geologist. Besides an interest in any mineral values which could be found,[710] the main questions that the TAE geology program sought to

[708] Dr. W.J. Pugh. F.R.S "Notes on Geology and Mineral Occurrences" February 25th 1955 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[709] Letter from Vivian Fuchs to Edna Plumstead October 20th Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[710] Dr. W.J. Pugh. F.R.S "Notes on Geology and Mineral Occurrences" February 25th 1955 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

answer were: Was Antarctica a single land mass under the ice sheet or archipelago?; What was the size of the ice sheet?; What was the connection between the very different land masses of East and West Antarctica?

Figure 11. Vivian Fuchs[711]

The Ross Sea Committee had a similar interest. While Edmund Hillary was mostly interested in securing men with mountaineering experience, the Committee made sure that he selected a pair of geologists. [712] Hillary's scientific disinterest was such that Bernard Gunn, of the University of Otago, recalled that when he applied to join the TAE, Hillary "wasn't a bit interested in the fact that I was a geologist or anything like this but he was very interested in the fact that I had been a student guide under Harry Aryes because Harry Ayres had taught Hillary most of his mountaineering technique…"[713] The lack of scientific emphasis of the Ross Sea Party was a sore point for Fuchs. For the Crossing Party, "Science was our goddess and each of the party began to worship at his own pet shrine."[714] But for the New Zealand Party, as Fuchs

[711] Photo by John Clayton, Depicts Vivian Fuchs, Antarctica New Zealand Pictorial Collection
[712] Edmund Hillary. *No Latitude for Error.* (New York: Dutton, 1961). 54
[713] Bernard Gunn. Interview with Jacqui Foley. New Zealand Antarctic Society Oral History Project. 22 September 2004
[714] George Lowe, *Because It Is There.* (Portway, Bath: Cedric Chivers Ltd., 1965). 189

wrote to R.W. Willett, the Director of the New Zealand Geological Survey in 1961: "I have been unable to find out if any work, other than geology, was done at Scott Base."[715]

Returning to Stephenson's dilemma, he had been extremely eager to do some fieldwork in the mountains near Southice. Blaiklock and Fuchs had already gathered some specimens on brief outings to the Theron Mountains. Blaiklock found some intrusive igneous rocks and "several are sedimentary-fine, dark grey sandstone…The sediment may be heat altered but they are certainly quite massive, well liquefied specimens." In January 1957, Fuchs landed in the Therons where he "sprang out and sprinted something like a mile…to get some rocks. He found coal, and some dark carbonaceous shales with plant remains, and white shales also with wood fragments. One of the dark shales contains a good frond … I would guess to be either *Glossopertis* of the Permian or *Sagenopteris* of the Jurassic."[716] While excited about Fuchs and Blaiklock's specimens, Stephenson enviously looked forward to his own fieldwork opportunities. In February 1957, Stephenson wrote to Fuchs detailing four potential field projects, ending with the one that he considered to be the easiest and most practical. Stephenson suggested that if he and one other man were dropped off for 24 hours near the rocky northwest side of a small range forty miles due north with a week's supply of emergency rations, "This would give a clue to the identity of all this 3rd range's geology, in a single traverse."[717]

When, in early March, Fuchs sent a suggestion to Southice that perhaps each member of the team could briefly return, in turn, to Shackleton for a bit of a break, Stephenson eagerly seized on an opportunity to visit the Whichaway Nunatuks instead, 30 miles away. While Fuchs

[715] Letter from Vivian Fuchs to R.W. Willett May, 19th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[716] Letter from Jon Stephenson to Raymond Adie January 20th 1957 British Antarctic Survey Archives E1/H1/4/49
[717] Letter from Jon Stephenson to Vivian Fuchs from Southice to Shackleton February 9th 1957 Scott Polar Research Institute Archives MS 1536/1; BJ

was apprehensive about sending off two men alone in what appeared to be worsening weather, "he must have understood how keenly I felt, and agreed on a short visit for two men."[718] Excited for his upcoming trip, Stephenson even added a provision for his hypothetical rocks in case of an emergency: "Specimens I collect I will put in an empty ration box. I will have them labelled and listed so that they can go straight back to Shackleton. If it is necessary for Ken and I to walk up to Southice, then I will leave a bulk (if there are too many specimens) of the material collected at some identifiable point for later pick up-for instance if we find good fossils."[719]

Figure 12. Jon Stephenson[720]

The TAE's assigned RAF pilot, John Lewis, dropped Stephenson and Blaiklock at the Whichaways for survey and geological work. This was intended to be no longer than 24 hours, though they carried a sledge and enough food and supplies for ten days, just in case of

[718] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 47
[719] Letter from Jon Stephenson to Vivian Fuchs from Southice to Shackleton Undated Scott Polar Research Institute Archives MS 1536/1; BJ
[720] Depicts Jon Stephenson, Antarctica New Zealand Pictorial Collection

emergency. Immediately, while "Ken climbed the nearby nunatak, carrying his theodolite for survey work, [Jon] couldn't wait to examine the nearby rocks." As he approached the first moraines, he found a large cube of limestone containing fossils of *Archaocyathus*, an early Cambrian tropical marine organism. As this was an "exciting" find, Stephenson climbed to the top of the main peak, "collecting specimens of sandstones and other horizontal sedimentary rocks and a dolerite on the summit." When it became clear after about twenty-four hours that no one was coming for them, he "enjoyed another midnight jaunt to a more distant nunatak where [he] was pleased to discover some Gondwana Permian fossils." After eight days without retrieval, Blaiklock and Stephenson began the long walk towards Southice. After three days of extremely difficult sledging, on half-rations, both discovered frostbite on their extremities, and realized that they were truly on a "life-and death journey." By that evening, they had finished all but remnants of their food and had one last fill of fuel for their primus. Though marking their coordinates, Stephenson even was forced to abandon his precious specimens, making "a cairn in the middle of nowhere and cached my rock collection, fossils and other specimens in a sledge box."[721] On the fourth morning, when they were eating the last of their rations, they were discovered by Fuchs and Lewis who had been searching for them for three days—they were only halfway back to safety, and lucky to have been found in the difficult drifting conditions.[722]

Stephenson's adventure ended up being his last before the crossing, but his escapade and findings were not in vain. By chance and fortune, Fuchs had spotted their tents, and "Incredibly, th[e] box of specimens was found six months later by the first overland vehicle party from

[721] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 47-50
[722] Vivian Fuchs and Edmund Hillary, *The Crossing of Antarctica; the Commonwealth Trans-Antarctic Expedition, 1955-1958,* (Boston: Little, Brown, 1959). 113-117

Shackleton!"[723] While immediately after his rescue Stephenson gushed "I feel sure field work will prove just as exciting as it promises to be at this stage. Tonight I almost feel I cannot wait for the Spring!,"[724] when remembering the circumstances for gathering these specimens in his memoir, he pondered "whether we could reach South Ice under our own steam. I doubt we could have done so, and were more than lucky to have made it back safely."[725]

Gathering Geological Specimens in the Ross Dependency

On the other side of the continent, Bernard Gunn and Guyon Warren experienced what turned out to be a less dangerous adventure. While, once the actual continental crossing began, the British Party mostly stayed together, slowly plodding through the crevasse-filled ice sheet, the New Zealand Party had a different strategy. While Hillary and others trekked toward the Pole laying depots for the Crossing Party, two smaller parties, the Northern Survey Party and the DaR.W.in Survey Party, took dog teams into Northern and Southern Victoria Land, exploring over 100,000 km² of uncharted continent.

These parties had a somewhat easier time with geological research than Stephenson for two primary reasons. First, Gunn and Warren were better prepared for Antarctic travel than Stephenson had been. New Zealand invested a good deal of effort in training and using dogs for traveling, which allowed them to cover a great deal more land per day than the British Party was able to cover using their typical modes of transportation, which included vehicles, man hauling, and aircraft. Second, the environmental conditions were quite different for the New Zealand team than for the British. The distance between Scott Base on the McMurdo Sound and

[723] Philip Jon Stephenson. *Theron Mountains, Shackleton Range and Whichaway Nunataks*. (London: Trans-Antarctic Expedition Committee, 1966). 8
[724] Letter from Jon Stephenson to Vivian Fuchs March 22th Scott Polar Research Institute Archives MS 1536/1; BJ
[725] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 50

Shackleton, on the Brunt Ice Shelf, is well over 2000 miles. The geography in these areas are actually quite dissimilar and the New Zealand party thereby had easier weather conditions, fewer dangerous crevasses, and more exposed rock.

Gunn and Warren were both members of the Northern Survey Party, which departed from Scott Base in the beginning of October 1957, concentrating on areas between the Mulock and Mawson Glaciers in Ross Dependency. The Mawson-Mulock sector of the Victoria Land mountain chain, a very small swath of the Ross Dependency, varies in width from 30 miles immediately south of the Mawson Glacier, to about 100 miles in the Skelton Koettlitz area. Eight outlet glaciers flow through this area, creeping eastward. On their team, Gunn and Warren were joined by engineer Murray Ellis, and British surveyor Richard Brooke. However, while Gunn and Warren had an easier time than Stephenson, they still faced several overall difficulties. For example, because the field parties had to be self-dependant for long periods and needed to carry everything themselves, they could, due to weight restrictions, only gather specimens that were "few and small." Furthermore, the cold and shortage of time did not allow a thorough examination of any particular area, even when "geological specimens were flown out to base by aircraft." The New Zealand field parties also faced "heavily crevassed country and areas of rough ice are dangerous or impossible for travel with dog,"[726] but overall, dog travel allowed for opportunities unworkable with vehicle transport, a clear advantage over the British Party.

[726] Guyon Warren and B. M Gunn, *Geology of Victoria Land between the Mawson and Mulock Glaciers, Antarctica*, ed. 1955-1958 Trans-Antarctic Expedition (London: Trans-Antarctic Expedition Committee, 1962). 17

Figure 13. Guyon Warren inspects a sastrugi on the edge of the Polar Plateau[727]

After over a month of fieldwork, Gunn and Warren were initially dissatisfied with their findings, but, in November, when coming off from Cape Roberts (approximately 77°S 163°43'E), Warren wrote in his diary "An interesting set of rocks for once, as so far they have been disappointing-here the granite has great blocks of stewed Beacon Sandstone and schist caught up with it."[728] Two days later he expounded on this theme and wrote: "This is the most spectacular country we have been in so far-huge rugged cliffs all round, much more dissected than we have been used to. Great rejoicing to spy a tiny wedge of banded rock, obviously sedimentary, squeezed between the granite and the capping dolerite high in the cliff on the north-east side opposite our camp, and quite an area of the same rock on the other side further west, and again very high up, sitting on the granite. We're into some real rocks at last."[729] Although Warren tired of all of the scree that he encountered, he found rock climbing in the Beacon

[727] Depicts Guyon Warren, Antarctica New Zealand Pictorial Collection
[728] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 240
[729] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 243

Sandstone area, "quite exciting to find the genuine base of the formation at last, the first time it has been inspected. Collected a few specimens, scribbled some notes, and away."[730]

Despite these finds, Gunn and Warren still were disappointed not to find any fossils. According to Warren's diary, "Bernie and I went along east to the edge of the rocks, and to my disappointment I see that the moraine in which fossiliferous boulders of sandstone were found in 1911, doesn't come from this pocket above us at all. Fortunately we will have two days-I'm not leaving here till I find these fishy fragments in place come hell or high water!" But two days later, after "Quite a lot of most unlikely-looking sandstone in the moraine, and after two or three hours of nose-to-the ground meanderings without a suggestion of anything interesting, was beginning to lose hope. However, about half-way along I turned up a smallish slab of a dark fine-grained rock, with quite an assortment of scale-like impressions, and later Bernie found a specimen with what looks like a saw-toothed fragment of jaw-bone. Nothing exciting in itself, but now at least we know better what to look for…"[731]

But as disappointing as this first set of discoveries were, Gunn and Warren were soon exalting over their finds. On November 28th, Warren waxed poetic about the discoveries that he had made during the day: "Eureka!! And similar expressive words of delight. Fossils at last…Bernie and I tried to disentangle the extraordinary assortment of rocks we found. Hadn't been going long before I turned up a boulder which yielded four species of plants, all extremely well-preserved, and multitudes of a tiny bivalve, the first mollusc recorded down here…Have seen nothing at all like the rocks here before, so it was a very interesting day and every chance of

[730] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 247
[731] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 252

getting a decent age determination from the fossils, particularly the plants which show remarkable detail."[732]

When they returned home, Gunn produced a number of articles based on their findings that were published in the *New Zealand Journal of Geology and Geophysics,* in addition to he and Warren producing the only substantial contribution to the TAE's *Scientific Reports.* After the report was published, Fuchs congratulated Warren, writing "you have made a major contribution to the results-one which I was most interested in and on which you are to be congratulated."[733] Their geological map of Victoria Land and the Ross Dependency went unaltered until 2014. Just after the update, Simon Cox, the lead author of the updated map, stated that "the Gunn and Warren map has been a standard geological reference for decades and one of the most highly cited pieces of Antarctic literature…Our mapping team remain in awe of the achievement of Bernie Gunn and Guyon Warren."[734] This group of four men also named dozens of geographical features,[735] many names that are still in use today.

The Oozing Rocks

By the end of the TAE, which concluded successfully on March 2, 1958, the Main Party had crossed 2,158 miles. Stephenson and Warren and Gunn's samples all ended up at Scott Base. Stephenson, who also produced his own contribution to the *Scientific Reports,* wrote, just after his return, to Dr. Edna Plumstead (1903-1989), a geology professor at the University of Witwatersrand in Johannesburg. Plumstead was one of the foremost figures in the field of Gondwana geology and palaeobotany and was a star in the tractioning, though still controversial,

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[732] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014).. 259

[733] Letter from Vivian Fuchs to Guyon Warren March 13th 1963 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

[734] "Geologists Produce New Map of Antarctica's South Victoria Land," *The New Zealand Herald*, January 28, 2014

[735] New Zealand Geographic Board and A. S Helm, *Provisional Gazetteer of the Ross Dependency*. (Wellington, N.Z.: Owen, Govt. Printer, 1960). University of Canterbury Library Antarctic Collection

theory of continental drift. Stephenson wrote: "Recently while conducting field work on the Commonwealth Trans-Antarctic Expedition, I collected flora from fossiliferous rocks in the mountains of the Weddell Sea side of that continent. To an Australian, as I am, the material looks closely similar to certain examples of *Glossopteris Gangamopteris* which I have seen in the Permian of Eastern Australia. There can be little doubt that they are representatives of the Permian Gondwana flora. I write to ask would you be interested in describing this material?"[736] Plumstead agreed and before leaving for his next position as a lecturer at the University of Punjab, Stephenson sent her the specimens. Gunn also wrote to Fuchs in Autumn 1958, asking what ought to be done with their own specimen collection: "… we have heard from John Stevenson who informs us he is sending his *Glossopteris* flora to Dr. Plumstead in South Africa for identification and advises us to do the same. As many of the plant fossils appear to be the same this appears to be the obvious course…"[737] Fuchs approved, responding in September 1958: "I think you at your end should definitely send the Glossopteris material to Dr. Plumstead of South Africa..."[738]

[736] Letter from Jon Stephenson to Edna Plumstead undated Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[737] Letter from Bernie Gunn to Vivian Fuchs undated Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[738] Letter from Vivian Fuchs to Bernie Gunn September 4th 1958 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

Figure 14. Edna Plumstead [739]

About a year later, in June 1959, Fuchs wrote to Plumstead asking for an update on her findings from the samples to which she replied: "Some rather interesting geological results have arisen ... Amongst the specimens they sent me were fossils which were conclusive Lower Permian and mid-Triassic corresponding very closely lithologically as well as paleontologically with our mid-Ecca and Molteno Series… As I see it now the Ross Sea Section of Antarctica has sediments corresponding to our Cape and Karroo Systems forming one great conformable sequence of Beacon Sandstone just as they do in the southern Cape. The tillite of the late Carboniferous should be found high up in the sequence, where I believe they did find one. …Is this too fanciful a picture?"[740]

This idea, the connection between Antarctica and other Gondwana regions, was not a geological consensus in the late 1950s. In fact, while still on his expedition, Warren made the following observation in his diary: "Two months out, and much the most interesting and

[739] J. M. Maguire, "Dr Edna P. Plumstead FRSSAF," *Transactions of the Royal Society of South Africa* 47, no. 3 (January 1, 1990): 355–57.
[740] Letter from Edna Plumstead to Vivian Fuchs June 15th 1959 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

important day geologically…we came eventually to boulders eight feet across and the belated realization that it was a glacial "boulder clay" or tillite. All very embarrassing because it is another very strong link in the chain of geological similarity between Antarctica and the other southern continents, particularly South Africa and India, which I have always thought more fantasy than fact, and particularly the 'continental drift' theories that go with it."[741] Even within the paleobotanical community, this theory did not have widespread acceptance; Dutch botanist Cornelis Van Steenis[742] and Swedish geologist Karl Florin[743] had both published against continental drift in 1962 and 1963 respectively. However, with the paleobotanical new evidence from Antarctica, Plumstead's final report argued that the specimens gave "evidence that some land link still existed during the vital period of early angiosperm distribution and that this land link was not ice bound… [which] have provided strong support for the theory of continental drift because the evidence…cannot be satisfactorily explained by any other hypothesis."[744]

Continental Drift theory, which was first hypothesized by German geophysicist Alfred Wegener in 1915, was starting to gain growing support in the 1950s. While during Wegener's lifetime fossil findings in Australia, and even the Antarctic through the Swedish South Pole Expedition 1901-03 and the British Antarctic Expedition 1910-13[745], suggested that there had once been a connection between the southern hemisphere continents, drift theory was still generally rejected on two grounds. First, the fossil evidence of tropical plants and animals in the Antarctic likely suggested that the continent had not always been as cold. This was consistent

[741] Guyon Warren, *The Daily Journal of an Antarctic Explorer 1956-1958*, ed. Karen Warren (Nelson, New Zealand: Copy Press Books, 2014). 264
[742] C. G. G. J. Van Steenis, *The Land-Bridge Theory in Botany* (Leiden: Rijksherbarium, 1962).
[743] Rudolf Florin, *The Distribution of Conifer and Taxad Genera in Time and Space.*, vol. 4, Acta Horti Bergiani 20 (Uppsala: Almqvist & Wiksell, 1963).
[744] Edna P. Plumstead and R Kräusel. *Fossil Floras of Antarctica.* (London: Trans-Antarctic Expedition Committee, 1962). 9
[745] Edna P. Plumstead and R Kräusel. *Fossil Floras of Antarctica.* (London: Trans-Antarctic Expedition Committee, 1962). 12-14

with contemporary views about geology which held that climates millions of years in the past were far warmer, planet wide. In fact *Glossopteris,* a plant fossil used by Plumstead and others to prove Continental Drift, found in Antarctica as early as 1912[746] and almost exclusively found in the southern hemisphere, had also been reported in Siberia.[747] Additionally, the common flora and fauna fossils found in different parts of the southern hemisphere could have arrived via land-bridges, long vanished into the sea. By the 1940s, while Homer LeGrand has argued that there were always some hold-outs,[748] continental drift had been almost thoroughly rejected by the geological community.

This changed in the 1950s and 60s when new data, techniques, and theories in earth science began to challenge the dominant theories of Permanentalism (that all the continents remained in place since their initial development) and Contractionism (the Earth's landscape was in a constant state of evolution through catastrophes, where pieces of the continents were destroyed by the sea). Studies of paleomagnetism, which pioneered at Madingley Rise in Cambridge University in the 1950s, were the first to reawaken interest in continental drift theory when a major systemic discrepancy was discovered between the modern Poles and those calculated from measurements from the Cambrian period.[749] They suggested that even if the landmasses did not move, the magnetic poles had indeed drifted. But by the late 1950s, those in the magnetism community were paying far more serious attention to continental drift.[750] A further piece of evidence came from those studying the sea-floor. American oceanographer

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[746] Edward J Larson, *An Empire of Ice: Scott, Shackleton, and the Heroic Age of Antarctic Science* (New Haven: Yale University Press, 2011). 242
[747] H. E. LeGrand, *Drifting Continents and Shifting Theories: The Modern Revolution in Geology and Scientific Change* (Cambridge ; New York: Cambridge University Press, 1988). 56
[748] H. E. LeGrand, *Drifting Continents and Shifting Theories: The Modern Revolution in Geology and Scientific Change* (Cambridge ; New York: Cambridge University Press, 1988). 120
[749] Carol Williams, *Madingley Rise and Early Geophysics at Cambridge*, (London: Third Millenium Pub Ltd, 2010).
[750] H. E. LeGrand, *Drifting Continents and Shifting Theories: The Modern Revolution in Geology and Scientific Change* (Cambridge ; New York: Cambridge University Press, 1988). Chapter 7

siblings John and Maurice Ewing noticed in the late-1950s that ocean-floor sediment on the Atlantic Ridge was exceptionally thin and there was no evidence of truly old sediment, which for them meant that all "crustal material was collected into one hemisphere by [an] initial current system. The second current, whose pattern is assumed to persist to the present…broke the continental mass into fragments which moved [into] the present pattern."[751] By 1959, most major geophysicists working on the ocean believed that the Mid-Atlantic Ridge was caused by some large motion of the continental crust, based on a new theory of sea-floor spreading.[752] This combined with the paleomagnetic evidence from Cambridge made drift theory quite a bit more popular in Britain than North America in the early 1960s.[753]

In 1964, the Royal Society held a Symposium on Continental Drift organized by the Madingley Rise geomagnetism group, and most of the discussions were supportive of continental drift.[754] In the beginning of 1966, the shift was complete when drift "solved more problems than the competing hypothesis-which was beginning to pose more problems than it solved."[755] While Henry Frankel has argued that debates in paleontology and paleobotany had "little role in the general acceptance of continental drift,"[756] paleobotantists, even women at the margins of the Commonwealth, were engaging with and contributing to this major debate. These Antarctic specimens gave drifters another ally in their scientific network. Though other geologists

[751] John Ewing and Maurice Ewing, "Seismic-Refraction Measurements in the Atlantic Ocean Basins, in the Mediterranean Sea, on the Mid-Atlantic Ridge, and in the Norwegian Sea," *Geological Society of America Bulletin* 70 (1959): 291-318. 309
[752] William Wertenbaker. *The Floor of the Sea: Maurice Ewing and the Search to Understand the Earth.* (Boston: Little, Brown, 1974). 176-8
[753] Henry Frankel, "The Continental Drift Debate," in *Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology*, ed. H. Tristram Engelhardt and Arthur L. Caplan (Cambridge ; New York: Cambridge University Press, 1987). 225
[754] *Proceedings of the Royal Society* (A) 258 (1965): 1-323
[755] Henry Frankel, "The Continental Drift Debate," in *Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology*, ed. H. Tristram Engelhardt and Arthur L. Caplan (Cambridge ; New York: Cambridge University Press, 1987). 237
[756] Henry Frankel, "The Biogeographical Aspect of the Debate Over Continental Drift," *Earth Sciences History* 4, no. 2 (January 1, 1985): 160–81. 160

reminded her that "Arguments for continental drift should not include the assumption that past climatic and floral zones have always had breadths comparable to the present one…and that it is likely that a deglaciated Antarctica could support cold temperate plants."[757] But for Plumstead, these fossils represented definitive proof: "The conclusion is inevitable: that paleo-botanical evidence from Antarctica demands a more plausible phytogeographical explanation than any given previously, and would appear to be satisfied only by the acceptance of some form of continental drift."[758]

In terms of Antarctica's contribution to this debate, in 1962, when Plumstead published her paper, though the theory was still "controversial,"[759] "continental drift and global expansion have at last become respectable subjects for serious research [and] The plant fossils collected by the Trans-Antarctic Expedition have certainly contributed to the sun of the evidence, but whether the interpretation presented here serves as a spark to enthusiasm or as an irritant to more conservative thought, it will have been justified if it serves to draw attention to the mass of available information. These facts, which individually appear extraneous and unrelated, have together begun to form a clear chain of evidence…"[760] Later she stated her case more firmly, engaging, too, with the paleomagnetic evidence: "That the same large plant assemblages should have thrived in India, South Austria and 6° from the South Pole at one and the same time is unthinkable. Only one alternative seems possible and that is a considerable movement of

[757] Comment by America Geologist Warren Hamilton on Edna P Plumstead, "Palaeobotany of Antarctica," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964). 652-3
[758] Edna P Plumstead, "Palaeobotany of Antarctica," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964). 652-3
[759] Edna P. Plumstead and R Kräusel. *Fossil Floras of Antarctica.* (London: Trans-Antarctic Expedition Committee, 1962). 120
[760] Edna P. Plumstead and R Kräusel. *Fossil Floras of Antarctica.* (London: Trans-Antarctic Expedition Committee, 1962). 132

continents relative to one another and the present Pole so as to bring all within one climatic zone…evidence of paleomagnetism, insofar as it available and reliable, supports that of plant fossils…"[761]

However, besides making the connections between Antarctic rocks and those in South Africa, a field in which Plumstead was one of the world's experts, she made another observation that she found more than passingly strange and queried Fuchs if it had been observed elsewhere: "I found, however, that the Theron Mountains' specimens, especially those from the upper horizons, oozed oil from every crack when left in the hot sun for a couple of hours. I first noticed it when working at an east window for a morning with a tray of these specimens in very hot sun. I noticed the same effect but less pronounced under a strong lamp. I use oblique lighting to emphasis venation and this brings the lamp close to the specimen. The oil solidifies into a pale yellow waxy film which weathers to a reddish orange. One of the specimens has a hair crack across it filled with shiny black bituminous matter."[762]

At the end of June, Fuchs replied to Plumstead's letter, responding to her queries and expressing interest in some of her findings: "I was very pleased to receive you[r] explicit and descriptive letter which was most interesting... I am most interested to hear about the oil and waxy film produced from your specimens… As far as I am aware this had not been observed here, and I do not think any of the specimens have been heated enough to show it up… the Therons contained a number of coal seams which, in places, had been coked by the intrusions,

[761] Edna P Plumstead, "Palaeobotany of Antarctica," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964). 652

[762] Letter from Edna Plumstead to Vivian Fuchs June 15th 1959 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

and no doubt this is the reason for the impregnation ... If you think that you can get enough of the material, and can find somebody to do it, it would be interesting to have a micro-analysis."[763]

Plumstead, despite her initial interest in the substance seeping from her fossil samples, did little analysis of said film in her final report. She carefully notes, under the heading "Thermal Metamorphism of Plant Matter" that "volatile matter driven from the coal and from plant fragments in the shale, apparently condensed in some vertical cracks as a shiny black bituminous substance…In Antarctica the process of devolatization is not yet complete for an oily substance which leaves a pale yellowish residue still oozed from vertical cracks or from planes between fossil leaves, if the specimens are left for a short period in bright sunlight or under strong and hot artificial hot light."[764] On a few individual specimens she described the phenomenon further, making guesses as to where it could have come from. In a small "mulberry-like object,…All the small seeds, stems and other thick portions of plant matter on this specimen have a higher concentration of this pale yellow waxy substance than elsewhere. In this fossil the wax not only outlines the small lanceolate object but makes a rather regular pattern on its surface, which suggests that the object itself is the remains of a collective fruitification and that some of the waxy residue was derived from it by a process of devolatization at the same time of the dolerite intrusions."[765] From a *Vertebraria* sample, Plumstead forced off a small piece and ground it down onto a glass slide for micro-analysis, and she observed "The concentration cracks, which

[763] Letter from Edna Plumstead to Vivian Fuchs June 26th 1959 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[764] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 19- 20
[765] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 56

appear as diagonal lines in the figures, were filled with transparent, structureless, yellow, collinite [that] may be attributed to thermal Metamorphism."[766]

The volatility of these plant fossils, while not dwelt on extensively in her report, contributes to an extremely important narrative in the historiography of science. Geological specimens, according to Latour, made for excellent tools, what he called immutable and combinable mobiles,[767] for a geographical center in Europe to rule at a distance, due to their stability and portability, even if they could lose their meaning out of context.[768] Rocks, carry with them a baggage of being wholly dead and unchanging—the most stable of specimens. While a geologist could surely expound at length at the changing nature of rocks, they are speaking in the context of millions of years, not the changeable nature of rocks in several months. Rocks that can grow, move, leak fluids, and become impregnated seem more at home in early modern understandings of crystals and geochemistry within an alchemical context,[769] or within Neo –Platonic of affinity webs and Aristotelian ideas of *generatio aequivoca,* where simple organism could grow from non-living material, even stone,[770] or even with the mythological and literary blurring of stone between life and death, explored at length in the work of literary scholar Tiffany Werth. But this could be because rocks, particularly, as in this case, fossils, have always been problematic objects for scientists, as they do not have a clear boundary between organic and inorganic, living and dead, stable and unstable.

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[766] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 59
[767] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Milton Keynes ; Philadelphia: Open University Press, 1987). 227
[768] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Milton Keynes ; Philadelphia: Open University Press, 1987). 225
[769] William Newman, "Geochemical Concepts in Isaac Newton's Early Alchemy," in *The Revolution in Geology from the Renaissance to the Enlightenment*, ed. Gary D Rosenberg (Boulder, Colo.: Geological Society of America, 2009). 41-49
[770] M. J. S Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology* (New York: Science History Publications, 1976). 35

Etymologically, fossils, for thousands of years simply referred to any distinctive objects that had been dug up. It was not until the nineteenth century that the term *fossils* distinctly referred to objects that had once been alive. In the sixteenth century, fossils were problematic objects because not only did philosophers and writers need to decide on organic origin, whatever that may be, they were working within the context of endless "fossil objects" dug up from the earth.[771] In the nineteenth century, fossils' depictions of change within the world's landscape also made them problems for geologists. While it was probable that gneiss and schist had been formed through the physico-chemical conditions of an early hot Earth, it was more difficult to believe, as suggested by the progressive nature of fossils, that the planet passed through several different stages of existence.[772] This is also reminiscent of the difficulty that Permanentalists had in believing that the continents could actually move, as in continental drift, even in the face of ever mounting evidence. Further, it speaks to the instability of geological specimens. Not only are fossils plastic enough to take on different meanings to different people over time, while they are inorganic remains of organic creatures, they can maintain some of their volatility and therefore became as changeable and unstable as the living organism themselves.

While this chapter has focused largely on the work of Edna Plumstead, she was not the only high-profile geologist examining these rocks. Dr. Dorothy Hill, at the University of Queensland in Australia, was a world-renowned paleontologist known for her work on coral.[773] Although Stephenson saw it prudent to send the fossil floras to Plumstead, the Cambrian *Archaeocyatha* which so delighted him in the Whitchaway Nunataks were sent to Hill. A firm

[771] M. J. S Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology* (New York: Science History Publications, 1976). Chapter 1
[772] M. J. S Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology* (New York: Science History Publications, 1976). 187
[773] Susan Turner. "Dorothy Hill." *Complete Dictionary of Scientific Biography*. (Detroit: Charles Scribner's Sons, 2008).

anti-drifter, Hill, who had an illustrative career both before and after her massive study on the invertebrate fauna of Antarctica, was eventually the first Australian woman to be elected to the Royal Society. Like Plumstead, she expressed frustration with the quality of the specimens she received, calling some too "small," "imperfect," and "unsatisfactory" for proper identification.[774] But her report, published in 1965, included at least one new species, named for its discoverer: *Coscinocyathis stephensoni.*[775] Stephenson and Fuchs also had new species named in their honor by Plumstead: *Stephensotomata crystallinum,*[776] and *Glossopteris fuchsia.*[777]

As part of the TAE *Scientific Reports,* Plumstead published her report, *Fossil Floras of Antarctica,* in 1962. Echoing Hill's frustrations, she even included specimens in her report "which, from any other continent, would not be considered worthy of description…because our knowledge of Antarctic material is so limited that no shred of evidence should be neglected."[778] She also continued this work in a later monograph, published by the British Antarctic Survey in 1975, proving connections between Dronning Maud Land, just east of the Weddell Sea, and the geology of the Talchirs in India, the Upper Dwyka Shales of South Africa, and the Bacchus Marsh bed of Australia.[779] Her research on these Antarctic rocks became her most famous contribution to palaeobotany and offered evidence for the existence of Gondwanaland and

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[774] Dorothy Hill. *Archaeocyatha from Antarctica and a Review of the Phylum.* (London: Trans-Antarctic Expedition Committee, 1965). 60-61, 89
[775] Dorothy Hill. *Archaeocyatha from Antarctica and a Review of the Phylum.* (London: Trans-Antarctic Expedition Committee, 1965). 101
[776] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 52
[777] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 48
[778] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 8
[779] Edna P Plumstead, *A New Assemblage of Plant Fossils from Milorgfjella, Dronning Maud Land* (Cambridge: British Antarctic Survey, 1975).

continental drift, yet she has largely been written out of the history, receiving mentions in none the prolific accounts of the TAE.[780]

The Rocks Find a Home

Even before any results were published from the geological specimens, scientists in both countries were posturing for which country deserved to permanently possess the specimens. While ostensibly the TAE was supposed to be an Expedition in which the Commonwealth was evenly represented, with support and participation from all, in reality, this was more of a British Imperial project than a Commonwealth project. More than half of the members were British with a token South African and Australian. While there were many New Zealand members, very few actually did any research, apart from survey work. Stephenson even recalls being jokingly called a "damned colonial" to which he predictably responded "Pommy bastards."[781] For all the idealism of Commonwealth togetherness on the onset of the Expedition, national politics still reigned, mostly that Britain, if no longer a superpower, was the first among its Commonwealth "equals." While the most esteemed scientists in the Commonwealth did not use such strong language, they clearly felt a sense of nationalistic competition, as exemplified by the final fate of the rocks.

By the summer of 1959, before any of the *Scientific Reports* were published, Fuchs received a letter from the British Natural History Museum requesting any specimens retrieved from the expedition. Fuchs responded that at Shackleton Base, since they were on an ice shelf, they gathered very few specimens themselves. Nor, Fuchs opined, could they expect many donations from New Zealand "as they are now entering the Antarctic field in a big way and both

[780] One exception to this is Henry Frankel's four volume book which includes a section on Plumstead in Volume 1. Henry R. Frankel, *The Continental Drift Controversy*, (Cambridge ; New York: Cambridge University Press, 2012).
[781] Jon Stephenson, *Crevasse Roulette: The First Trans-Antarctic Crossing, 1957-58* (Dural, N.S.W.: Rosenberg, 2009). 72

their geological and biological organisations are rather jealous of what they have obtained [at] their end."[782] As far as what the British Party gathered: "The geological specimens are still in use by Stephenson … and I have not yet been able to determine how important they may be for reference at the F.I.D.S. geological department at Birmingham. …. " Additionally, "the specimens of archaecyathus sp. are being worked up by Miss Hill in Australia, and the glossopteris flora by Dr. Plumstead in South Africa. This will of course mean that we have some responsibility to those Universities as well since both countries contributed to the Expedition."[783]

Gunn and Warren also weighed in on this matter: "Mr. Guyon Warren and myself…are concerned that some definite statement should be made as to the ultimate ownership and storage of geological specimens collected in the course of the expedition…As these specimens are being examined and the Geology of the part of the Ross Sea Dependency is being described under the auspices of N.Z. Geological Survey it has been more or less taken for granted that the specimens will be catalogued as being part of N.Z.G.S.'s collection but this will lead to confusion if some of these samples have to be given to T.A.E in London…"[784] Gunn also wrote to Fuchs almost immediately after their return, expressing concern over the fate of his specimens: "[the] chief paleontologist who is also on the Ross Sea Committee has raised the point that it has never been defined who has control over our specimens, us as collectors, T.A.E.N.Z. or T.A.E. (Lond.) of N.Z. Geological Survey. I also believe that the T.A.E. committee in London have expressed a wish that all specimens should be housed in Britain, and while the many committees are deciding this we have to wait as much of the stratigraphy cannot be written up until the fossils are dated.

[782] Letter from Vivian Fuchs to Gavin de Beers July 18th 1959 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[783] Letter from Vivian Fuchs to Gavin de Beers July 18th 1959 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[784] Undated Letter from Bernie Gunn to Arthur Helm New Zealand Alexander Turnbull Library Arthur Helm Papers 73-132-13/08

The amount of some of the fossil material is limited and if too many institutions want specimens it will just be too bad."[785]

This issue became even more pressing two years later when Plumstead published her paper describing these rocks and emphasized their importance to Earth history. This suddenly gave these specimens even greater value for whichever organization took possession. Fuchs was hesitant to split up the specimens and the British Natural History Museum, taking an even stronger position on his original pessimistic specimen position: "The situation has now arisen where the paleobotanical material collected by the U.K. Party, together with another collection made on the far side of the Continent by Dr. Edna Plumstead of South Africa (Johannesburg), in a paper which will be published in the Trans-Antarctic Expedition Scientific Reports series. It therefore seems unsuitable to divide the material… Further, Dr. Willett of the New Zealand Geological Survey is very strongly of the opinion that this material belongs to the southern hemisphere and a large part of it was collected by New Zealand geologists, it should be deposited with the New Zealand Geological Survey… in all, the amount of collection that was done was relatively small seeing that the greater part of our effort was in survey, glaciology, seismic, gravity and similar types of work."[786]

If Fuchs believed that this notice would close the matter and that the geological specimens would live full-time in New Zealand, he was mistaken. Within two days of writing, he was contacted by Dr. Errol I. White, the Keeper of Paleontology at the Museum. White was enormously displeased with Fuchs' decision to keep the rocks in New Zealand: "…we are anxious to have representative collections here to help in our studies on other Antarctic

[785] Letter from Bernie Gunn to Vivian Fuchs July 3rd 1958 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[786] Letter from Fuchs to Dr. Morrison-Scott July 13th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

material... It is not a question of just trying to grab material from the New Zealanders… If all the material is sent to New Zealand and stays there, it will be to some extent sterilized for they have not got a full staff of paleontologists… Clearly it would be really far more accessible and therefore useful here than in New Zealand: everybody comes to London sooner or later… It is all very well to say that the material belongs to the Southern Hemisphere and is collected by New Zealand personnel, when most of the workers on paleontology live in the Northern Hemisphere."[787]

Fuchs responded with some level of incredulity with White's expectations: "it is clear that you would like to receive as much as possible of the palaeobotanical material from the Trans-Antarctic Expedition…This arrangement will of course mean that both depositories will lack some described specimens and as I am not sure how much duplication there is within the collections, it may be that there will be complete, but different, blanks in both museums. I understand that you do not think this will be an undue disadvantage..."[788] He also wrote to Willett about how he "had been put under considerable pressure by the Natural History Museum as a result of my suggestion that all the material should go to New Zealand … on the grounds that there are likely to be more palaeobotanists visiting and working here than… in New Zealand." He then offered a plan whereby, rather than Plumstead splitting the collections between the two institutions, she would send the British rocks to London and the New Zealand Rocks to Wellington. Then the Natural History Museum would sort out the specimens gathered

[787] Letter from Errol White to Vivian Fuchs June 15th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[788] Letter from Vivian Fuchs to Errol White July 27th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

by the British party and "send a representative series to [Willett]."[789] The NZGS would do likewise with the NZ specimens and send a representative series to London.

Both Willett and White seemed reconciled, if not exactly pleased with this alternative, though Willett added the clarification that the British Natural History Museum would be getting no specimens gathered by the New Zealand Geological Survey, only the TAE, and again insisted that the NZGS divided the NZ specimens and not Plumstead.[790] This situation appeared to be, and in fact finally was, resolved. In January 1963, White dropped Fuchs a Thank you note: "With regard to our correspondence in July 1961 concerning the palaeobotanical specimens of the T.A.E., the material has now arrived here from Johannesburg, and is being unpacked in the Palaeobotanical Section. Thank you again for the trouble you have taken on our behalf."[791]

[789] Letter from Vivian Fuchs to R.W. Willett July 11th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[790] Letter from R.W. Willett to Vivian Fuchs July 19th 1961 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE
[791] Letter from Errol I White to Vivian Fuchs January 29th 1963 Scott Polar Research Institute Archives MS 1326 Box 8 Geology CTAE

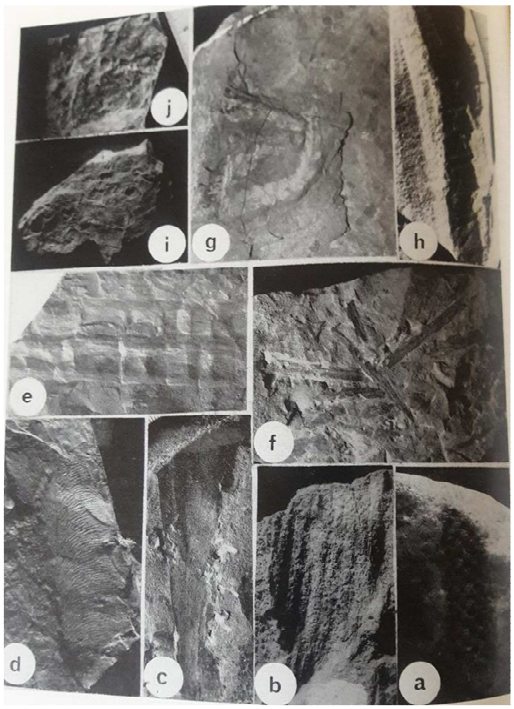

Figure 15. An Assortment of Antarctic Fossils examined by Plumstead[792]

Dorothy Hill did not seem to have the same controversy and simply sent all of her specimens to the British Museum of Natural History.[793] White, true to his word about the value of the rocks to geologists in the Northern Hemisphere eventually wrote a paper using these specimens, the last volume of the TAE's *Scientific Reports,* published in 1968.[794] This paper, on Devonian fishes found in Victoria Land used, as he predicted, the material from Gunn and Warren's expedition on New Zealand's side of the continent.

Conclusion

Rocks often appear to be just rocks. But through this set of geological specimens, it is possible to examine several themes in the history of science and exploration in Antarctica. The

[792] Edna P Plumstead, "Palaeobotany of Antarctica," in *Antarctic Geology: Proceedings of the First International Symposium on Antarctic Geology : Cape Town, 16-21 September 1963*, ed. Raymond J Adie (Amsterdam: North-Holland Publishing Co., 1964).
[793] Dorothy Hill. *Archaeocyatha from Antarctica and a Review of the Phylum.* (London: Trans-Antarctic Expedition Committee, 1965). 46
[794] Errol Ivor White. *Devonian Fishes of the Mawson-Mulock Area, Victoria Land, Antarctica.* (London: Trans-Antarctic Expedition Committee, 1968).

first comes from the context in which the rocks were gathered. As detailed in earlier chapters, while the TAE was occurring, there was massive international movement in Antarctica, the first of its scale in history. Besides the thirteen countries who built research stations that were officially part of the International Geophysical Year, many other people were in the Antarctic 1956-1958. Besides the men at Scott Base and Hallett Base, a joint NZ-US IGY station at Cape Adare, New Zealand, funded survey expeditions by the New Zealand Geological Survey. Two undergraduate students from Victoria University in Wellington set up a small geology program in the McMurdo Dry Valleys. As for United Kingdom, besides the TAE and the Royal Society Expedition to Halley Bay, the Falkland Islands Dependency Survey maintained over a dozen bases scattered through the Antarctic Peninsula. However, despite, or maybe because of all of this other activity, in its legacy, the TAE is characterized as a continuation of the Heroic Era of Antarctic Exploration from the first two decades of the twentieth century, "the last of the heroic expeditions-full stop!"[795] and "the last great journey in the world."[796]

The fact that the specimens were gathered as part of this romantic and seemingly heroic expedition, which had great appeal with the mass press—dozens of books have been published on the TAE, mostly in the years immediately after—lends to their interest. They epitomize the continuation of the masculine heritage of glacial science and exploration which had its origins in the nineteenth-century glaciological exploration[797] and nineteenth-century mountaineering,[798] not to mention the masculine heroic tradition of polar exploration.[799] This is clearly so in the case of

[795] Quoted in Stephen Haddelsey, *Shackleton's Dream: Fuchs, Hillary and the Crossing of Antarctica* (Stroud: History Press, 2012), 251
[796] Egon Larsen. *Sir Vivian Fuchs*. (London: Phoenix House, 1959). 109
[797] Bruce Hevly, "The Heroic Science of Glacier Motion," *Osiris* 11 (1996): 66–86.
[798] Michael S. Reidy, "Mountaineering, Masculinity, and the Male Body in Mid-Victorian Britain," *Osiris* 30, no. 1 (2015): 158–81
[799] Michael Robinson, "Manliness and Exploration: The Discovery of the North Pole," *Osiris* 30, no. 1 (2015): 89–109; Lisa Bloom, *Gender on Ice: American Ideologies of Polar Expeditions* (Minneapolis: University of Minnesota Press, 1993).

these geological specimens. Plumstead credits Fuchs, Stephenson, Gunn, and Warren in these terms, stating "The fact that in so many places recognizable, if sometimes fragmental fossil plants have been found despite the paucity of outcrops and the rigours of climate, bears lasting witness to extraordinary powers of observation as well as perseverance and endurance."[800] Even when somewhat bemoaning the lack of good fossil specimens from the Upper horizon of the Theron Mountains, she evokes the heroic nature of Stephenson's work: "Stephenson, working by daylight in the small hours of the morning, was recalled by the pilot because the weather was deteriorating. This decision had to be obeyed, albeit with protests and many permanent regrets for there was no further opportunity to return to the site. Fossil collecting has probably never been carried out at such hours and under such conditions…"[801] The press coverage of the expedition similarly focused on the traditionally masculine drive of its members, with one newspaper in April 1958 interviewing geophysicist Geoffrey Pratt: "What was it like crossing the South Pole? Terrifying? Dangerous? An exhilarating experience? "Very cold" said Pratt. Modesty is a characteristic of courageous men."[802]

This emphasis on the masculine activity of facing danger alone for the sake of science, contrasted with the arguably more feminine activity of studying rocks from home presents interesting contrasts between Fuchs, Stephenson, Gunn, and Warren, and those who studied their rocks like Plumstead, Hill, or even White. This could be chalked up to the lack of "lost love between the class of men who go out and do such work and authorities at home who deal with their collections,"[803] in the context of Antarctic research. But this does not explain the stark

[800] Edna P Plumstead and R Kräusel, *Fossil Floras of Antarctica* (London: Trans-Antarctic Expedition Committee, 1962). 8
[801] *Ibid*. 18
[802] "BP Maps the Future: 33 at 52 Below" Believed to be from the *London Times* April 23rd 1958 Scott Polar Research Institute Archives MS 1507/2/2
[803] Apsley Cherry-Garrard, *The Worst Journey in the World*, (North Salem, NY: Adventure Library, 1997). 114

gendered divide between the men who did the collecting and the women who wrote up the research. In fact, historian Naomi Oreskes has argued that it is this notion of the masculine hero, going alone on dangerous quests without the help of the outside world, is what makes the work of women scientists invisible in the history of science.[804] Plumstead made one of the more important scientific contributions to the TAE, and she did it without ever visiting the continent. Antarctica was thoroughly constructed as a masculine space where: "the purpose of the dazzlement is not to catch the eye of a flirtatious blonde, but to attract spotters in the event that the explorers become lost in the frozen waste."[805] Bernie Gunn, when visiting Scott Base in 2000, was surprised by the number of women, recalling how leadership in the 1950s would never have allowed it. But, he joked, "We were all male chauvinists then!"[806] But even more strikingly, the fact that her work was not done in the field meant that she could not be a "hero" of science. The discovery was made by the Expedition, and while no one deliberately sought to erase her, since she was not on the Expedition, she is effectively deleted from the narrative.

These rocks also shine a light on the politics of late-Imperial British Science. At the start of the Commonwealth, for many within the elite British science community, "international activities were…motivated by motivated by domestic concerns about preserving Britain's position as a scientific 'Mecca'"[807] While the TAE was supposed to be an achievement of the Commonwealth, it was a Commonwealth where the UK was ranked first. White's insistence on the geological specimens ending up in the British Natural History Museum, despite the fact that they were gathered by an Australian and two New Zealanders and then initially written up by a

[804] Naomi Oreskes, "Objectivity or Heroism? On the Invisibility of Women in Science," *Osiris* 11 (1996): 87–113.
[805] Ruth Montgomery "Womenless Continent of Ice and Snow" *Lincoln Evening Journal*, November 2nd 1958
[806] Vern Gerard "Return of the Pioneers to Scott Base" New Zealand Antarctic Society *Antarctic* 17 (3) 66-67 2000.
[807] Jennifer Rose Goodare, "Representing Science in a Divided World: The Royal Society and Cold War Britain" Unpublished Dissertation (University of Manchester, 2013). 33-34

South African and Australian because more people travel to London than New Zealand may not be absurd, but it assumes a world with London at the center, ignoring the relevant scientific communities on the Pacific Rim, many of which had a staked interest in the region and were certainly much closer geographically.

These rocks then served to make London into what Bruno Latour identified as a center of calculation.[808] It may seem that proximity to a location actually helps to determine one's familiarity with said location. Therefore, for New Zealand, their close proximity and burgeoning relationship with the region should make Christchurch an epicenter for expertise. But objects like geological specimens which are mobile, combinable, and relatively stable, allow places at a distance to exercise authority and expertise with any specific location. Latour even argues that "the history of science is history of science is in large part the history of the mobilisation of any-thing that can be made to move and shipped back home for this universal census."[809] Expeditions therefore allow centers to produce local knowledge from a distance. It is this mobilization of specimens to the metropole that allows paleontologists like Errol White, who virtually never left London for research after 1930, to become a worldwide expert on fossil fish from the British Museum of Natural History.[810] Whatever desire that Willert had to make Christchurch a center of calculation, in 1961 it could not claim the same precedence as London.

Finally, these rocks themselves say something important about the role of non-human actors and the environment in scientific research. Those fossil stones lay, unmoved, likely for millennia in their respective parts of the continent. However, once their environment changed,

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[808] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Philadelphia: Open University Press, 1987). Chapter 6
[809] *Ibid*. 225
[810] James Stubblefield. "Errol Ivor White. 30 June 1901-11 January 1985." *Biographical Memoirs of Fellows of the Royal Society* 31 (November 1, 1985).

and they were moved to a warmer location, they changed. They could not help but to leak a contaminant unfamiliar to one of the top palaeobotanists in the world. This suggests that the specimens and therefore the research in Antarctica are inherently unstable and troubles the stability of geological findings in Antarctic research. Despite the desired stability of specimens within a center of calculation, this also suggests that the stones themselves in a new environment are not only devoid of their context,[811] but are alive-not in a biological sense of the word-but they are in fact changeable and capable of interaction with the world around them. Fuchs even uses the term "impregnate" years before White, worried about them becoming "sterile."

In conclusion, it is clear that this set of geological specimens, are boundary objects, as defined by Susan Leigh Starr and James Griesemer.[812] They maintained their meaning as valuable geological samples in a vast array of locations and to a number of people within different fields of the scientific community. However, they also were plasticized enough to take on different uses. They were used by Warren, Gunn, and Stephenson as a way to solidify their standing as scientists acting in a heroic masculine tradition, legitimizing their presence in the Antarctica. For Plumstead, they served as a reaffirmation of her life's work and a way for her to contribute in an important way to Antarctic science without ever leaving Johannesburg. For White and Willett they served a physical manifestation of their scientific authority in Antarctica, a region that both British and New Zealand scientists sought to establish dominance in going into the 1960s. And finally, the stones themselves served as a reminder of both the changeable nature of geological specimens, artifacts of history of a simply longer scale, and also that many things-

[811] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Philadelphia: Open University Press, 1987). 225

[812] Susan Leigh Star and James R. Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," *Social Studies of Science* 19, no. 3 (1989): 387–420.

rocks and scientists alike, cannot help but to change, be changed, and unknowingly contaminate their surroundings when they are transplanted into an unfamiliar environment.

CHAPTER SIX: THE FORGOTTEN GLACIOLOGICAL EXPEDITION

"If a Capt, some Officers & a Crew were convicted of some heinous crimes, they ought to be send by way of punishment to these inhospitable cursed Regions, for to explore and survey them. The very thought to live here for a year fills the whole Soul with horror and despair."[813]- Johan Reinhold Forster, naturalist aboard the *HMS Resolution,* on the island of South Georgia

"A long sea-voyage not only brings out all the mean traits one has, and exaggerates them, but raises up others which he never suspected he possessed, and even creates new ones. A twelve months' voyage at sea would make of an ordinary man a very miracle of meanness. On the other hand, if a man has good qualities, the spirit seldom moves him to exhibit them on shipboard, at least with any sort of emphasis."[814]-Mark Twain

Introduction

On July 11, 1959, Jeremy Smith, a postgraduate student in geology at London University, wrote a letter to Gordon Manley, the eminent climatologist who had been supervising his research on the isolated sub-Antarctic island of South Georgia during the International Geophysical Year (IGY). In his letter, he described his progress, writing "The report is progressing slowly but surely. About a month ago I finished re-writing chapters II and IV….when the report is finished, it will be a case of re-typing…and altering the introduction and conclusions a bit to make it read as if the work was thought up beforehand, and didn't just evolve on the spot."[815] He also expressed a desire to apply for Lectureship positions when he finished his dissertation. Finally, he signed off, writing that he was "off for a fortnight to the Alps

[813] Quoted in Robert Headland, *The Island of South Georgia* (Cambridge: Cambridge University Press, 1984). 29
[814] Mark Twain, *The Innocents Abroad* (London: Collins, 1964). 341
[815] Letter from Jeremy Smith to Gordon Manley July 11th, 1959 British Antarctic Survey Archives GL/78/003/16

soon."[816] This was Smith's last letter to Manley. At thirty years old, he was killed in a climbing accident on Mont Blanc on Sunday, August 9, 1959 and immediately "mourned by many, including glaciologists, geologists, and the mountaineering fraternity."[817] His family's decision that "Jeremy's body should be left in an apparently almost inaccessible place in the Alps seems to be a very appropriate resting place."[818]

When those within the polar community received word of Smith's death, there was an immediate outpouring of grief. But the most compelling way that this community thought to honor Smith was through accolades of his research. His obituary in the *Journal of Glaciology* focuses on the great loss to the future of scientific research: "The preliminary reports of his investigations were very well thought of and showed great capabilities. It was clear that his energy, initiative, drive and independence of outlook would have yielded valuable results. Apart from the personal aspects it is sad that a life of so capable and determined a recruit to scientific study should have been eclipsed thus prematurely."[819] It seemed to be that the most lasting tribute to Smith would be the publication of his work. Less than a month after Smith's death, Raymond Adie, a senior geologist at the Falkland Islands Dependency Survey (FIDS) and professor at the University of Birmingham, wrote that "Already we have been able to submit one of his papers to the Journal of Glaciology and I think it will not be too difficult to bring the main report into a form suitable for publication as a FIDS Scientific Report."[820]

Manley, who had taken leadership on Smith's manuscript, scheduled its release in 1964 as No. 29 in the series of *British Antarctic Survey Scientific Reports,* reflecting the name change

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[816] Letter from Jeremy Smith to Gordon Manley July 11th,1959 British Antarctic Survey Archives GL/78/003/16
[817] "Obituary: Jeremy Smith," *Journal of Glaciology* 3, no. 26 (September 14, 1959).
[818] Handwritten letter from J.W. Matthew to Raymond Adie August 18th, 1959 British Antarctic Survey Archives GL/78/003/16
[819] "Obituary: Jeremy Smith," *Journal of Glaciology* 3, no. 26 (September 14, 1959).
[820] Letter from Raymond Adie to Robert Glentworth September 4th, 1959 British Antarctic Survey Archives GL/78/003/16

between FIDS and BAS in 1962. He titled the work *Glaciological Studies During the International Geophysical Year: I. South Georgia 1957-58* and credited the author as Jeremy Smith, B. Sc. In his preface, he wrote a touching memorial:

"Mr. Jeremy Smith, a graduate in geology of King's College, London, working at the Macaulay Institute on the Soil Survey of Scotland, was given leave of absence to join the Falkland Islands Dependencies Survey and work at the scientific station at Grytviken. He had the advantage of earlier experience in Spitsbergen, and was also a very capable mountaineer. With Mr. Richard A. Brown, a surveyor of experience and a climber who already had some knowledge of the island as a participant in the Sutton mountaineering expedition of 1954, he arrived in South Georgia in January 1957…To the informed reader, Mr. Smith's remarkable accomplishment in building up such an extensive discussion of the glacierization of South Georgia will be very evident. It must be emphasized that it depends almost wholly on the work of two men working entirely on foot, in a most trying climate, over a period limited to little more than twelve months. This is the more noteworthy as Mr. Brown, who with his mountaineering experience and capacity as a surveyor gave great assistance, left the island before the work was complete. It is therefore with the greatest regret that the National Committee learnt of Mr. Smith's death in a climbing accident on Mont Blanc during a short holiday in August 1959, when his report was nearly completion."[821]

Manley was not the only one to perceive value in Smith's work. For example, Vivian Fuchs asserted that Smith's "work constitutes an important part of the UK Antarctic contribution to the IGY."[822] Adie even wrote that "this is probably the most important FIDS contribution to

[821] Gordon Manley "Preface" Jeremy Smith *Glaciological Studies During the International Geophysical Year: I. South Georgia 1957-58*, Unpublished Manuscript, 1964. British Antarctic Survey Archives
[822] Letter from Vivian Fuchs to Chief Librarian, University of Aberdeen February 13th, 1959 British Antarctic Survey Archives ADS/1/AS/139(1)

the IGY."[823] Manley even concluded his preface to the report, writing that this "report will stand out not only as a contribution to our knowledge of the glaciology in a very critical area, but also as a memorial to determined accomplishment under unusually difficult conditions requiring not only a wide scientific training but also initiative and resourcefulness under the limitations perforce imposed,"[824] implying that FIDS saw the report as not only essential for the scientific knowledge it imparted, but also as a tribute to its writer. In his death, it appeared that Smith was securely a valued member of an international community of scientists.

Considering the seemingly widespread acclaim for both Smith and the IGY Expedition to South Georgia, it seems strange that BAS never published any findings from his work on the island. In fact, before stumbling upon a reference to it at the end of a research trip to the British Antarctic Survey Archives, I had heard of neither Smith nor his expedition. On the BAS website, which has digitized of all their Scientific Reports, the only evidence of No. 29 is an entry reading "*[28-32 not issued]."* In this chapter, I will argue that political, environmental, and interpersonal factors combined to set up this expedition for failure, drawing particular attention to the changing profession of glaciology and the policing of the practice of glaciological fieldwork. I will argue that fundamentally, despite the outpouring of grief upon his death, Smith's report was never published due to his lack of social capital, which manifested itself in a weak social network that essentially collapsed upon his death. To make this argument, I will chart the fraught process that this research project underwent, beginning with its inception and ending with its non-publication. In order to write this narrative, I will open with an account of the state of Antarctic glaciology at the start of the IGY and the goals which were hoped to accomplish by a

[823] Letter from Raymond Adie to Vivian Fuchs August 13th, 1959 British Antarctic Survey Archives ADS/1/AS/139(1)
[824] Gordon Manley "Preface" Jeremy Smith *Glaciological Studies During the International Geophysical Year: I. South Georgia 1957-58*, unpublished Manuscript, 1964 British Antarctic Survey Archives

large concerted effort to study glacial behavior around the world, in addition to a brief history of the history of science on the island of South Georgia.

Next, I will get into the International Geophysical Year Expedition to South Georgia, focusing on the social dynamics of science in extreme environments, dynamics which were all at once political, professional, and personal. I will start with its organization and selection of its personnel, namely Richard Brown and Jeremy Smith. Smith, who had a solid education in geology clashed greatly with Brown, who had a weaker academic background but had previously lived in South Georgia, and brought his wife, Elizabeth, to the island for the duration of the expedition. In this section I will ground Elizabeth Brown's experience within a larger discussion the role of women in the field in Antarctica drawing on recent research theorizing a feminist understanding of glaciers and ice. The very detailed correspondence from those involved with this expedition present a charged relationship between Smith and Richard Brown, with, among other things, a conflict over Elizabeth Brown at the center. In addition to exemplifying the misogyny rampant in polar science, Smith's magnified reaction to her presence also highlights his insecurity with his own position, further illustrated by a delayed letter of appointment, lack of additional training, relatively low pay, and tenuous accommodation and messing situation, all of which translate to a weak network. I will also examine Smith's progress in writing his unpublished research after his return to the UK, and discuss the outpouring of support for publishing Smith's research after his death. I will end my chapter with a comparison between this expedition and its contemporaries, showing that the particulars of this expedition placed it into a situation where success would be almost impossible.

Science on the Island of South Georgia

First discovered and mapped by James Cook in 1775, South Georgia's topographical status as a remote island, making it particularly suitable for Western scientific research, has been well explored by historians. During the Enlightenment in particular, "science turned islands into nature's laboratory"[825] and the "island easily became, in practical as well as environmental terms, an easily conceived allegory of a whole world."[826] This is perhaps no betters symbolized through the centrality of islands to the work of Charles Darwin and Alfred Russel Wallace who wrote in 1880 that "Islands possess many advantages for the study of the laws and phenomenon of distribution. As compared with continents, they have a restricted area and definite boundaries, and in most cases their geographical and biological limits coincide."[827] Considering the central role of islands to British scientific expeditions as well as the economic value of the Southern ocean whaling and sealing,[828] it is no wonder that scientific expeditions were common in South Georgia.

South Georgia also served a gateway to Antarctica; a stopover point for those making the journey further south. The Discovery Investigations, formed in 1918 and funded by the Colonial Office was created to study the marine habitats of the Southern Oceans. Due to the centrality of South Georgia to the whaling industry as well as the existing logistical support on the island, shore work was carried out at in a marine laboratory at the Discovery House, where the scientists both lived and worked within the town of Grytviken. The Discovery Investigations were instrumental in constructing South Georgia as a location associated with scientific work. Before, science on the island was sporadic and rarely formally organized. But since 1924, excepting

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[825] John R. Gillis*, Islands of the Mind: How the Human Imagination Created the Atlantic World* (New York: Palgrave Macmillan, 2009). 4
[826] Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (Cambridge: Cambridge University Press, 1996). 9
[827] Quoted in John R. Gillis, *Islands of the Mind: How the Human Imagination Created the Atlantic World* (New York: Palgrave Macmillan, 2009). 112
[828] Ben Maddison. *Class and Colonialism in Antarctic Exploration, 1750–1920*. (London: Routledge, 2014).

WWII, scientists have had a continuous presence on the island. The Discovery Investigations built a structure for scientific research at South Georgia, one that could be, and was, embraced by most subsequent expeditions in terms of their relationship with the whaling companies and their use of the administrative and logistical resources of the Colonial Office. Finally, before the IGY, there was one major scientific project in South Georgia worthy of mention. The South Georgia Surveys (1951-7) organized by Duncan Carse, completed in the course of four expeditions, resulted in the first comprehensive map of the island completed since the eighteenth century.

Glaciological Work during the IGY

During Antarctic exploration prior to WWI, glaciological studies were severely limited by extreme isolation, dangerous conditions, and limited supplies. Therefore, research was generally more descriptive than theoretical or quantitative.[829] As late as 1928, in order for Antarctic glaciology to have a future, "The time has come when new technique[s] or better equipment will have to be evolved."[830] After World War II, the study of glaciology was infused with new vigor, nearly at the same level as its nineteenth century golden age,[831] marked by the founding of the Association for the Study of Snow and Ice in 1936 which became the British Glaciological Society in 1945.[832] The emerging glaciology strongly influenced the research program of the Norwegian-British-Swedish (NBSX) expedition of 1949-52 which G.E. Fogg has termed the beginning of "the modern phase of Antarctic exploration."[833] On this expedition Swedish glaciologist Valter Schytt pioneered new techniques like snow-pit sampling, first

[829] G. E. Fogg, *A History of Antarctic Science* (Cambridge; New York: Cambridge University Press, 1992). 269
[830] R.E. Priestley and C.S. Wright, "Some Ice Problems of Antarctica," in *Problems of Polar Research*, ed. W.L.G. Joerg (New York: American Geographical Society, 1928), 330–41. 341
[831] G. Seligman, "Research on Glacier Flow. An Historical Outline," *Geografiska Annaler* 31 (1949): 228–38.
[832] J. Weertman, "Impact of the International Glaciological Society on the Development of Glaciology and Its Future Role," *Journal of Glaciology, Special Issue* (1987): 86–90.
[833] G. E. Fogg, *A History of Antarctic Science* (Cambridge; New York: Cambridge University Press, 1992). 270

developed by the American Antarctic Service Expedition 1939-41.[834] Peder Roberts has shown that unlike the self-funded expeditions of the past where science to a back seat to adventurism, the NBSX was committed to an image of scientific integrity, where its members were well-compensated and focused on mundane routine and specialized expertise rather than enterprise and endurance. Probably this focus on the more tedious details of glaciological research contributed to the lack of public interest in their expedition.[835] But more importantly, the tools and techniques, as well as major questions and theoretical framework developed during the NBSX were the basis for British and American glaciological work during the IGY.[836]

Although there was no specific detailed plan for glaciology during the IGY, participants hoped to embark on an epochal glaciological program taking advantage of the widespread geographical sweep of the IGY to make "the first detailed survey of the glaciers of the whole world."[837] In many countries around the world, particularly those with large numbers of glaciers within their borders like Canada, the USA, and the USSR, this meant the study of the movements, micrometeorology, and annual budgets of their own local glaciers. This was also the case in both newly independent nations, such as the Geological Survey of India's investigations of the Gangotri Glacier, and nations in their last years of colonization, like the Makerere College expedition up the Ruwenzori in Uganda. Already, glaciologists knew that glaciers in the Northern Hemisphere were shrinking-was this part of a world-wide trend, perhaps evidence of warming of the entire earth?

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[834] F. Alton Wade, "The Physical Aspects of the Ross Shelf Ice," *Proceedings of the American Philosophical Society* 89, no. 1 (1945): 160–73. 162

[835] Peder Roberts, *The European Antarctic: Science and Strategy in Scandinavia and the British Empire* (New York: Palgrave Macmillan, 2011). 131-2. 137

[836] J. Weertman, "Impact of the International Glaciological Society on the Development of Glaciology and Its Future Role," *Journal of Glaciology, Special Issue* (1987): 86–90.

[837] Ronald Fraser, *Once Round the Sun: The Story of the International Geophysical Year*. (New York: Macmillan, 1958) 134.

In 1959, well before any serious study had been done using IGY data, Laurence Kirwan wrote "both Arctic and Antarctic, it seems, are slowly melting, almost imperceptibly changing, for their ice cover is melting and adding minutely to the volume of the oceans… In the remote future perhaps…luxuriant vegetation may flourish once again within the Antarctic circle."[838] In a 1957 *BBC* broadcast, the Duke of Edinburgh explained that during the IGY "glaciers are being studied, partly because they make up ten percent of the world's land surface, but principally, because they're melting away. And the sea level is rising at the rate of two and a half inches a century. If they melted away all together, sea port cities of the world, like London and New York, would be completely submerged, as the level of the sea would rise over a hundred feet. The ice melts into the oceans which cover three quarters of the world's surface. The circulation of the seas has a profound effect on climate."[839] These concerns over the global effects of glacier behavior and their contribution to climate variation, which would not be out of place for a public figure to address on today, were already a driving question for the organizers of the IGY.

While any serious study of glacier behavior could not be completed in two years, scientists believed that the IGY would mark the beginning of serious and dedicated monitoring of Antarctic ice. One major question for glaciologists in the IGY was the source of Antarctic ice. Since every year the Antarctic delivers many cubic miles of ice-bergs into the Southern Oceans and the plateau contains very little precipitation, "What, then, replaces the outflowing ice?"[840] The most ambitious plan for Antarctic glacial measurement was seismic sounding conducted on over-ice traverses, including the Trans-Antarctic Expedition. This study of the Antarctic ice-cap

[838] Laurence Kirwan, *The White Road: A Survey of Polar Exploration.* (London: Hollis & Carter, 1959). 354
[839] Aubrey E. Singer, *The Restless Sphere: The Story of the International Geophysical Year*, Documentary (BBC, 1957).
[840] Walter Sullivan, *Assault on the Unknown: The International Geophysical Year*. (New York: McGraw-Hill, 1961). 332

would finally determine whether Antarctica was a continent or an archipelago.[841] Finally, during the IGY, using the newly developed modern ice core drilling technology, the Snow, Ice, and Permafrost Research Establishment (SIPRE), first established in 1949, successfully recovered the first deep ice cores ever obtained from the Antarctic ice sheets.[842]

The International Geophysical Year South Georgia Expedition

Organizing the Expedition

On May 26th 1956, Gordon Manley, the British correspondent in glaciology for the Comite Scientifique de l'Annee Internationale Geophysique, and professor in the Geography Department at the Bedford College for Women, who was "a charming caricature of an absent-minded professor,"[843] submitted a proposal for a Glaciological Program for the Falkland Islands Dependencies Survey to the British National Committee for the IGY. Based on the very broad recommendations of the IGY Special Committee at Brussels, he concluded that the United Kingdom should attempt to carry out glaciological fieldwork within their colonial territories in the Falkland Dependencies and East Africa. The Falkland Dependencies, the focus of Manley's report, offered three distinct areas worthy of investigation: South Georgia, the Antarctic Peninsula and its adjacent islands, and the continental areas beyond 70°S. However, he presumed that the continental areas beyond 70°S would be likely be managed by the Royal Society Expedition to Halley Bay and the Trans-Antarctic Expedition. Additionally, due to a lack of suitably qualified personnel, work at the existing seventeen bases would be limited to the recording of glacial movements by local FIDS personnel, to the best of their ability. However, he

[841] Walter Sullivan, *Assault on the Unknown: The International Geophysical Year.* (New York: McGraw-Hill, 1961). 309
[842] Chester Langway, "The History of Early Polar Ice Cores," *Cold Regions Science and Technology* 52, no. 2 (April 2008): 101–17.
[843] Hugh M. Noble, email to author, July 4, 2017.

concluded that other than a small program on the South Shetland Islands, an expedition to South Georgia would present the best opportunity for research during the IGY. Not only was it one of the few British territories possessing glaciers, very little was known about their characteristics or behavior.

In Manley's plan, two men with experience in both mountaineering and glaciology could take up residence in the whaling town of Grytviken, which could provide accommodations, equipment, and even occasional volunteers. Manley believed that the most important qualifications for these research "are in essence those of field survey."[844] Rather than performing a general glaciological reconnaissance of the island, which would have reproduced work done by Carse's South Georgia Survey, he suggested a course requiring detailed observations on designated glaciers. He tentatively suggested that the selected men embark on a program of study focusing mostly on the Hamberg glacier, which was in slight retreat and could be visited at least fortnightly. He plotted a similar program of study for the Hodges glacier, which could be visited more frequently. Around the glaciers, these two men would be charged with setting up large cairns as survey marks and linking them to existing surveys, plotting the position of the glacier terminus, and examining the proximity and types of vegetation below and adjacent to the glacier. On the glaciers themselves, these two men could survey its longitudinal profile, identify areas with major crevasses, and set up stakes to determine glacial movement. Finally, they would be able to study the snowline in conjunction with local meteorological events. Manley believed that this program could be carried out between January 1957 and April 1958 using basic surveying equipment, and in the case of accumulation and ablation studies, a shovel, bamboo rods, and a

[844] "Proposed IGY Glaciological Program for Falkland Islands Dependencies Survey" Notes of the British National Committee for the International Geophysical Year May 26, 1956. Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A

portable ice drill.[845] The remaining task was to find a pair of geologists capable of carrying out this expedition, which, would be carried out on a low budget, and with relatively low priority for both the Royal Society, who were investing their efforts in their larger and more public expedition to Halley Bay, and FIDS, which was stretched thin, focused on occupying as much of the Antarctic Peninsula as possible.[846] Further, these men would be in a rather anomalous position because "they are Royal Society personnel but FIDS is looking after the logistics."[847]

For this project, Manley and polar geologist James Wordie, began to interview personnel for this position, classed as an 'Assistant Experimental Officer.' The posts were advertised at £400-540 per year (£9160-12370 today), to begin in November 1956 and run through June 1958. Ideally, they sought men between the ages of 22 and 30, with "Scientific training to B.Sc. or equivalent, preferably in geography or geology with some physics…expected to have had strenuous field experience in glaciology and must be capable of working entirely alone." To draw those seriously considering a future in glaciology, the Royal Society offered the consideration that "Candidates will be considered for registration in a higher degree."[848]

It did not prove easy to find suitable candidates. They received only eleven applications. Manley even bemoaned the state of their applicants, asking "Why do not better men come forward? ...It worries me very much that our national scientific accomplishment during the IGY should depend on so few and so meagre an entry?"[849] So few men applied for these glaciology

[845] British Glaciological Society, Glaciological Research Sub-Committee "Technical Note No. 1: Measurements required on a glacier in an area which is unknown and unmapped." Scott Polar Research Institute Archives MS 1326 Glaciology CTAE
[846] Adrian Howkins, "Political Meteorology: Weather, Climate and the Contest for Antarctic Sovereignty, 1939--1959," *History of Meteorology* 4 (2008): 27–40.
[847] Undated Letter from Raymond Priestley to F.K. Elliott British Antarctic Survey Archives ADS/1/AS/139(1)
[848] "Appointments in the United Kingdom International Year Programme" British Antarctic Survey Archives AS/138/A 1956-1957
[849] Letter from Gordon Manley to Raymond Priestley October 28, 1956 British Antarctic Survey Archives ADS/1/AS/139 (1)

positions that the list of applicants was shared with FIDS and the Royal Society Expedition to Halley Bay; two of the rejected candidates were later hired onto other IGY expeditions. In May, Manley, Wordie, and Martin concluded that John Trevor Hollin should be appointed glaciology leader in South Georgia. Hollin was an experienced skier and climber with a degree in Geography from Oxford and a member of student expeditions to Spitzbergen in 1951 and 1955. As far as a second man, the hiring committee had some disagreement. They interviewed Jeremy Smith "and on first consideration could find no suitable post for him although he is quite good."[850] Wordie favored Smith to be appointed as the second glaciologist. However, Manley preferred and had been "pushing" Richard A. Brown, "who is somewhat neurotic and has failed his degree but has since done a survey in South Georgia."[851] After come convincing, Manley and the rest of the committee agreed that "it is not wise to send a neurotic person along with a healthy extrovert like Hollin"[852] and "Brown and Hollin might not get on very well together."[853] It would be Hollin and Smith, with Brown perhaps joining them for a single summer rather than the full eighteen months. But the expedition faced its first of many setbacks when Hollin withdrew to accept a position as the Chief Glaciologist at the US Wilkes Station, in the Australian Antarctic Territory.[854] After his withdrawal, Wordie and Manley resigned themselves to appointed Jeremy Smith, who Wordie described as "a very good man indeed and I think we are fortunate to have him even for the one year,"[855] and Richard A. Brown. While "Smith has far

[850] Memorandum for David Martin from James Wordie May 15th, 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[851] Memorandum for David Martin from James Wordie May 15th, 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[852] Memorandum for David Martin from James Wordie May 15th, 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[853] Memorandum for A.F. Moore May 17th, 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[854] Scott J. Lehman and John T. Andrews, "John Trevor Hollin 1930–2016," *Arctic, Antarctic, and Alpine Research* 49, no. 2 (May 1, 2017): 197–99.
[855] Letter from James Wordie to David Martin October 1957 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A

the better academic qualifications…Brown has field experience in the Antarctic which might be taken to offset the academic edge."[856] These were certainly not the ideal picks for anyone.

The two were given a fairly free hand in determining their priorities on the island, in recognition of the many obstacles, environmental, logistical, and technological alike, which would steer their decisions upon arrival. But given both their qualifications and their resources, Manley believed that Smith and Brown could, most broadly, study and/or achieve the following: the establishment of reference marks for purposes of survey and for use by future investigators; survey of terminal features of the Hodges, Hamberg, Harker, Lyell, and Gaikie glaciers; Accumulation, ablation and movement of the Hodges and Hamberg glacier; Relationship of glaciers to meteorological data taken at the South Georgia whaling station at Grytviken; discussion and comparison of the observed behavior of small and large glaciers around Grytviken; reconnaissance survey of glaciers further afield; local study of snowbeds; and assistance, if possible to other work contributed to the IGY program.[857] He summarized the problems at South Georgia as follows: "1. Are the glaciers advancing, stationary or retreating, and if so, why? 2. Given that they are broadly in balance at present, for how long has this been true? 3. On what factors does their behavoiur depend, i.e. what part in their economy is played, as regards accululation, by a) precipitation as rain or snow, b) wind force and direction; and as regards ablation, by c) radiation and evaporation, d) convection and condensation?"[858]

By all accounts, Jeremy Smith was an ambitious young man. Born in 1929, he was educated at Bryanston School. After receiving a commission in the Royal Air Force, he read for Honors in Geology at King's College in London, and studied biology for one year at the London

[856] Minutes from phone call between Gordon Manley and Raymond Priestley October 11th, 1956 British Antarctic Survey Archives ADS/1/AS/139(1)
[857] "I.G.Y Glaciological Programme-South Georgia" 1957 British Antarctic Survey Archives ES1/H1/5/88
[858] Letter from Gordon Manley to Jeremy Smith August 29th, 1957 British Antarctic Survey Archives GL/78/003/16

University before joining the Macaulay Institute for Soil Science at Aberdeen. There, he joined an expedition to Spitsbergen (northern Norway), which resulted in a publication in the *Journal of Soil Science*.[859] While on this expedition, he became interested in glaciology from examining and mapping glacial drifts and soil parent materials.[860] In 1956, Smith applied to the Royal Society for glaciological posts connected with the IGY and in May, was invited by David C. Martin, the Assistant Secretary of the Royal Society, for an interview.[861] Six weeks later, he still had not heard about his status and worried that his offer could have been mislaid since "I have changed my address three times, and …office staff at the Macaulay Institute have been known to misdirect correspondence."[862]

Even this early in the expedition's planning, Smith likely recognized the general lack of priority of his expedition when Martin responded to his query that "Unfortunately there have been some difficulties regarding the manner in which the work is to be conducted, and although I am now reasonably confident that the survey will proceed and that we hope to appoint you to assist in this work, I am unable to make a definite offer until about 25 July 1956."[863] Even after Smith was offered the position as glaciologist by the Royal Society, he was still frustrated by the lack of a formal offer from the British Government. He wrote to the Crown Agents, imploring them to give him a formal offer so he could give notice to the Macaulay Institute and make the necessary preparations. After sending several letters to the Royal Society, FIDS, and the Crown Agents, in November 1956, the very month he was scheduled to leave, he finally received "a

[859] J. Smith, "Some Moving Soils in Spitsbergen," *Journal of Soil Science* 7, no. 1 (January 1, 1956): 11–21.
[860] Letter from Jeremy Smith to J.B. Cragg November 20th, 1957 British Antarctic Survey Archives GL/78/003/16
[861] Letter from D.C. Martin to Jeremy Smith May 2nd, 1956 British Antarctic Survey Archives GL/78/003/16
[862] Hand-written copy of a letter from Jeremy Smith to D.C. Martin, June 1956 British Antarctic Survey Archives GL/78/003/16
[863] Letter from D.C. Martin to Jeremy Smith July 16th, 1956 British Antarctic Survey Archives GL/78/003/16

letter for appointment and form of agreement"[864] for the post of 'Glaciologist' for the Falkland Islands Dependency Survey.

Even without an official appointment, Smith spent the month of October preparing for his expedition. He sent in an array of questions and comments to FIDS ranging from his hopes that the ship would stop at other bases on its way to South Georgia, his experience with experimental dried foods, and where he, a keen photographer, could cheaply buy photography equipment. Hoping to submit his IGY work as a PhD thesis, Smith enrolled in London University and found a professor, geologist J.H. Taylor of King's College, who along with Gordon Manley, would supervise his thesis.[865] He also wrote to the British Glaciological Society for advice on his future field work. Finally, an amateur botanist, he began correspondence, detailing the sort of botanical research that he might pursue in his spare time. Of those involved in the IGY Expedition to South Georgia, Smith had the most at stake. He was giving up a stable, well paid career, albeit temporarily, to travel for eighteen months to a far-flung corner of the Empire. But Smith clearly believed that this gamble could launch his career within the scientific world far more efficiently than his continued work at the Soil Survey by instantly placing him in the center of a major international project, giving him contacts with some of the most well-known and well-placed figures within the glaciological and wider scientific community, and providing him with a PhD. This project could give him access to an extended network of scientists and future research projects and the social capital that accompanied such a network. For Smith, this was the opportunity of a lifetime, one which he planned to capitalize on in its fullest.

[864] Letter from the Crown Agents to Jeremy Smith November 8th, 1956 British Antarctic Survey Archives GL/78/003/16
[865] Letter from Jeremy Smith to Raymond Priestley November 8, 1956 British Antarctic Survey Archives GL/78/003/16

In April 1956 Smith met Richard "Dick" Brown (1927-2009), who was appointed to be his partner during the expedition, at a meeting of the British Glaciological Society. Brown was a geologist with experience on expeditions to Norway and as a member of the British South Georgia Expedition (BSGE) of 1954-5. At the time of his engagement, he was working for Thomas Cook and Son Ltd, a London based transportation and travel company. Like Smith, Brown also approached FIDS and the Royal Society with questions about the equipment planned for the expedition and even offered to approach "several contacts in the commercial would who would supply him with…material at a greatly reduced price."[866] Although the early correspondence between Smith and Brown mostly involved equipment, logistics, and background reading on glaciology, Brown included a proposal, which became a major source of contention between the two men. Brown had heard that zoologist Nigel Bonner was going to be bringing his wife, Jennifer, to South Georgia. Additionally, when Brown had been there last, as part of the BSGE, there had been three wives living at Grytviken: Nan Brown (unrelated), Ev Williscroft, and Betty Biggs, along with Biggs' three children.[867] Therefore Brown decided that "I am going to try my luck for poor Liz…who will otherwise have a thin time! She can mend our buttons + socks!"[868] Lisbeth Lewander has argued that "No person, whatever their educational or professional background, visits Antarctica without being impressed by the climate and geography. This particularity seems to provoke visitors into encoding the place with expressions of humanity, including gender relations."[869] Consequently, the presence of Elizabeth "Liz" Brown at Grytviken had an enormous impact on the future of this expedition.

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[866] Memorandum for A.F. Moore October 18th 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[867] Nan Brown, *Antarctic Housewife* (Hutchinson, 1971). 31
[868] Handwritten letter from Richard Brown to Jeremy Smith November 8, 1956 British Antarctic Survey Archives GL/78/003/16
[869] Lisbeth Lewander, "Women and Civilisation on Ice," in *Cold Matters: Cultural Perceptions of Snow, Ice and Cold*, ed. Heidi Hansson and Cathrine Norberg (Umeå: Umeå University and the Royal Skyttean Society, 2009). 89

The rather dissimilar backgrounds of Jeremy Smith and Richard Brown does much to foreshadow their eventual clash. While Smith was attempting to follow a more conventional pathway for a young scientist hoping for a successful career: a Bachelor's degree in geology, experience with a government agency, enrollment in a PhD program, correspondence with academics around the world, etc., Brown's career was a bit more haphazard. He studied at Sheffield University, where he had been a student during his participation on the Oread M.C. Lyngen Expedition to Norway in 1951. Initially, he studied medicine but later moved on geology, though he "devoted more time to expeditions than his academic studies,"[870] eventually leaving the university without a degree. He was a member of the privately funded British South Georgia Expedition (1954-5), which while primarily intended for mountaineering, George Sutton, the organizer, "had no hesitation about adding an ambitious scientific objective to our programme."[871] He therefore selected Brown along with surveyor Harry Pretty. Both had been on Sutton's previous expedition to Norway, and had experience studying glaciers, were skilled mountaineers, and perhaps most importantly to Sutton they were "…ideal companions…[who] also had the kind of rugged intellect, the sense of humor, tolerance and fortitude to suffer hardship and accept failures as part of the game."[872] While the research conducted by this expedition was not particularly rigorous, Brown's observations of the Ross Glacier were published in a 1956 issue of *Nature.*[873] The weak results could possibly also be attributed to the severe climbing injury that Pretty sustained early in the expedition. Or, the BSGE could be an

[870] George Sutton, *Glacier Island: The Official Account of the British South Georgia Expedition, 1954-1955*, (The Travel Book Club, 1958). 21
[871] George Sutton, *Glacier Island: The Official Account of the British South Georgia Expedition, 1954-1955*, (The Travel Book Club, 1958). 19
[872] George Sutton, *Glacier Island: The Official Account of the British South Georgia Expedition, 1954-1955*, (The Travel Book Club, 1958). 20
[873] Richard Brown, "The Ross Glacier," *Nature* 178 (July 28, 1956): 192–93.

example of British mountaineer John Hunt's assertion that "science and mountaineering do not readily mix."[874]

While Sutton was not present on South Georgia during the IGY Expedition, his description of Brown's personality speaks manifold of his future conflict with Smith: "I have never understood Dick and do not suppose I ever shall, for he was the unpredictable genius in our lives, the lovable rogue and optimist, who with his impossible stories kept our spirits high and just as frequently caused us to despair over one of his incorrigible escapes." While helping Sutton to organize the BSGE, "his capacity to drift brilliantly through a dozen involved subjects and extract the essence of each in less time than it would take me to master one was harnessed to a cause in which he had his heart."[875] Other members of his mountaineering club offered him this tribute in 1953: "His bearded, dignified, almost noble appearance contrast strikingly with his youthful sense of fun. A true disciple of Rabelais, he has long been the hero of countless legendary exploits and orgies; exploits of astonishing variety, but all characterised by some outlandish episode exhibiting the true Brownian genius. Whether climbing Arctic mountains, or supping Cointreau in a Sheffield den of vice, Richard 'A'. Brown makes a delightful if bewildering companion. He undoubtedly possesses a great future - but what sort of future is anyone's guess."[876] Sutton's depiction of Brown throughout the expedition as an easygoing sort, who enjoyed parties and pranks, socialized comfortably with men and women, Norwegian whalers, and British school teachers alike, is corroborated elsewhere, both by Smith and also Nan Brown. Nan Brown, the wife of a radio operator at South Georgia through 1957, wrote of a party where he captured a penguin from the beach and brought it indoors for a scavenger hunt, an

[874] Hunt, John. *The Ascent Of Everest*. Hodder And Stoughton. 1954.
[875] George Sutton, *Glacier Island: The Official Account of the British South Georgia Expedition, 1954-1955*, (The Travel Book Club, 1958). 21
[876] P.R. Faulkner, "Richard A. Brown." *Oread Mountaineering Club Newsletter* (1953).

escapade typical of Brown. But she clearly had a friendship with him as she wrote too of visiting Richard Brown with Betty Biggs and their husbands for a picnic when he was camped at the Morraine Fjord "having returned to the island to pursue glaciological studies following the initial investigations he and Harry Pretty had carried out."[877]

Smith and Brown Arrive in South Georgia

Aboard the RRS *John Biscoe,* Smith and Brown arrived at Grytviken in January 1957. At first, it seemed that Brown and Smith had an amiable or at least professional relationship. When the two men were assigned to South Georgia, neither was placed in charge nor assigned a particular project, instead decided the program themselves. They agreed that Smith would concentrate on the budget, climatological, and Quaternary work, in addition to any botanical studies that he wished to pursue. Brown would attend to glacial movement, plane-table plots of the glacial snouts, and a general topographical map of the Cumberland Bay area.

Smith's first impressions of the island itself were not altogether positive: "The climate is windy and very changeable, and cold enough for the island to have the fiercest glaciers that I have ever seen." In Smith's mind, he was not emulating the small heroic expeditions of traditional Antarctic narratives: "it is not at all like being stuck on an ice-cap in the Antarctic or Greenland; we live in one of ten huts at Grytviken-the seat of government" and "There are thirty other British people-meteorologists, radio, customs etc. and several hundred Norwegian whalers."[878] Grytviken, which had been founded in 1904, became the center of island life when, in 1911, an administrative center and residence was established at King Edward Point. At the time of the IGY, there were seven whaling stations around the island, representing a veritable

[877] Nan Brown, *Antarctic Housewife* (Hutchinson, 1971). 155
[878] Letter from Jeremy Smith to Joy Tivy March 1st, 1957 British Antarctic Survey Archives GL/78/003/16

United Nations of whalers, but all licensed and taxed by the British Government. The presence of so many people on the island did not diminish the hostility of the environment. For example, it took Brown and Smith six weeks to find a practicable route to the upper basin of the Hamberg glacier, which was the main focus of their study, before they could begin to collect ice movement and accumulation data. After receiving word from Smith about their trouble with the Hamberg glacier, Manley expressed concern for the "tough" and "strenuous" conditions that the two men were experiencing at South Georgia. He wrote to the FIDS Scientific Bureau that despite "the very find effort Brown and Smith have been making…the conditions do seem to be astonishingly fierce and unpleasant." Manley was also troubled by their lack of equipment since "Smith and Brown are taking what may be considerable risks in a boat which may be too small for the job"[879] and "Their tents seen to be far too heavy and unsatisfactory."[880] He hoped that word be passed to Brown and Smith that "the programme must be curtailed, without any sense of shame if the Hamberg Glacier is in the condition they describe."[881] After all, "a small programme well done is likely to be of more use to the I.G.Y than a large effort carried out at unjustifiable risk."[882] Smith and Brown eventually abandoned the majority of their studies on the Hamberg Glacier, and, due to the dangerously conditions, even minimized their work plans for the much nearer Hodges Glacier.

But the worst hostilities that Smith received from South Georgia came not from the ice and wind, but from the social environment where he was living. South Georgia, as a site, was

[879] Letter from Gordon Manley to Raymond Priestley April 25th, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[880] Letter from Gordon Manley to Raymond Priestley April 16th, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[881] Letter from Gordon Manley to Raymond Priestley April 16th, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[882] Letter from Gordon Manley to Raymond Priestley April 25th, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY

complicated because it functioned separately from FIDS and was administered directly under the Gvernor of the Falkland Islands. Therefore "Numerous local complexities exist."[883] Smith was certainly not the first to think badly of the South Georgia community. R.B. Robertson, who visited in the 1950-1 season called it "the worst administered place in the colonial possession of Great Britain, the most sordid unsanitary habitation of white men to be found the whole world over, and the most nauseating example of what commercial greed can do at the expense of human dignity…"[884] In 1961 Grytviken was still "squalid…about the filthiest habitation of men the whole world over…a bastard of a place."[885] Upon arrival, Smith later reported that "the Administrative Office had said…that they were not a F.I.D.S. expedition and that he had previously advised Port Stanley that the expedition should not be permitted to land on the island. This apparent had made Smith and Brown feel they were 'not wanted.'"[886] It is definitely true that for Smith, in the words of Gordon Manley, despite the harsh environmental landscape, "the difficulties attending work in South Georgia are not solely of climatic origin."[887]

[883] Letter from Gordon Manley to A.F. Moore August 1st, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[884] R. B. Robertson, *Of Whales and Men*, (New York: Simon Schuster Trade, 1954). 56-7
[885] William R. D. McLaughlin, *Call to the South: A Story of British Whaling in Antarctica* (London: George G. Harrap & Co Ltd., 1962). 160-1
[886] A.F. Moore "Confidential Report to Sir James Wordie, Sir Raymond Priestley, Professor G. Manley and Dr. D.C. Martin on the I.G.Y. Glaciological Expedition at South Georgia, 1957" March 5th 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[887] Letter from Gordon Manley to Jeremy Smith August 29th, 1957 British Antarctic Survey Archives GL/78/003/16

Figure 16. Grytviken, South Georgia[888]

Throughout his experience in South Georgia, Smith appeared wholly absorbed with producing as much research as possible. His prolific correspondence with professors from across the Commonwealth exemplifies the ways that informal correspondence was used to establish trust and legitimacy within the professional science community[889] and his wish to be accepted by this community. It was an effort, familiar to any novice, of the attempt to build the network of allies necessary for becoming an authority figure in a given field.[890] In fact, aside from his relationship with Brown, Smith frequently reminded others both of his qualifications, the need for his work to be taken seriously, and his apprehensions that perhaps neither of these were the case. For example, shortly after arrival, Manley advised that Brown and Smith conduct their research safely as "Scientific observations of value are nowadays rarely if ever demanded under conditions of undue hazard…."[891] Smith "was glad to read that no needless risks must be taken while carrying out glaciological work…it should be pointed out that no liability is taken by FIDS

[888] Antarctica New Zealand Pictorial Collection
[889] Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939*, (Manchester University Press, 2013). Chapter 3.
[890] Bruno Latour. *Science in Action: How to Follow Scientists and Engineers through Society*. (Philadelphia: Open University Press, 1987).
[891] Gordon Manley "IGY: South Georgia-Note on Policy with regard to scientific investigations on glaciers" January 27, 1957 British Antarctic Survey Archives GL/78/003/16

for their staff in the Antarctic…there can be very few organizations employing scientific staff in outdoor work that do not insure their staff…If this upsets FIDS so much the better since it is high time that they offered qualified men conditions of service that they would receive elsewhere, and stopped relying on Boy-Scout pioneering spirits to man their bases."[892]

For Smith, on South Georgia, "The conditions of service are not conducive to the ~~production~~ execution of scientific work either indoors or in the field, and in my opinion they are reflected in the extremely skimpy ~~scientific~~ results that FIDS have produced in its 11 years of operation. A well-equipped expedition such as the Swedish of 1901-03 or the Sw-Norw-Br can do the same amount of work in 2 or 3 years at a tenth of the cost and without involving qualified scientists in power politics. Effectively FIDS is a quasi-political organisation ~~and all it~~ only requiring of its personnel is that they shall be a resident of the Dependencies and this become a statistic in the British claim for possession."[893] Smith's claim that FIDS would gain better, more qualified applicants for their positions rather than relying on those driven by the spirit of adventure, reflects of a continuation of the trend that "by the second half of the nineteenth century it was the credentials of universities and professional societies, rather than the word of gentleman amateurs, that served as the guarantors of reliable knowledge."[894] While it seems that polar science was late to this inclination, many, including Smith, believed that Antarctica should be the domain of professional scientists.

He also had an extended argument on South Georgia with J.W. Matthew, the acting Magistrate, who, Smith believed, took neither he nor his project seriously. The problem stemmed

[892] Letter from Jeremy Smith to Gordon Manley June 5th 1957 British Antarctic Survey Archives GL/78/003/16
[893] Hand-written draft of letter from Jeremy Smith to Gordon Manley British Antarctic Survey Archives GL/78/003/16
[894] Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939*, (Manchester University Press, 2013). 62

from an issue of dining. Based on an agreement between the Royal Society and FIDS, when not on camping trips, Smith and Brown would be "fed in 'Discovery' house when at the base."[895] Initially, Smith took his meals at Discovery House, the official headquarters of FIDS on the island, where the majority of the men took their meals. Due to the impending arrival of more FIDS personnel, who would be at the base in a more permanent capacity than Smith, Matthew suggested that Smith eat with the Browns, who "From Sept.1st … starting cooking for themselves in the gaol." Smith was appalled, complaining to Manley that "The magistrate wanted me to feed there also but I objected maintaining that he could not force me to come the guest of a married family and that anyway the government were obliged to provide messing."[896] He also believed "that feeding with the Browns will reduce our output by about a third."[897] Rather than considering the additional time spent with his partner as a positive, his chief concern was that it would distract him from his work.

In September 1957, Smith wrote Matthew to "ask for your formal recognition of my status in South Georgia. The necessity for this request arises from your suggestion that in order to ease the catering arrangements at Discovery House I should eat instead with Mr. and Mrs. Brown at the gaol. You argued that as a member of an expedition ('jaunt' was the phrased used) I have less claim to the services of a cook and steward than the other government staff. I question this discrimination… [and] respectfully ask you to recognize my status as a government officer."[898] Matthew, in response told Smith that "You may have free messing in the Discovery House for as long as there is room." If, as he anticipated, there would be no room for him in the

[895] Letter from James Wordie to David Martin September 28th, 1956 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[896] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16
[897] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16
[898] Letter from Jeremy Smith to J.W. Matthew September 7th 1957 British Antarctic Survey Archives GL/78/003/16

future, he would be free to eat with the Browns or otherwise receive a small stipend in lieu of provisions. Additionally, Matthew responded to Smith's own insecurities about the value of his work, reminding him of his relative status as an outsider on the island: "Perhaps [jaunt] is a trifle gay an epithet for an expedition with a grave scientific purpose in view. Nevertheless, staff in posts which are established, some of them for more than 40 years, and more particularly those whose lives' work is in outposts such as this, are not to be deprived of the somewhat minimal small facilities available here in order to make room for 2 members of an expedition for whom their work here is in the nature of a brief excursion from their established occupations at home in Britain. Moreover, the Royal Society must have been made fully aware of the facilities here and their limitations."[899]

Matthew also poked fun at Smith's complaints over minor inconveniences: "You may recall that a poet once sang:- Facile descensus Averno, sed, co-orior/ Hoc est labor, hoc opus est[900] by which he may have meant 'If a man falls down the crevasse of carping about difficulties he may find it hard to rise again to see the light of true scientific purpose.' Moreover, a millennium and a half later Milton attempted to define the possible depth of the crevasse when he wrote about the fall of the Prince of Avernus 'From morn till dewy eve, all of a summer's day he fell.'[901] Quite a fall if calculated in feet per second."[902] Rephrasing Virgil, Matthew suggests that Smith's complaints are distracting him from performing useful work. Additionally, alluding to Milton, Matthew compares Smith with Lucifer, perhaps suggesting that Smith's excessive arrogance would led to a devastating fall. Matthew concluded his letter, still reminding Smith of

[899] Letter from J.W. Matthew to Jeremy Smith September 10th 1957 British Antarctic Survey Archives GL/78/003/16
[900] Virgil *The Aeneid* Book 6 "The way downward is easy from Avernus. But to arise, this is work, this work."
[901] John Milton, *Paradise Lost* Book One
[902] Letter from J.W. Matthew to Jeremy Smith September 10th 1957 British Antarctic Survey Archives GL/78/003/16

his relative weak standing on the island: "By all this I mean that I will continue to assist your expedition in every way that I can to reach a valuable and successful conclusion, if you are prepared to make the best of such facilities as we can afford you."[903]

Matthew's attitude infuriated Smith. He reiterated the burden that Matthew was imposing on him: "By accepting the alternative arrangement that you propose I consider that I would be unable to carry out fully the duties that I have been assigned. You comment that my dissatisfaction with worldly matters may distract me in my scientific quest, but surely the distraction would be far greater were I to spend several hours each day procuring and preparing my own food. Thus my demand for messing is made in a spirit of altruism, my only consideration being the effort that I can apply to giving a full and faithful account of the glaciers of South Georgia."[904] He recommended taking the matter directly to FIDS and requested that Matthew forward a letter, dated September 12th, to F.K. Elliott, the FIDS Secretary, before leaving for a sledging trip. When he returned, he learned that the letter had never been sent.

Smith opted to telegram Elliott directly. He complained that "During our conversations on messing and accommodations Mr. Matthew has repeatedly stated his view that, government contract notwithstanding, I must not expect the facilities that he provides for government officials filling established posts. He maintains that the brevity of my tour of duty, the fact that it is in a temporary post and the non-productivity of my work combine to make me less eligible for government sources… I believe that this decision will benefit our scientific results by allowing more time for field world and by satisfying these in authority that…we are not merely on an extended holiday as has been the case of certain previous expeditions to South Georgia." Finally,

[903] Letter from J.W. Matthew to Jeremy Smith September 10th 1957 British Antarctic Survey Archives GL/78/003/16
[904] Letter from Jeremy Smith to J.W. Matthew September 13th,1957 British Antarctic Survey Archives GL/78/003/16

concerned with how he was coming off with his circumvention of Matthew's authority, he notes that "the question of messing is the only quarrel that I have had with Mr. Matthew and in every other respect he has been most helpful and hospitable to us."[905]

While it may not seem to matter where Smith took his meals, it actually is extremely important. First, since Matthew believed that he had the right to curtail Smith's dining in the Discovery House, it means that to the regular inhabitants of South Georgia, Smith was an outsider, especially to the newly appointed Matthew, without enough clout to dictate his dining preferences. Smith's correspondence with Matthew indicate a lack of confidence in regard to his importance and his position simply due to his insistence that his work was important and he required consideration. Matthew believed that Smith was overly self-important, and that his short trip had no serious place on the island. Despite Smith's attempts to position himself as an authority with a strong network of allies, he had no authority on South Georgia and had to write to London, to actual authority figures, in order to get support. Finally, it speaks to Smith's perception of what a scientist, leading an expedition, appointed by the Royal Society, supervised by a well-known researcher, and employed by the government, all factors he brought up with Matthew, should be afforded. At the very least, they should be given the same courtesy and deference as any other government official or scientist living on the station; the ability to dine together and not be singled out as a mere ancillary presence.

Jeremy Smith's Quarrel with Richard and Elizabeth Brown

Smith's ideas about FIDS and his quarrel over messing provide evidence of his rigid beliefs about what science and scientists should look like and the respect that they should be afforded. Therefore, considering Brown's background and his relationship with the people at

[905] Letter from Jeremy Smith to J.K. Elliott October 18th, 1957 British Antarctic Survey Archives GL/78/003/16

Grytviken, it is unsurprising that the two suffered tension. One major source of tension came, unsurprisingly, from the presence of Elizabeth Brown. Yet even discounting the Elizabeth Brown's existence on South Georgia, Smith found many aspects of Brown's background, credentials, character, and research quality to be substandard, which he noted in detail both to Gordon Manley and to FIDS. He complained about Brown's education to Elliott, saying: "It is hardly fitting for me to criticize the Royal Society's choice of personnel for this glaciological programme, but these are the facts of Brown's qualifications as far as I know them. At Sheffield University he had to leave the medical school through repeated failure of the first year examination, he then studied geologist but was finally sent down from the university for misconduct."[906] In a letter to Manley, he likewise states "You must know of his career through University. He was sent down from medical school through repeatedly failing exams and then from the science faculty through his own misbehavior."[907]

In regards to Brown's experience on previous glaciological expeditions and his publication in *Nature*, Smith was equally contemptuous. To Elliott, he criticized these expeditions, saying; "he has been a member of an expedition to Northern Norway and of the British South Georgia Expedition 1954-55. Both of these expeditions would have given a scientist of average talent the opportunity to devise and carry out a programme of field observations, an opportunity that would be particularly welcome to one wishing to vindicate a poor academic background. But Brown achieved practically nothing of value…"[908] To Manley, he criticized that "he has been with several semi-scientific expeditions to Norway and here when he had the opportunity to show himself an observant worker capable of finding and working on a

[906] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[907] Letter from Jeremy Smith to Gordon Manley October 10th, 1957 British Antarctic Survey Archives GL/78/003/16
[908] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16

problem. But his note on the Ross Glacier is a skimpy outcome to six month's field work as "expedition geologist."[909] He even declared that any glaciological work done on the BSGE was not even really done by Brown, but by Harry Pretty, who "judging from the way in which the survey points are marked; so far as I can find out he had no particularly training in surveying," and the "snout survey and other observations on the Ross Glacier described in 'Nature' was Clive Webb's work; Dick at best saw the glacier from five miles out to sea."[910] In fact, since Sutton, the leader of the BSGE, published an account of the expedition, Smith used it to criticize Brown's work. He remarked that "The account of the glaciological work gives a poor reflection on the foresight and knowledge of the scientist in charge-Brown. The series of observations…that he planned might have been carried out more profitably on any glacier…without making an 8,000 mile voyage…"[911]

Smith also had cause to critique Brown's work in the field and gave Manley and Elliott both several examples of moments when he believed Brown was undermining their research. Within the first few months of their arrival "I became more and more concerned that Brown was making no attempt to carry out a programme of glacier movement observations with which he had been entrusted."[912] For example, after some urging, Brown established some reference points, and made three sets of observations. But then, he delayed interpreting his results before confessing that he lost a notebook containing some of the angles. In terms of Brown's work ethic, "Brown will resort to save himself the smallest amount of work,"[913] and only set to tasks

[909] Letter from Jeremy Smith to Gordon Manley October 10th, 1957 British Antarctic Survey Archives GL/78/003/16
[910] Letter from Jeremy Smith to Gordon Manley February 20th, 1958 British Antarctic Survey Archives GL/78/003/16
[911] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[912] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[913] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16

after "persistent nagging and unpleasantness from me."[914] Though later in the winter, while working on the Hodges Glacier, Brown "eventually did the temperature readings which was a great help." But then in October, Smith noticed that Brown marked an area with negative temperatures that Smith had noted were running with water: "To me all this amounts to the most through incompetence."[915] Smith admitted that "socially he is excellent company, but in circumstances that demand foresight, resolution, and a sense of responsibility he falls badly." Additionally, "work involving routine observations at regular intervals is quite foreign to his temperament." [916] And in conclusion, "I consider Brown to be a complete humbug."[917]

Again, just like in his quarrel with Matthew, Smith used his self-identification as a scientist to justify his remarks, writing that perhaps "a more adaptable and amicable person may have been able to see to him through the rest of the season. But I am not prepared to modify my intolerance of sloth and carelessness…I am a professional field scientist…and as such I have certain standards to uphold."[918] For Smith, there were certain qualities associated with being a scientist; qualities that Brown did not possess-he therefore actively tried to have Brown removed from the expedition, policing the boundaries of who should be trusted to practice scientific fieldwork. In a nascent field like glaciology, "the question of who could be trusted became especially important in the context of changing measures of expertise,"[919] and Brown's credentials and persona meant that he could not be trusted. Smith even worried that Brown's experience in polar regions could be read as a sign of expertise: "it alarms me to reflect that he

[914] Letter from Jeremy Smith to Gordon Manley December 1st, 1957 British Antarctic Survey Archives GL/78/003/16
[915] Letter from Jeremy Smith to Gordon Manley December 1st, 1957 British Antarctic Survey Archives GL/78/003/16
[916] Letter from Jeremy Smith to Gordon Manley October 10th, 1957 British Antarctic Survey Archives GL/78/003/16
[917] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[918] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[919] Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939*, (Manchester University Press, 2013). 61

has been on a sufficient number of expeditions to pose as an expert on polar exploration whose advice will be sought by future expeditions."[920]

This policing did not just apply to Richard Brown, but also extended to his wife, Elizabeth. While women were rare on South Georgia, the wives of government officials on the island was not unprecedented. Elizabeth Brown would have found other women; at least two other wives lived at Grytviken at the same time. Though Brown had written to Smith before their departure about his attempt to get his wife on the island, Smith wrote that he was aware of her impending arrival: "Some time in March I was surprised to learn that Mrs. Brown was on her way."[921] He took particular issue with her attempts to join Smith and her husband in their fieldwork. Before the start of the expedition Manley made it clear that Smith and Brown could use some assistance in the future, drawn from the personnel at Grytviken, perhaps by a geologist, "but almost any young and physically capable man might suffice."[922] Drawing on the support of non-scientists to assist in fieldwork was not uncommon in Antarctic research in this time. For wxample, at during the Halley Bay site also during the IGY, "Many of the support personnel took an active interest in the scientific routines in addition to their normal work."[923] But on South Georgia, Smith was adamant that assistance in scientific fieldwork did not come from Elizabeth Brown.

Despite Smith's protestations, it is clear that Elizabeth Brown did in fact participate in the expeditionary work. Sir James Wordie wrote in October 1957 that the Browns would remain on

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[920] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[921] Letter from Jeremy Smith to J.K. Elliott October 18th, 1957 British Antarctic Survey Archives GL/78/003/16
[922] "Proposed IGY Glaciological Program for Falkland Islands Dependencies Survey" Notes of the British National Committee for the International Geophysical Year May 26, 1956. Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[923] Brunt, David, "Royal Society International Geophysical Year Antarctic Expedition." *The Royal Society International Geophysical Year Antarctic Expedition, Halley Bay, Coats Land, Falkland Islands Dependencies*, 1955-1959. (London: Royal Society, 1960-64). 17

the island after Smith returned and that "Mr and Mrs Brown should be able to carry out all the observations and the only doubt in my mind is whether they will have satisfactory accommodations."[924] Wordie assumed that Elizabeth Brown was contributing to work in the field. Additionally, after Smith's planned departure at the conclusion of the IGY, Manley suggested that "Brown might, fairly soon, be asked if he would continue (He has Mrs. Brown with him),"[925] suggesting that he could continue making his observations with just his wife, and perhaps another, cheaper assistant. When Manley believed Smith and Brown were taking unnecessary risks at the Hamberg Glacier, he sent "a note to that effect by Mrs. Brown."[926] Manley was assuming that she discussed the research programme with the two men. However, Smith took exception with her attempts to join him and her husband in any way. For example, he wrote to Manley in October that "I am anxious that Elizabeth stays here as the wife of a government employee not as part of an expedition; I have had to insist that she does not accompany us in our field work."[927] To Elliott he wrote "Several times it has been necessary for me to be very firm with Brown that his wife is not to accompany us in our field work and once or twice this has been a cause for hard feelings between us."[928]

Part of this hostility came perhaps from Elizabeth Brown's prolific pen; she wrote a number of articles about her polar travels in popular women's magazines, accounts of her life about which Smith did not approve. Her sex also made her the subject of some publicity, which Smith felt was a distraction from what he considered to be the serious nature of work done on the

[924] Letter from James Wordie to David Martin October 7th 1957 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[925] Letter from Gordon Manley to AF Moore August 1st 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[926] Letter from Gordon Manley to Raymond Priestley April 25th, 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[927] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16
[928] Letter from Jeremy Smith to J.K. Elliott October 18th, 1957 British Antarctic Survey Archives GL/78/003/16

island. In October, he wrote to Elliott that when she arrived on the island "we received newspapers and magazines announcing her departure and giving highly coloured accounts of the island where she was going to live…It is plain that she intends to capitalize on her stay here by writing magazine articles and later a book." Smith did not approve of these writings for two primary reasons. First, he was distraught over her candidness in her writings: "I have just read the first of her articles in "Woman" and frankly I am nauseated by her indelicacy and vanity; to a million women she reveals the intimacies of her marriage that with her husband 'we don't like to discuss.'" Though "So far this is a private matter concerning only the Brown family," he was particularly worried that she might use her writing to color the IGY expedition and asked Elliott "what protection you can provide for myself and for the IGY and Royal Society against this woman's pen."[929] He was determined that "on her return she can write as much as she wishes about the rigours of her polar sojourn, but I will not give her any change to claim she was a member of a scientific expedition sponsored by the Royal Society."[930] This attitude is perhaps unsurprising considering that even in settler colonies like South Georgia, "Women were systematically excluded from the spaces of academic connection and its attendant opportunities."[931] Smith was specifically concerned about how her presence would appear to other scientists back in the UK: Brown "and I were selected from this job from a number of applicants and one of the unsuccessful ones would be rightly angry if he were to read in 'Women's Own' or 'Reveille' that a totally unqualified woman was assisting with this work."[932]

[929] Letter from Jeremy Smith to J.K. Elliott October 18th, 1957 British Antarctic Survey Archives GL/78/003/16
[930] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16
[931] Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939*, (Manchester University Press, 2013). 8
[932] Letter from Jeremy Smith to J.K. Elliott October 18th, 1957 British Antarctic Survey Archives GL/78/003/16

Smith's insistence on Elizabeth Brown's exclusion from his fieldwork, again speaks to his monitoring the boundaries of who could participate in scientific research. Her lack of training made it inappropriate for her to spend time in the field. Her propensity to share her experience on the islands with a female readership crossed the hard lines within he felt that serious science should reside. This attitude deeply connects with current scholarship on the gendered nature of physical spaces. Several scholars have linked the power relations between the public and private spheres of living and the political oppression of women, where space is symbolically encoded with meanings that produces a gender difference.[933] For Smith, Elizabeth Brown's desire to step outside of the domestic sphere in London and into a whaling station in the subantarctic, and even into the field, contrasted the idea that "The burning desire to discover unknown natural phenomena and unknown land was reserved for male explorers; such lusts were not for female rationality."[934]

Elizabeth Brown's experience with Smith shows that "polar history has something both particular and general to say about gendered spaces and the meaning of gender"[935]: ice, while imbued with romanticism,[936] is a place for scientists and mountaineers, who are invariably men, as icily devoted to their progress as the glaciers themselves. The presence of Elizabeth Brown on a Royal Society funded IGY expedition in the traditionally masculine space of Antarctica interrupted Smith's perceptions as to what such a scientific expedition should resemble, but also several enduring conceptions of glaciology, mountaineering, and Antarctica generally. So

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[933] Alison Blunt and Gillian Rose, *Writing Women and Space: Colonial and Postcolonial Geographies* (Guilford Press, 1994).
[934] Lisbeth Lewander, "Women and Civilisation on Ice," *in Cold Matters: Cultural Perceptions of Snow, Ice and Cold,* ed. Heidi Hansson and Cathrine Norberg (Umeå: Umeå University and the Royal Skyttean Society, 2009). 93
[935] Lisbeth Lewander, "Women and Civilisation on Ice," in *Cold Matters: Cultural Perceptions of Snow, Ice and Cold,* ed. Heidi Hansson and Cathrine Norberg (Umeå: Umeå University and the Royal Skyttean Society, 2009). 90
[936] Francis Spufford, *I May Be Some Time: Ice and the English Imagination* (New York: St. Martin's Press, 1997).; E. Wilson, *The Spiritual History of Ice: Romanticism, Science and the Imagination*, (Basingstoke: Palgrave Macmillan, 2003).

important was research at glaciers-rather than relying on second-hand observations-that, as Bruce Hevly,[937] Michael Reidy,[938] Steven Shapin, and Michael Robinson[939] contend, the validity of the science in polar and alpine regions depended on heroism, manly exertion, risk, and physical discomfort. For Smith, giving Elizabeth Brown direct experience with glacial research was robbing a more legitimate scientist of such an opportunity, and her very presence undermined the masculinity necessary to conduct polar research.

Mary Terrall has argued that scientific expeditions, beginning in the Enlightenment, made "manifest a particular version of masculinity that expanded the list of desirable attributes for practitioners of science to include physical courage and fortitude as well as intellectual acumen."[940] While women may read about the manly exploits of adventuring scientists, the wilderness was defined by its lack of feminization. But in this case, Elizabeth Brown and her literary bent damaged this perception of science. She made the same travels as her husband and Smith and wrote about these experiences, and Smith worried that she would be able to use her experience to gain some of what Alison Rose has called "authorial authority"[941] that the heroic scientific travelers of the past had gained, an authority which undermined his own as a professional scientist and highlighted his own tenuous position on South Georgia. As National Geographic photographer David Boyer later noted, "If women come down here, it would no

[937] Bruce Hevly, "The Heroic Science of Glacier Motion," *Osiris* 11 (1996): 66–86.
[938] Michael S. Reidy, "Mountaineering, Masculinity, and the Male Body in Mid-Victorian Britain," *Osiris* 30, no. 1 (2015): 158–8.
[939] Michael Robinson, "Manliness and Exploration: The Discovery of the North Pole," *Osiris* 30, no. 1 (2015): 89–109.
[940] Mary Terrall, "Heroic Narratives of Quest and Discovery," *Configurations* 6, no. 2 (May 1, 1998): 223–42. 229
[941] Alison Blunt, "Mapping Authorship and Authority: Reading Mary Kingsley's Landscape Descriptions," in *Writing Women and Space: Colonial and Postcolonial Geographies*, ed. Gillian Rose and Alison Blunt (Guilford Press, 1994). 52

longer be a place where men could go and come back from as 'heroes.' The men would resent women…Women would wreck the illusion."[942]

Again, it is important to note that Elizabeth Brown was neither the only or first woman on the island, nor even the first tangentially involved in scientific research. Margit Kohl-Larsen, the daughter of Grytviken's founder and wife of Dr. Ludwig Kohl-Larsen, contributed to biological and glaciological studies in 1928-9, published in 1930 as *An den Toren der Antarkis,*[943] observations not superseded in their comprehensiveness until the South Georgia Survey.[944] The masculine environment of a whaling station too would have been no deterrent; R.B. Robertson wrote in 1954 that though extremely rare, "women are worth their weight in ambergris on long whaling voyages"[945] and "even young attractive women, would be safer …on the isolated male island of South Georgia than anywhere else in the world."[946] As such, Smith could have seen Elizabeth Brown's presence as a positive. After all, she was providing free labor, both in the field and in her domestic arrangement.

Matthew even attempted to capitalize on her labor when he determined that Smith should dine with the Browns. She got to South Georgia in the first place after securing a job as a cook on a whaling ship. Her literary inclinations provided free publicity for an Expedition that was receiving in no way the fanfare of the contemporaneous Royal Society Expedition to Halley Bay, or the privately funded TAE. Wordie and Manley both assumed that she was assisting the pair of men with their observations, or at least that she would after Smith's planned departure. Manley even expressed his belief that "The presence of Mrs. Brown, who of course is "unofficial", may

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[942] Dian Olson Belanger, *Deep Freeze: : The United States, the International Geophysical Year, and the Origins of Antarctica's Age of Science* (University Press of Colorado, 2006). 352
[943] At the Gates of Antarctica
[944] Robert Headland, *The Island of South Georgia* (Cambridge: Cambridge University Press, 1984). 88-90
[945] R. B. Robertson, *Of Whales and Men*, (New York: Simon Schuster Trade, 1954). viii
[946] R. B. Robertson, *Of Whales and Men*, (New York: Simon Schuster Trade, 1954). 71-2

nevertheless prove very helpful. She is herself a graduate, and has also had 3 years as a Metropolitan policeman."[947] In fact, possessing a degree and three years of experience in a municipal position made her at least as qualified on paper as her husband, or Hugh Noble, the young glaciologist at Admiralty Bay, neither of whom were graduates during the IGY. In addition to these qualifications, Manley suggested that "her presence might do something to compose…some local personal asperities."[948] For many involved in this expedition, Elizabeth Brown's presence on South Georgia was more of an asset than a liability.

Instead, Smith felt the same way towards women in Antarctica as Vivian Fuchs, who declared that "I have steadfastly opposed the inclusion of women in an Antarctic team as liable to cause more trouble than they are worth."[949] As late as 1982, Fuchs wrote "Should it happen one day that women are included as part of the base complement, problems will certainly arise [and] lead to the breakdown of that sense of unity which is so important to the group."[950] Smith's disparagement of Elizabeth Brown's written work about her experiences on the island further indicates that women's experience with glaciers could only be regarded as serious if they produced and then published knowledge in the same way as men-in peer reviewed journals and in front of dissertation committees. As Mark Carey has observed, "women could read about glaciers, but they were not fit for glaciological research, fieldwork, or even alpine tourism."[951] To accept Elizabeth Brown as capable, Smith would be forced to relinquish some of his own authority, on shaky grounds as it already was. Her very company communicated to Smith that he

[947] Letter from Gordon Manley to A.F. Moore May 14th 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[948] Letter from Gordon Manley to A.F. Moore May 14th 1957 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[949] "Women Would be More Trouble in Antarctic than They're Worth" British Antarctic Survey Archives ES1/H1
[950] Vivian Fuchs, *Of Ice and Men: The Story of the British Antarctic Survey, 1943-73* (Oswestry, Shropshire, England: A. Nelson, 1982), 328
[951] Mark Carey et al., "Glaciers, Gender, and Science," *Progress in Human Geography* 40, no. 6 (December 1, 2016): 770–93. 778

held a marginal position, where he could neither forbid her presence nor claim that serious credentials and academic networks were required for polar exploration.

Smith reached his breaking point with the Brown family when "it became the subject of gossip among our amateur obstetricians that Mrs. Brown was expecting a child."[952] In September 1957, "I asked Brown outright whether there was any truth in this rumor, an embarrassing question for him but plainly one that must be faced in the circumstances. He denied the rumor, but in a manner that made me doubt whether he was telling the truth."[953] Once the veracity of Elizabeth Brown's condition had been confirmed, Matthew, the magistrate, attempted, "only out of consideration for Mrs. Brown," tried to secure her passage back to the UK. Smith admitted that he wanted her removal for less altruistic reasons as he believed the issue would likely slow Brown's work even more, "besides involving me in responsibilities that are none of my concern."[954] Additionally, if Mrs. Brown were to give birth at the whaling station, it could involve considerable publicity "probably of the type of 'ballyhoo' journalism that she seems to like,"[955] rather than attention to the serious work he was doing. Her removal and perhaps a temporary absence of Brown, escorting her at least to Uruguay, would perhaps "patch the strained relations that have arisen between us."[956] Despite Smith's wishes that Elizabeth Brown's pregnancy remain quiet, a pretext to remove her from the island rather than a source of attention itself, this was certainly not the case, as it was widely enough known that Duncan Carse in 1959, when describing the gaol accommodations, wrote "Others have since enjoyed the facility, including, so it is said, an expectant mother."[957]

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[952] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[953] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[954] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[955] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[956] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[957] Duncan Carse, "The Survey of South Georgia, 1951-7," *The Geographical Journal* 125, no. 1 (1959): 20–37. 21

According to Smith, even before his wife's arrival, Brown was subject to indolence and during a critical period of observations shortly after arrival he "decided to visit friend at Leith Harbour where he stayed for three days. The first day after his return we set off on a long delayed reconnaissance of the Hamberg Glacier, but after half an hour Brown stopped to vomit his excess of alcohol."[958] The drinking culture on South Georgia was important to community life and "a South Georgian's brains and ability are estimated by his fellows according to the quality of liquor he can manufacture."[959] Brown, though considered to be a member of "our little community"[960] by South Georgians, for Smith, his "family problem…is a culmination of many incidents in which his incompetence and inertia have exasperated me. He and I are very different personalities and I believe that we have now reached the limit of our mutual tolerance. He sees me as a fanatical scientist, utterly intolerance of social propriety and a misogamist. I find him indolent, incompetent, and irresponsible."[961] Smith's solution was to have Brown removed from the expedition as soon as possible, perhaps assigned to a position where the lack of a wife and whaling stations might prompt him toward some useful work. He felt that Brown's shortcoming might give the expedition a bad reputation and "As he considered his [own] work to be satisfactory, he felt that she should attempt to establish that we was not responsible for any of the events which might lead to criticism of the nature of their work…Accordingly, he wrote to Port Stanley pointing out the defects of his partner."[962] He concluded his letter to Elliott writing "I hope that I have given sufficient reason why it is he who should leave and not me."[963] In due

[958] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[959] R. B. Robertson, *Of Whales and Men*, (New York: Simon Schuster Trade, 1954). 81
[960] Nan Brown, *Antarctic Housewife* (Hutchinson, 1971). 91
[961] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16
[962] A.F. Moore "Confidential Report to Sir James Wordie, Sir Raymond Priestley, Professor G. Manley and Dr. D.C. Martin on the I.G.Y. Glaciological Expedition at South Georgia, 1957" March 5th 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[963] Letter from Jeremy Smith to J.K. Elliott October 23rd, 1957 British Antarctic Survey Archives GL/78/003/16

course, Elliot arrived at Grytviken and conducted his own inquiry, giving Brown three months notice of the termination of his appointment.

Brown and Smith Depart from South Georgia

Smith got his wish. In early December, Matthew called Smith into his office and asked if he would be able to continue the expedition on his own. At this point, Mrs. Brown had already departed from the island, demonstrating the ways that cold regions are "sometimes used sexual politically to exclude particularly women from polar ventures."[964] Brown, after his wife took her leave, made "an administrative nuisance of himself" and Smith gave his "opinion that Dick is not capable of doing the work for which he is contracted and that if I had been in charge of the party I would have asked for disciplinary action against him long ago."[965] Smith hoped "that the news of Dick's dismissal is not too unwelcome since you appeared to have had a good deal of confidence in his ability…[and] since I believe my opinion influenced the final decision to dismiss him I shall explain for fully my reasons for giving it."[966] First, of the tasks to which he had been assigned, the only one that Smith believed that he had done satisfactorily was the mapping of the Nordenskiold, Harker, Hamberg, Hodges, Lyell, Esmark, Geike, and Ross Glaciers. He also mapped monthly the position of the ice-cliffs of the Harker and Hamberg Glaciers, which Smith admitted was useful in budget assessment but Brown's only surveying work, in ten months, was along ten miles of the coastline on either side of King Edward Cove. In addition to his scientific idleness and family situation, he also was careless with equipment; he and a member of the Meteorological staff had to stand up in a formal enquiry after losing a tripod

[964] Heidi Hansson and Cathrine Norberg, "Revisioning the Value of Cold," in *Cold Matters: Cultural Perceptions of Snow, Ice and Cold*, ed. Heidi Hansson and Cathrine Norberg (Umeå: Umeå University and the Royal Skyttean Society, 2009). 21

[965] Letter from Jeremy Smith to Gordon Manley December 1st, 1957 British Antarctic Survey Archives GL/78/003/16

[966] Letter from Jeremy Smith to Gordon Manley December 1st, 1957 British Antarctic Survey Archives GL/78/003/16

in a boating incident. Brown left South Georgia in February 1958, leaving Smith to finish his work.

Once Brown returned to the UK, senior officials at the Royal Society and FIDS were somewhat unsure of how to proceed. While Manley had received multiple letters from Smith regarding Brown's incompetence, he believed that "We have as yet insufficient information regarding the differences of opinion and complaints and we are dependent on [Brown's] survey results."[967] Manley suggested that perhaps Brown be paid through June, and, under the supervision of Raymond Adie, at the University of Birmingham, continue to work up his results. Unsurprisingly, due to the deluge of complaints he received from Smith, and after meeting with Brown after his return from the island, Manley also believed that when Smith returned, the two should sit in judgement in front of Raymond Priestley, the Director of FIDS, to "get from both of them their story of such differences of opinion as developed."[968] Raymond Adie, who visited South Georgia during the IGY, "got the impression that fundamentally there was a temperamental clash and the Brown is not wholly to be condemned, but certainly had not due as much work as Smith." Since Smith would not arrive until May, "Adie is willing that Brown should work under his supervision at Birmingham… [and] would not be faced for long with the problem of having them working together in his place."[969]

But despite these senior officials attempt to reconcile the conflict between Brown and Smith with the production of useable results, they ran into problems. First, Smith began to communicate problems with Brown's completed research. He telegraphed Raymond Priestley in

[967] Letter from Gordon Manley to David Martin March 3rd, 1958 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[968] Letter from Gordon Manley to David Martin March 3rd, 1958 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[969] Letter from Gordon Manley to AF Moore April 1st, 1958 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A

early April that "In my opinion [Brown's] work is worthless his crude maps superseded by my own more comprehensive survey. His glacier movement observations not of comparable standing to…present work. Suggest person named presents manuscripts and notes to Scientific Bureau to decide whether he be employed further in writing report remembering glaciological work of BSGE 1954/55 not yet published."[970] Smith also reported that "he was doing quite a lot of survey work and his phrasing casts some further doubt on the work done by Brown."[971] Deciding Brown's future actually had some urgency as Brown needed to either be guaranteed future employment with FIDS or be free to pursue employment elsewhere. Through testifying that his own observations were of a higher value of Brown's within the context of Smith's frequent complaints over Brown's lack of education and outrageous behavior, connects this episode to Steven Shapin's analysis of seventeenth century British science, where the testimony of gentlemen-philosophers regarding icebergs,[972] was implicitly trusted over that of the less genteel divers regarding under-water pressure, who "possessed no acknowledged moral right to be believed."[973] Although university degrees had replaced genteel birth as a marker of trust, testimony was still believed based on the standardized credibility of its witness.

It was eventually decided through discussions between Manley, Priestley, and David Martin at the Royal Society that Brown should remained employed through the end of April, at which time he should surrender his notes and observations to FIDS. Not everyone back in the United Kingdom was pleased with this outcome and A.F. Moore, a staff member at the Royal

[970] Letter from Raymond Priestley to DC Martin April 8, 1958 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[971] Letter from Gordon Manley to AF Moore April 1st, 1958 Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A
[972] Shapin, Steven. *A Social History of Truth: Civility and Science in Seventeenth-Century England*. Chicago: University of Chicago Press, 1995. 252
[973] Shapin, Steven. *A Social History of Truth: Civility and Science in Seventeenth-Century England*. Chicago: University of Chicago Press, 1995. 266

Society who had informally investigated the problematic expedition on South Georgia, noted in a letter to David Martin that "Smith's opinion…should have been treated as extremely biased," and that previously, "Smith made a bad impression on us when it came to laying down the law and blowing his own trumpet…I would have thought that there were good reasons for taking Brown on…but presumably it is now too late to discuss the matter again,"[974] particularly since the governor of the Falkland Islands Dependencies had gotten involved in Brown's termination, based on Smith's comments.

Recounting the incident later, Manley summarized Smith and Brown's experience and placed the blame on the interpersonal politics which developed on the island: "I think that he and his partner got on very well at first with a good division of labour. Mrs. Brown then went out to join her husband. The small Grytviken community is of course under the Administration; accommodation is difficult; a series of troubles appears to have developed and our final report from the Administration was such as to lead us, not entirely without regret however, to feel that the continuance of [Brown's] appointment for a further three months could not be recommended. It will be apparent that a complex relationship between administration and scientists is involved. I also think it is fair to say that, in the earlier phases at least, Brown did useful work."[975] Manley recognized that the quality of research produced often depends on the interpersonal relationships between researchers, and their surrounding community. Another similar summary of the expedition read "R.A. Brown had come to the island and…his wife had arrived some time later, without permission. Against all advice she had become pregnant, and after no little persuasion she had eventually returned to the United Kingdom. Apparently Brown had lost his field notes at the end of the season and this, among other things, finally led Jeremy Smith to feel that the

[974] Letter to David Martin from AF Moore April 10th, 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[975] Letter from Gordon Manley to L. Moore May 22nd, 1958 British Antarctic Survey Archives ADS/1/AS/139 (1)

expedition was likely to have a poor reputation."[976] Smith then took it into his hands to protect his reputation by writing to the governor to eliminate the man who he felt was responsible.

Ultimately, Smith left South Georgia in April 1958, and was replaced by Michael Stansbury, who continued observations on the Hodges Glacier and Moraine Fjord. He reported to Manley that "he and Smith have a clear understanding as to the division of work between them and that his job is to work up his Survey and produce a general report which, he says, will take him two or three months."[977] At this point, in the spring of 1958, Brown essentially vanished, taking with him any notes and observations. In June 1959, Manley "asked [Smith] whether Brown had among his field notes anything useful. He said there was a set of sounding across the face of one of the glaciers of which he had no copy. Brown was interested in the historical changes of glacier faces and has a file containing copies of photographs taken by previous expeditions. Also his own photographs would be useful."[978] But Brown's work was never recovered. Presumably not long after, Smith composed a letter to Brown, unclear if it was actually sent. He wrote: "Do you want a year of your life written off in this way? If so I think it most dishonourable of you…It is possible that like everyone else, I have misjudged you and that you are writing up your work on glacier movement and snow oscillations independently of FIDS. The best of luck to you if you are, though I'm quite sure that you won't get away with it.…Are you still keeping the glacier snout surveys made by the BSGE? Once again various firms and big wigs didn't sponsor the expedition just so that you can hang onto the scientific results as

[976] A.F. Moore "Confidential Report to Sir James Wordie, Sir Raymond Priestley, Professor G. Manley and Dr. D.C. Martin on the I.G.Y. Glaciological Expedition at South Georgia, 1957" March 5th 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[977] Letter from Raymond Priestley to E.P. Arrowsmith March 5th, 1958 Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[978] Minutes of Phone call between Gordon Manley and Jeremy Smith June 18th, 1958 British Antarctic Survey Archives ADS/1/AS/139 (1)

souvenirs..."[979] The personnel officer at FIDS, Bill Sloman, also tried to reach out to Brown in February 1959 but concluded that "Every effort has been made to contact Richard Brown, including the stopping of leave pay, but no success has been achieved. I think we must treat his work as more or less written off."[980]

Rid of Brown, and, unfortunately, Brown's data, Smith concentrated on turning his research into a publishable report. For six months after his return to the United Kingdom, he was given facilities at the Department of Geology at the University of Birmingham in order to prepare his data. Since he had done "a really splendid job of work,"[981] and made a "major contribution to the study of glaciology in the Antarctic"[982] the Soil Survey gave Smith leave to remain at the University of Birmingham until January 1959. His progress was rapid and of a high quality; when he submitted his first report to the Glaciological Society, he received compliments from the secretary who wrote: "I received your South Georgia report last week and thought it a most workmanlike effort-much better than most other British reports that have arrived in the World Data Centre: congratulations."[983] Yet he still had logistical concerns: that he was undervalued, and that it was reflected in his pay. Though he was offered a few opportunities to earn "a little pocket money"[984] such as when Manley was unavailable to lecture on IGY glaciology, he believed that his pay was not enough to produce better quality work, nor was it commensurate with that of other scientific officers in the civil service. He wrote that his salary of £520 in 1956 was suitable when he had the free accommodation and messing in South Georgia

[979] Undated letter from Jeremy Smith to Richard Brown British Antarctic Survey Archives GL/78/003/16
[980] Letter from W.O. Sloman to Jeremy Smith February 2nd, 1959 British Antarctic Survey Archives ADS/1/AS/139(1)
[981] Letter from Raymond Priestley to A.B. Stewart October 16th 1958 British Antarctic Survey Archives ADS/1/AS/139 (1)
[982] Letter from Raymond Adie to Raymond Priestley October 14th, 1958 British Antarctic Survey Archives ADS/1/AS/139 (1)
[983] Letter from Hilda Richardson to Jeremy Smith August 6th 1958 British Antarctic Survey Archives GL/78/003/16
[984] Letter from Gordon Manley to Jeremy Smith June 6th, 1958 British Antarctic Survey Archives GL/78/003/16

but had he been employed by the Soil Survey again, he would be earning more than £910. Though he also received an allowance of fifteen shillings per day, considering both the costs of his accommodations in Birmingham, and the fact that "I am anxious to complete the report on my glaciological work in South Georgia as soon as possible and with this in view I have more of my meals in restaurants enabling me to spend more time in the university…it cannot be said to ease my circumstances at all."[985] For Smith a "substantial increase in my salary,"[986] equated a higher standard of work, certainly the mark of a professional.

Salary complaint notwithstanding, Smith worked extremely diligently at writing up his research. Under the supervision of Manley and Adie, he hoped that the main outcome of his glaciological and Quaternary work should appear in the FIDS *Scientific Reports* and could be used, with little alteration, for his PhD thesis. He also planned to write a synopsis of this report, about 2000 words, which he anticipated would get published in the *Journal of Glaciology*,[987] and another short paper on cryoturbation data (the mixing of materials in levels of soil due to freezing and thawing), to be published in 1960 in *Biuletyn Periglacjalni.*[988] While his paper was not read at the International Commission of Periglacial Morphology in October 1958, it was not because "they did not consider [it] good enough" but that it was "late in arriving and did not reach Lotz" in time.[989]

In regards to his "Magnum Opus,"[990] in summary, Smith used the bulk of the report to explain his glaciological and climatic investigations in South Georgia. He discusses the budgets

[985] Letter from Jeremy Smith to Raymond Priestley August 7th, 1958 British Antarctic Survey Archives GL/78/003/16
[986] Letter from Jeremy Smith to Raymond Priestley August 7th, 1958 British Antarctic Survey Archives GL/78/003/16
[987] Letter from Jeremy Smith to Mr. Seligman October 28th, 1958 British Antarctic Survey Archives GL/78/003/16
[988] J Smith, "Cryoturbation Data from South Georgia," *Biuletyn Peryglacjalny* 8 (1960).
[989] Letter from Dr. Fitzpatrick to Jeremy Smith October 10th, 1958 British Antarctic Survey Archives GL/78/003/16
[990] Letter from Dr. Fitzpatrick to Jeremy Smith October 10th, 1958 British Antarctic Survey Archives GL/78/003/16

of the Hodges and Hamberg Glaciers in relation to climatic factors and the fluctuations of South Georgian glaciers in between 1947-57. Finally, he concludes that all of the ice on the island below one thousand meters was geophysically temperate, meaning that rather than being completely frozen throughout the year, as one expects with polar glaciers, it was always, from surface to base, at its melting point. Smith acknowledged the "practical assistance…given by every member of the government staff at King Edward Point" and "the whaling companies."[991] In an early draft of his introduction, he credited Brown directly, who had "mapped the terminus of the Grace Glacier" and made observations until his departure, then indirectly when he describes the Hodges Glacier as "the site of unpublished movement and ablation observations carried out in 1955 by the British South Georgia Expedition, who made photographs and a map available for IGY observers."[992] Elizabeth Brown goes unmentioned.

After six months at the University of Birmingham, Smith returned to his former job with the Soil Survey of Scotland at Aberdeen, [993] though "my report on IGY glaciological work in South Georgia was still unfinished, and I agreed with Dr. Adie that I should continue working at it on my own time. I am writing to confirm that it is my intention to complete this work, although this will not be done as speedily as it would have been had I been able to continue working full time at Birmingham."[994] Back in Scotland, he resumed his mountain climbing hobby; in February 1959, he missed a lecture by Manley since he "was climbing on Ben Nevis."[995] Upon completion of his first draft, Smith circulated his paper quite broadly seeking feedback.

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[991] Jeremy Smith Draft of "Observations on the Economy of Valley Glaciers" British Antarctic Survey Archives GL/77/062
[992] Jeremy Smith Draft of "Observations on the Economy of Valley Glaciers" British Antarctic Survey Archives GL/77/062
[993] Letter from Jeremy Smith to Alec Trendall January 9th, 1959 British Antarctic Survey Archives GL/78/003/16
[994] Letter from Jeremy Smith to Vivian Fuchs January 23rd, 1959 British Antarctic Survey Archives GL/78/003/16
[995] Letter from Jeremy Smith to Gordon Manley February 14th, 1959 British Antarctic Survey Archives GL/78/003/16

Peer review gave him substantial writing chores before his paper would be ready to publish, but none that would derail its publication. The geologist on the South Georgia Survey, Alec Trendall, for example, wrote that while "my comments can be hardly called encouraging…there is nothing like a little controversy to stimulate further thought….don't let me deter you from publishing."[996] John W. Glen, a glaciologist at Cambridge's Cavendish Laboratory as well as a member of the British Glaciological Society's research committee, wrote that while several sections were quite good, it suffered from a lack of original data which "worries me…After all, your method of obtaining these values may turn out to be wrong, and unless you give the original data, later workers will have no means of making any correction to it."[997] However, despite any hiccups that his first round of peer review underwent, a summary of his work, which he hoped to publish in the *Journal of Glaciology,* was, in September 1959, deemed "extremely good and should go forward."[998]

In July of 1959, having completed a fairly solid draft of his glaciological report, Smith initiated an account of his ecological studies on South Georgia, based partially around a collection of plants which he had collected in South Georgia and sent to the Royal Botanical Gardens at Kew.[999] His first, unpublished draft of this paper," Notes of the Phanerogam Vegetation of South Georgia," summarized the types and distribution of seed producing plants near Grytviken, as well as the soils in which they grew and their relationship with native and introduced fauna.[1000] His botanical work showed great promise and "his collection from S. Georgia has just been studied here [Kew] and contains some most interesting specimens,

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[996] Letter from Alec Trendall to Jeremy Smith January 15th, 1959 British Antarctic Survey Archives GL/78/003/16
[997] Letter from J.W. Glen to Jeremy Smith undated British Antarctic Survey Archives GL/77/062
[998] Letter to G. Seligman from Raymond Adie September 18th 1959 British Antarctic Survey Archives GL/78/003/16
[999] Letter from Jeremy Smith to C. Hubbard July 23rd, 1959 British Antarctic Survey Archives 1986/71/B1 Dec 1986/LS 82/1
[1000] Jeremy Smith "Notes on the Phanerogam Vegetation of South Georgia" Copy 1960 British Antarctic Survey Archives 1995/61/6/1

excellently prepared. Some of them are new to the Kew Herbarium, and one gathering might even be a new species."[1001] It was at this point that he wrote to Manley of his upcoming travel plans, who responded: "Good luck with the Alps."[1002]

Posthumous Attempts to Publish Smith's Research

After Smith's mountaineering accident in August 1959, Raymond Adie, who gathered together Smith's papers, tried to see what work of Smith's could be published posthumously, and made arrangements for Smith's short summary of the forthcoming longer report to be published in the 1960 issue of the *Journal of Glaciology.* Adie wrote that "I have been through the short paper that Smith wrote for the Journal of Glaciology. It feel it is a most useful summary of the work that I have seen so far and that it will be a most valuable contribution, especially as the work was done during them International Geophysical Year."[1003] Nigel Bonner, who had attempted to co-write an ecological study with Smith on South Georgia, offered to finish said paper.[1004] A.C. Crundwell, a botany student at the University of Glasgow and "a close friend of Jeremy's,"[1005] for whom Smith has especially gathered moss specimens on the island,[1006] also offered to complete Smith's botanical study. Smith's supervisor at the Soil Survey, Dr. Robert Glentworth who "had a fairly close connection with Jeremy Smith in Aberdeen,"[1007] even wrote to Crundwell of his wish that "you, or others, will in due course, be able to bring to publication

[1001] Letter to Raymond Adie from C. Taylor August 28th, 1959 British Antarctic Survey Archives GL/78/003/16
[1002] Letter from Gordon Manley to Jeremy Smith July 15, 1959 Antarctic Survey Archives GL/78/003/16
[1003] Letter from Raymond Adie to Vivian Fuchs August 24th, 1959 British Antarctic Survey Archives ADS/1/AS/139(1)
[1004] Letter from Nigel Bonner to Raymond Adie March 28th 1960 British Antarctic Survey Archives GL/78/003/16
[1005] Letter to Raymond Adie from Robert Glentworth September 17th, 1959 British Antarctic Survey Archives GL/78/003/16
[1006] Handwritten letter from Jeremy Smith to Raymond Adie June 23rd, 1958 British Antarctic Survey Archives ES1/H1/5/88
[1007] Letter from Raymond Adie to Robert Glentworth September 4th, 1959 British Antarctic Survey Archives GL/78/003/16

some of the many aspects which Jeremy had under study."[1008] To Adie, Glentworth wrote of "the tremendous amount of effort which Jerry put into his work. I sincerely hope that you will be able to complete the studies…I need hardly to say that Jerry's colleagues on the Soil Survey of Scotland will wish you every success in the difficult task of bringing this work to publication."[1009] But perhaps most relevantly, Adie, Glen, and Manley immediately worked on finishing and then publishing Smith's final glaciological report,[1010] which had taken up so much time in the last few years of his life. They were "sure that his family would wish to see his work completed."[1011] Less than a month after Smith's death, Adie wrote that "Already we have been able to submit one of his papers to the Journal of Glaciology and I think it will not be too difficult to bring the main report into a form suitable for publication as a FIDS Scientific Report."[1012]

Adie continued with this goal over the next few years, but as time went on, he, got distracted with other matters. In November 1962, he received a letter from Smith's PhD advisor, J.H. Taylor, at King's College. In a short note, Taylor wrote: "One of our old students was talking to me the other day about a contemporary of his, Jeremy Smith, who was working in South Georgia…I had been intending to write to you for some time to ask if Smith's South Georgia work is likely to be published as a FIDS Report. He talked to me from time to time and it sounded interesting, but I have no idea how far he got to arranging his material before his

[1008] Letter to A.C. Crundwell from Robert Glentworth September 14th, 1959 British Antarctic Survey Archives GL/78/003/16
[1009] Letter from Robert Glentworth to Raymond Adie September 2nd, 1959 British Antarctic Survey Archives GL/78/003/16
[1010] Letter from Vivian Fuchs to Robert Glentworth August 18th, 1957 British Antarctic Survey Archives ADS/1/AS/139(1)
[1011] Letter from Vivian Fuchs to Robert Glentworth August 18th, 1957 British Antarctic Survey Archives ADS/1/AS/139(1)
[1012] Letter from Raymond Adie to Robert Glentworth September 4th, 1959 British Antarctic Survey Archives GL/78/003/16

untimely death. I hope it may be possible for it to be published ultimately. He was a nice young man and it would be pleasant if some results of the work he was doing were on record."[1013] Adie, who seemed to have every intention of getting Smith's work published, responded "I think you must realize that it is only too difficult to complete work started by someone else, since many of the other person's ideas are completely lost, especially if they have not been written down. However, the last two chapters of the main IGY work are now being written and I hope it will not be too long before this final report is published."[1014] Taylor then expressed his gratitude for Adie's efforts "to try and get as much of Smith's work as possible published."[1015] But, nothing ever came of their attempts, other than an unpublished manuscript residing in the British Antarctic Survey Archives.

IGY Glaciology in the Antarctic Beyond South Georgia

In order to understand the context of Smith and Brown's expedition, it is necessary to see comparisons with glaciological expeditions elsewhere in Antarctica. While glaciology was clearly not a priority for the British scientific agenda during the IGY due to the limited time and resources which were dedicated to it, it was studied to some extent in other places beyond South Georgia. The Royal Society Expedition to Halley Bay had a small glaciological program. While Manley wrote up a rough program for three different capacities of glaciological work, the Royal Society opted a plan which included "A small effort involving accumulation measurement…movement [and] past vicissitudes of annual…accumulation."[1016] It was believed that "The 'modest programme'… will provide basic data which can stand by themselves."[1017]

[1013] Letter from J.H. Taylor to Raymond Adie November 26th, 1962 British Antarctic Survey Archives ES1/H1/5/88
[1014] Letter from Raymond Adie to J.H. Taylor November 27th, 1962 British Antarctic Survey Archives ES1/H1/5/88
[1015] Letter from J.H. Taylor to Raymond Adie November 29th, 1962. British Antarctic Survey Archives ES1/H1/5/88
[1016] Letter from Gordon Manley to David Martin May 25th, 1955. Royal Society Expedition Papers Royal Society Archives ARF1090 Box 10A Halley Bay General
[1017]Letter from Gordon Manley to Vivian Fuchs August 28th, 1955 Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

However, though a small program was carried out with little difficulty, it was clear, as Manley predicted, that "the glaciological work might be a minor adjunct and not require a great proportion of available man-hours."[1018] While FIDS of course, in conjunction with the Royal Society organized the IGY South Georgia Expedition, they also carried out glaciological observations at their stations on Argentine Island and Admiralty Bay. In 1957, at the Argentine Islands station (Base F), now known as Faraday station, located on Galindez Island on the Antarctic Peninsula, the station personnel were instructed to commence "a full geophysical programme."[1019] But glaciological work was limited to minimal sea ice observations.

Though at Argentine Island and Halley Bay, glaciological work was constrained, at Admiralty Bay (Base G), on King George Island in the South Shetland Islands, the regular base personnel were joined on February 2nd, 1957 by Hugh M. Noble, designated as a glaciological and general assistant. Admiralty Bay had been selected for glaciological study in connection with the IGY and Noble, who had initially applied for one of the posts on South Georgia, had been selected to plan and carry out the investigations. Noble, an undergraduate student at the University of Glasgow, described as a "dependable person, inexperienced but keen and with a good imagination which is so important to field work,"[1020] and by Manley as "a personable young man with quite useful mountaineering experience…"[1021] selected two glaciers for his work: the West Stenhouse and the Flagstaff Corrie. But while Noble directed the program, he was sometimes assisted on the glacier by members of the meteorological and mechanical staffs. Although Noble only remained on the station for one season, he prepared a detailed report for

[1018] Letter from Gordon Manley to David Martin May 25th, 1955. Royal Society Expedition Papers Royal Society Archives ARF1090 Box 10A Halley Bay General
[1019] D. Emerson. Base F Argentine Islands Yearly Report 1957 British Antarctic Survey Archives AD6/2F/1957/A
[1020] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16
[1021] Letter from Gordon Manley to Raymond Priestley October 28, 1956 British Antarctic Survey Archives ADS/1/AS/139 (1)

FIDS and the base leader wrote, in direct contrast to the concurrent experience at South Georgia, that "the work on glaciers provided many enjoyable days out, and it is a pity that Noble could not have stayed at Base G for another year and perhaps extended his investigations to other glaciers."[1022]

In his research, Noble primarily focused on accumulation and the glacial budgets. He concluded, based on his glacial observations that "in recent years there has been a decline of the high pressure systems, which tend to form in the South, and a consequent increase in the frequency of depressions over King George Island,"[1023] observations which both would explain the shrinking of the glacial ice sheet. Although according to the Base Diary, Noble often had to turn back from their work when the weather was bad, he integrated well with the rest of the station personnel and often assisted the others in their work, or more frequently, in building maintenance. While Noble perhaps took on a somewhat smaller project than Smith and Brown, his positive experience of a low-tech glaciological expedition joining an existing structured community, could be held up as a model for what the South Georgia Expedition could have been. Noble's report was published as in 1965 in the *BAS Bulletin,*[1024] after, like Smith, he spent two months working up his results at the University of Birmingham. But despite the success of Noble's expedition, he too noticed the lack of priority given to FIDS glaciology programs and recalled that "That half-hearted attitude was obvious from the equipment they gave me. Lots of paper advice but hardly any operational equipment. And what there was largely useless. The choice of myself was another sign that they did not really expect anything much by way of

[1022] A. Precious. Annual General Report 1957 Base G British Antarctic Survey Archives AD6/2G/1957/A
[1023] H.M. Noble "Report on Glaciological Observations at Admiralty Bay (Lat. 62° 05'S., Long. 58° 24'W.). King George Island, South Shetland Islands, 1957-58." British Antarctic Survey Archives AD6/2G/1957/S2
[1024] Hugh Noble, "Glaciological Observations at Admiralty Bay, King George Island in 1957-58," *British Antarctic Survey Bulletin* 5 (January 1965): 1–11.

dependable science. For example, they gave me a 100ft measuring tape (for survey work) of which the first 9 or 10 feet had been obliterated. A lack of optical survey instruments was also obvious."[1025]

The most extensive glaciological project conducted by the UK in Antarctica during this period was the programmed devised by the Trans-Antarctic Expedition. This project involved basic, low tech work, done by field workers with little glaciological training, in addition to larger projects using the latest techniques and tools in geophysics, carried out by teams with advanced degrees in the subject, headed by Dr. Harold "Hal" Lister. Their studies ranged from Lister's pet project of snow drift studies, to Dr. Jon Stephenson's applied interest in applying techniques in petrofabrics to ice and snow crystals, to a massive project in seismic sounding which measured the size of the ice cap covering the continent, with several smaller studies along the way.

The success of the TAE's glaciological program could certainly be attributed to the number of financial and human resources dedicated to the projects; the allies that the men of the TAE were able to enroll in men, technology, publications, and funding. Pratt and Lister both had the benefit of excellent equipment. While Pratt valued the cost of his seismic equipment at £10,000, British Petroleum lent this and other equipment valued at approximately £25,000 (£601,959).[1026] As expounded in greater depth in Chapter 2, dozens of other firms donated, lent, or drastically reduced payment for equipment to be used on the well-publicized TAE, eager to see how their instruments would hold up in Antarctic conditions, meaning that the men had access to some of the best equipment available. Compare this to the "simple camping

[1025] Hugh Noble, email message with author, July 4th 2017
[1026] Letter from Trevor Gaskell to W.H. Dowling BP March 15th 1956 1956 Scott Polar Research Institute Archives MS 1326 Box 50 Working Papers of T.F. Gaskell

equipment,"[1027] theodolite, ice axe, butter knife, shovel, and bamboo rods[1028] recommended for the IGY South Georgia Expedition.

In terms of personnel, far more heed was paid to the pedigrees of expedition members than on the small expedition to South Georgia. Lister, the glaciologist, had previous experience on polar expeditions and a PhD. To assist him in his work, he had Jon Stephenson, a PhD in geology. Fuchs, the expedition's leader, who oversaw all field world, also had a PhD in geology and years of polar experience. For the post of a geophysicist, the TAE Committee of Management and BP determined that they needed someone "very experienced in seismic reflection and refraction measurements… [and] be well acquainted with all results and modern theories of ice-covered regions, and should have enough research experience to adapt standard prospecting methods to solve the particular problems that present themselves."[1029] They chose Pratt, who possessed a Master's degree in Natural Sciences Tripos from Cambridge. Compare this to Brown, with a spotty academic background and experience only on mountaineering expeditions or Smith, with a B.S. and only one prior polar expedition. The TAE, along with the American parties in Antarctica during the IGY was the face of future glaciological work, which required specialized education, larger teams of highly educated scientists, and expensive, heavy, and sensitive equipment.[1030]

[1027] "Proposed IGY Glaciological Program for Falkland Islands Dependencies Survey" Notes of the British National Committee for the International Geophysical Year May 26, 1956. Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A

[1028] British Glaciological Society Glaciological Research Sub-Committee "Technical Note No. 1: Measurements required on a glacier in an area which is unknown and unmapped" Scott Polar Research Institute Archives MS 1326 Glaciology CTAE

[1029] Letter to C.R.L. Parry from Dr. T.F. Gaskell March 9th 1956 Scott Polar Research Institute Archives MS 1326 Box 22 Seismic Shooting CTAE

[1030] Simone Turchetti et al., "Accidents and Opportunities: A History of the Radio Echo-Sounding of Antarctica, 1958-79," *The British Journal for the History of Science* 41, no. 3 (2008): 417–44.; Ronald E. Doel, "Constituting the Postwar Earth Sciences," *Social Studies of Science* 33, no. 5 (October 1, 2003): 635–66.

But the vast resources dedicated to the TAE were not the only factors which explain the unproductiveness of the South Georgia IGY Expedition. After all, while certainly not as celebrated as the TAE, the low-tech, relatively untrained glaciological work done elsewhere in the Antarctic, particularly at Admiralty Bay and Halley Bay seemed unproblematic. This is where the conflict of personalities came in. Smith and Brown, if they had been able to get along, could possibly have produced work of some value, even if relatively small in scale. Additionally, arguably, they were not set up for success, considering their disparate tempers and personas. In all other expeditions, there was distinct leadership within the expedition and a clear allotment of tasks. While the TAE and Admiralty Bay in particular paint a picture of glaciological work done in teams, there was always a well-defined decision maker. Jessica Reilly has pointed out, in fact, that today, "Because of their origins and… management, these [Antarctic] stations often have a paramilitary atmosphere,"[1031] implying a clear sense of order and hierarchy. However, in the case of Smith and Brown, before the expedition, as Smith recalled to Manley, "You may recall that in London you were not willing to place one or other of us in charge nor would you portion the work between us. Instead you left it to us to work through the set programme jointly or individually as we thought fit."[1032] This meant that neither man, when encountering hostility from the other, felt he needed to bow to the other's authority; instead, one complained steadily to their superior, while the other, it seems, took solace in the company of his wife and the whaling community on the island. The Brown family, who did not fit within a social network which could advance Smith's career, were not the type of allies that he would enroll to promote his research. Instead, they were obstacles which he first attempted to control, and then eliminate. Hierarchy

[1031] Jessica O'Reilly, *The Technocratic Antarctic: An Ethnography of Scientific Expertise and Environmental Governance* (Cornell University Press, 2017). 67
[1032] Letter from Jeremy Smith to Gordon Manley December 1st 1957 British Antarctic Survey Archives GL/78/003/16

and structure, it seems, particularly when two people do not get along, are essential ingredients for successful knowledge-making.

Conclusion

Although G.E. Fogg has argued that "There are no obvious examples of scientists who have been disastrous as leaders of Antarctic expeditions,"[1033] the IGY Expedition to South Georgia can be read as a failed endeavor. One of two of the field workers was dismissed. Its main report was never published. It was also never really set up to be successful, evident by the delay of Smith and Brown's appointment letter, confusion over messing and accommodations, relatively inexperienced personnel, and lack of resulting publications. But the failure of this expedition is extremely telling as to the state of the history of glaciology and indeed the changing professionalization of science. First, despite the UK's attempt to remain the center of the scientific world, particularly in regard to polar studies, a position which it is debatable if they ever held to begin with,[1034] and their claims to Antarctica on the basis of the quality of their scientific research,[1035] they invested little funding or even attention to glaciology within their territorial claims. While midway through the IGY, James Wordie believed that "the prestige of the Glaciology with the Royal Society is rising and it should not be difficult to get extra money,"[1036] the lack of glaciological publications following the IGY, speaks otherwise. Other than the TAE, which again, was largely privately financed, most of these glaciological expeditions were not well funded, not particularly well organized, and used little manpower. FIDS, in their annual report for 1956-7, simply stated that for South Georgia "Two glaciologists

[1033] G. E. Fogg, *A History of Antarctic Science* (Cambridge; New York: Cambridge University Press, 1992). 396
[1034] John Murray, "The Renewal of Antarctic Exploration," *The Geographical Journal* 3, no. 1 (1894): 1–27. 26
[1035] Adrian Howkins, *Frozen Empires: An Environmental History of the Antarctic Peninsula* (Oxford, New York: Oxford University Press, 2016).
[1036] Minutes from Conference on Glaciology held in William Sloman's office July 17th, 1957 British Antarctic Survey Archives ADS/1/AS/139 (1)

were employed to carry out a programme in accordance with IGY requirements,"[1037] a somewhat minimalist approach and description. In 1957, their report on glaciology read: "Surveys of glaciers and snow cover will be made at Grytviken and Admiralty Bay."[1038] While for Jeremy Smith, this Expedition would have been the headline of his early career, for senior leadership at FIDS and the Royal Society, it was just a footnote.

The IGY Expedition to South Georgia also draws attention to a relative lack of well-trained geologists in the UK willing and able to take work in the Antarctic. FIDS lamented their shortage, arguing that and future investment in the Antarctic, post-IGY, would require the attraction of more "scientists of the right caliber and experience."[1039] Even in the planning of the IGY glaciological program, Manley proposed a study of the large glacier at Admiralty Bay, but as "it now appears unlikely that a suitably qualified man will be forthcoming," he proposed a much simpler program there, which "should lie well within the competence of the survey personnel at the bases,"[1040] eventually appointing Hugh Noble to the position. Raymond Adie too took issue with the quality of FIDS scientific personnel, without being too specific, writing "these various pseudo-glaciologists who are going to FIDS seem to think that they can do anything they like…It seems to be that several of the people already in Graham Land are already completely out of their depth; they are ordering equipment which they cannot possibly know how to use, and therefore I cannot really imagine what sort of results we are going to get in the

[1037] Annual Report on the Falkland Islands Dependencies Survey 1957 British Antarctic Survey Archives AD6/8/57
[1038] "I.G.Y. activities in the Falkland Islands and the Dependencies" July 4th, 1957 British Antarctic Survey Archives AS/138/A/1 1956-1959
[1039] Note on the Future Policy of the Falkland Islands Dependency Survey undated British Antarctic Survey Archives AD1/DD1/1
[1040] "Proposed IGY Glaciological Program for Falkland Islands Dependencies Survey" Notes of the British National Committee for the International Geophysical Year May 26, 1956. Royal Society Expedition Papers Royal Society Archives ARF1094 Box 23A

end."[1041] Finally, in an undated memo from the late 1950s, FIDS stated that "At present there is an acute shortage of well-trained geologists in the U.K. and …it has been extremely difficult for FIDS to recruit the "right type of geologists…We have to consider very carefully all aspects of his technical qualifications and in particular his personal character and ability to mix well with the sort of men who will also be stationed at his base…In the past all sorts of candidates with varying degrees of qualification have applied for FIDS geological posts. To employ poorly qualified geologists …would be disastrous…Past experience has shown that although the geologists employed by FIDS may have possessed the necessary academic qualifications not all of them have had the ability to preserve with writing up their results for publication or to get on well with their companions at the FIDS bases."[1042] Moving forward past the IGY, FIDS wanted to be sure that in glaciology, like other disciplines before it, "the criteria by which to judge quality and competence were gradually standardized."[1043] This was not a problem unique to FIDS and despite being the expedition geologist for the New Zealand Party of the TAE, Bernard Gunn noted that "Geology was weak with only Warren and I, both new graduates with no mapping experience. At least my Master's degree work had been done in the Southern Alps and included glaciology, but I suspect the only reason we were chosen was because no more experienced person had come forward."[1044]

Though the South Georgia Expedition is not referenced, this memo refers to many of its problems concerning both the academic and the social qualifications of its men. Smith, who had only a bachelor's degree, wrote disdainfully of the academic qualifications on Brown,

[1041] Letter from Raymond Adie to Anne Todd September 8th, 1958 British Antarctic Survey Archives ADS/1/AS/139(1)
[1042] "'Summer School' for FIDS Geologist Candidates." Undated British Antarctic Survey Archives AD1/DD1/1
[1043] Philippa Levine, *The Amateur and the Professional: Antiquarians, Historians, and Archaeologists in Victorian England, 1838-1886* (Cambridge: Cambridge University Press, 1986). 158
[1044] Bernard Gunn. "Land of the Long Day." Chapter 5.

who did not finish his undergraduate degree; Smith, a marginal figure himself, used his academic qualifications to police the boundaries of his aspirations to be a professional scientist, forging a sense of power from his own diminished place. But he also found himself unable to get along with the other men stationed on the island. Brown annoyed him in fact, in part because of his indifference to the larger scientific community. For example, when Smith was fretting about his lack of an official letter of appointment, Brown's appointment letter was similarly delayed. But rather than contacting the Crown agents himself, he was content to benefit from Smith's what he termed "vitriolic" letters, and received his official appointment at the same time as Smith.[1045] Not only did Smith clash with Brown and Matthew, his critique of Brown's sociability with the rest of the South Georgia community, implies that he did not share the same communal relationship. This does not just refer to whalers, but also the administrative and scientific community on the island.

Furthermore, Smith and Brown had essentially different visions for the island of South Georgia. Smith saw the glaciers of South Georgia in a profoundly imperialist mindset. From the beginning of the field, glacier researchers traveled to the glacial ice and transforming glaciers into laboratories; "sources of data and objects of scrutiny."[1046] The requirement that scientists journey to glaciers for their research further transformed glaciers into sites of imperialism which was defined by a very rigid sort of Western science.[1047] Smith saw South Georgia as a peripheral space from which he could advance his career in the metropole, even enquiring into Lectureship positions before his tragic death. On South Georgia, he would be able to extract data which could

[1045] Hand-written Letter from Richard Brown to Jeremy Smith November 5th, 1956 British Antarctic Survey Archives GL/78/003/16
[1046] Mark Carey, "The History of Ice: How Glaciers Became an Endangered Species," *Environmental History* 12, no. 3 (2007): 497–527. 507
[1047] Mark Carey, "The History of Ice: How Glaciers Became an Endangered Species," *Environmental History* 12, no. 3 (2007): 497–527. 507

be transformed into scientific facts, which could be exploited to propel him into the larger scientific community. His clash with Matthew, which hinged on the idea that as a serious scientist he should be able to take his food at Discovery House, as otherwise he would be distracted from his work, demonstrates both his idea about the deference he should receive from the local community and the insecurity and tenuousness of his own position. It is indeed somewhat ironic that he was attempting to police Richard and Elizabeth Brown's participation in glaciological research when his own position within the British scientific hierarchy was relatively weak.

On the other hand, while for Smith, the un-occupation of the Antarctica made their glaciers more comparatively more mysterious and capable of revealing unknown and valuable information, for Brown, it made the island symbolically ideal for settler colonialism.[1048] Brown, rather than the same extractive, exploitative, imperial vision for South Georgia as Smith, Brown had a functionally colonial mindset. That is, South Georgia was a site for domestication. The connection between domesticity and colonialism has been explored at length by many historians,[1049] and Brown, through bringing his wife, turning the "gaol into a fairly habitable flat,"[1050] fathering a child, which he wished even to be born there, and becoming a member of the local community, domesticates South Georgia in every way possible. South Georgia would, through his work advising scientific expeditions, and possibly through Elizabeth Brown's literary ambitions, support his family and allow for him to make a home. While likely interested in geological work, he was more concerned with establishing a life for himself and his family. He

[1048] Adrian Howkins, "Appropriating Space: Antarctic Imperialism and the Mentality of Settler Colonialism," in *Making Settler Colonial Space*, ed. Tracey Banivanua Mar and Penelope Edmonds (Palgrave Macmillan UK, 2010), 29–52.
[1049] See, for example, Julia Clancy-Smith and Frances Gouda, eds., *Domesticating the Empire: Race, Gender, and Family Life in French and Dutch Colonialism* (Charlottesville, Va: University Press of Virginia, 1999).
[1050] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16

neither put too much into his time in South Georgia, nor expected to get much out of it. And Brown's domestication of South Georgia did not necessarily separate it from the production of science in the greater empire. In fact, through her presence on the island, Elizabeth Brown, there to mend Smith and Brown's socks, as Brown jovially put it, but also, according to Smith and Wordie, performing academic labor, became one of the "women [who] joined… 'the shadow networks' of the British academic world. Although they were frequently enmeshed in long-distance ties, these were not of a kind that earned them a significant place inside settler institutions. Even as they participated in the scholarly project, women provided the poorly paid, under-recognised, and often locally based labour that both supported and enabled the mobility of the white, male and largely middle-class Britons appointed to senior posts."[1051]

In terms of Smith's unpublished report, while it is impossible to know exactly why it was not published, it is possible to posit several theories. First, the most obvious reason, could stem from Smith's own death. Smith's character when he was alive suggests that he would certainly have done all in his power to see his work published, one way or another. With his death, while his research certainly had other allies who could rally on its behalf, their priorities were elsewhere. Those such as Manley, Adie, Taylor, and Bonner etc., certainly could have made certain that Smith's report was published, but considering Smith's lack of social capital, as often happens with allies in a network, "People escape, lose interest, do something else, are indifferent."[1052] In the "collective drift of good intentions"[1053] demonstrated by the community he so wished to join, robbed of its biggest advocate, Smith's perfectly fine research, could not

[1051] Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939*, (Manchester University Press, 2013). 82
[1052] Bruno Latour. *Science in Action: How to Follow Scientists and Engineers through Society*. (Philadelphia: Open University Press, 1987). 145
[1053] Bruno Latour. *Aramis, or the Love of Technology*. (Cambridge: Harvard University Press, 1996). 290

live on its own.[1054] Since the facts which make publication possible "are made by mustering resources and holding allies in line,"[1055] Smith's inability to do either prevented his research from having a future. Smith was probably even aware of the weakness of his project, as Hugh Noble recalled visiting Smith on South Georgia in 1958 and "[J]erry showed me what he had discovered. I think he was disappointed by his own results. They had not been able to do any work on a major glacier. May be he just didn't show me everything but I think all of his work was confined to a small corrie glacier on the far side of Mount Hodges. His poor relationship with Dick Brown had not helped them do good work."[1056]

Yet another possibility, comes from the changing field of glaciological research. Smith's research, as well as Noble's did not engage in the new techniques and theories in fieldwork. As polar explorer Frank Debenham observed in 1961, glaciological work required specialized equipment, used by well-educated teams, collaborating with other scientists;[1057] the really exciting work could no longer be done with one or two surveyors, who had perhaps enthusiasm and mountaineering experience, but little equipment or education. While Smith desperately wanted to be seen as a part of this community of professional glaciologists, and fervently policed to boundaries of who should be doing glaciological fieldwork, his research project was essentially a causality in the changing emphasis of glaciology. Greater emphasis was not placed on getting Smith's report published because it was rapidly losing relevancy. Of course, it could just have been that BAS was so far behind in their publications that they opted to write off those which had been simply assigned numbers but not yet published by 1964. Again, as Smith's paper

[1054] See Bruno Latour, *Aramis, or the Love of Technology* (Cambridge: Harvard University Press, 1996). Bruno Latour, *The Pasteurization of France* (Cambridge: Harvard University Press, 1988).
[1055] Bruno Latour. *Science in Action: How to Follow Scientists and Engineers through Society*. (Philadelphia: Open University Press, 1987). 167
[1056] Hugh M. Noble, email message with author, July 4th, 2017
[1057] Frank Debenham, *Antarctica: the Story of a Continent* (New York: Macmillan, 1961).

draft had a cover, assigning it as No. 29, with the date 1964, when No. 33- 39 were published in 1963, this certainly could be a possibility. Considering that a synopsis of Smith's paper, in the *Journal of Glaciology* and published in 1960, mentions the forthcoming report No. 29, it is true that BAS was very far behind in its publications.

Another possibility comes from general embarrassment of FIDS over the conflict between Smith and Brown on the island. Without Smith, there was no need to shine a light on a situation which could be ignored. No official account of the Expedition, even in draft form, mentioned the conflicts between Smith and Brown or the presence of Elizabeth Brown. *The Island of South Georgia,* the most recent history of the island, which not technically an institutional history, was written Robert Headland. A polar explorer and longtime BAS employee, Headland is extremely detailed, but his section on Smith is limited to a few sentences.[1058] No mention of Brown. Headland writes three paragraphs on the BSGE, specifically naming George Sutton and Harry Pretty and referring to glaciological study, but again, no mention of Brown.[1059] Vivian Fuchs' historical account of FIDS, *Of Ice and Men,* published in 1982, does not mention this expedition at all. Elizabeth Chipman, who catalogued all of the women who she could find in the 1950s Antarctic, while acknowledging "some details of women in the far South will be missing,"[1060] did not uncover Elizabeth Brown's experience. While these people lived in South Georgia for more than a year and gathered data which was submitted to the IGY World Data Center and even drafted into a manuscript report, their expedition was ultimately unsuccessful because it lacks publications. For scientists, their work "is only a means to the end of publishing a paper. The production of papers is acknowledged by

[1058] Robert Headland, *The Island of South Georgia* (Cambridge: Cambridge University Press, 1984) 100, 137
[1059] Robert Headland, *The Island of South Georgia* (Cambridge: Cambridge University Press, 1984) 98-9
[1060] Elizabeth Chipman, *Women on the Ice: A History of Women in the Far South* (Carlton, Victoria: Melbourne University Press, 1987). 1

participants as the main objective of their activity."[1061] The lack of publications means that it was unsuccessful and would fade out of historical memory. Likewise, it is important to remember that a publication is not recognition of a scientific job well-done, but the sum total of the network, based largely on his own social capital, that a scientist is able to build. In order for publications to become realities, you need to have social capital and build a network.

I would like to suggest that this expedition's disappearance was a combination of these factors. Smith's untimely demise, in combination with the relatively weak glaciological study he contributed, the somewhat embarrassing circumstances around its writing, lack of resources around glaciological research in Britain more generally, and the clear backlog of BAS *Scientific Reports,* means that Smith's report got lost. Glaciological science during the IGY, and indeed all scientific research more generally is based around contingencies-the loss of any existing support can cause an entire project, like that of the South Georgia Expedition, to be a long-term failure. It can ultimately be ascribed to the collapse of a network. Every hiccup that Smith encountered from the beginning of the expedition's organization until his own death, ranging from his delayed letter of appointment, lack of additional training, uncertain messing, inability to control his partner, low pay, and lack of publication reflect a weak network and a lack of social capital. Smith's network, which he diligently tried to build through his publication in a Polish journal,[1062] his direct contact with the glaciers on South Georgia, his correspondence with leading figures in the scientific community, and his own attempts to place himself within a position of power while on the island, essentially collapsed with his death. To refer back to Steven Shapin's analysis,

[1061] Bruno Latour and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. (Princeton, N.J: Princeton University Press, 1986). 71

[1062] Rather than waiting to publish in a British journal, which he was criticized for by W.H. Ward of the Department of Scientific and Industrial Research- Letter from W.H. Ward to Raymond Adie July 31st, 1958 British Antarctic Survey Archives GL/78/003/16

Smith was attempting to turn himself from a diver, whose word was of marginal importance, to a gentleman-philosopher, whose "Factual testimony...was almost never gainsaid in the public forums of…English science."[1063] But, it is unclear whether or not this would come to be, with or without his death, considering the rapid demise of his network.

Finally, this expedition highlights the interpersonal relations essential to producing solid work which often get written out of scientific accounts. Nearly all observers to Smith and Brown's dramas surmised that it was a personality conflict, coming partially from the presence of Elizabeth Brown, which got out of hand and caused so much trouble on the island. Personal relations matter in scientific research, particularly when people are working close together. Smith himself noted that this issue when complaining about Brown, realizing that "This must sound like the embittered grumblings of one who has bourne another's company for too long so let me hasten to say that we are not on bad terms…I expect that if two people like myself worked together there would probably have been a murder by now."[1064] George Sutton, recalling the organization of the BSGE, warned of the troubles often presented by interpersonal relationships during polar sojourns: "Like so many leaders of small expeditions, I knew that a man could so grow to dislike a companion that in a matter of weeks he would be ready to hit him with an ice-axe merely because of some trifle."[1065]

While of course political, professional, and personal conflicts happen everywhere, the extreme isolation of a polar expedition compounds these issues. But Antarctica is often defined by the comradeship that it produces between expedition members.[1066] In fact, Vivian Fuchs

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[1063] Shapin, Steven. *A Social History of Truth: Civility and Science in Seventeenth-Century England*. Chicago: University of Chicago Press, 1995. 124

[1064] Letter from Jeremy Smith to Gordon Manley October 10th 1957 British Antarctic Survey Archives GL/78/003/16

[1065] George Sutton, *Glacier Island: The Official Account of the British South Georgia Expedition, 1954-1955*, (The Travel Book Club, 1958). 20

[1066] R. B. Robertson, *Of Whales and Men*, (New York: Simon Schuster Trade, 1954). 91

argued that it was one of the few places in the world where men could universally look back and remember "the close comradeship which develops in isolated groups from shared experience and the growth of mutual confidence."[1067] The social difficulties of Smith and Brown strongly contrasts the official public image of FIDS' bases which were instead characterized in extremely positive terms. For example, a description of FIDS bases in a recruitment ad specifically highlight the comradeship that emerges from working in Antarctica where "Each has a vital contribution to make to the life at base, by cheerfulness as much as by hard work, and there develops a great sense of comradeship and teamwork, consistent with the great tradition set by Shackleton…Small wonder then, that men returning from a tour of duty with the Survey carry with them imperishable memories of experiences which comparatively few are privileged to share."[1068]

But, if two very different men are forced to work together in relative close quarters and isolated from their regular world, with relatively weak administrative support and experience working together, and different visions for their work, they can become frustrated and unproductive. As the FIDS recruitment ad read, "As an experience in human companionship it can have no counterpart, for the men are entirely dependent on one another-a situation demanding cheerfulness, tolerance, and unselfishness."[1069] Based on the correspondence surrounding this expedition, Smith and Brown displayed few of these traits. These personality problems, exacerbated by the extreme conditions, had an enormous impact on the glaciological

[1067] Vivian Fuchs, *Of Ice and Men: The Story of the British Antarctic Survey, 1943-73* (Oswestry, Shropshire, England: A. Nelson, 1982). 11
[1068] Falkland Islands Dependencies Survey "The Falkland Islands Dependencies Survey popularly known as F.I.D.S. is and organization devoted to exploration and scientific research in the British sector of the Antarctic." Royal Society Archives ARF 1094 Box 23A SCAR/IGY
[1069] Falkland Islands Dependencies Survey "The Falkland Islands Dependencies Survey popularly known as F.I.D.S. is and organization devoted to exploration and scientific research in the British sector of the Antarctic." Royal Society Archives ARF 1094 Box 23A SCAR/IGY

research. It echoes similar problems experienced by earlier explorers in Antarctica, who noted that while on the field "the loss of a biscuit crumb left a sense of injury that lasted a week; how the greatest of friends were so much on one another's nerves that they did not speak for days for fear of quarreling."[1070] In the best of circumstances, the extreme conditions produced social conflicts that could have wide-reaching reverberations. And this can be the case no matter how lofty and ambitious their goals, or the tendency of men to bond over their shared polar hardships.

[1070]Apsley Cherry-Garrard, *The Worst Journey in the World*, (North Salem, NY: Adventure Library, 1997). 113

CONCLUSION

In an internet search for world maps, it is striking how many maps leave out Antarctica entirely. This omission is strange, considering that the seventh continent holds nearly nine percent of the world's landmass, an area bigger than most of the world's largest countries including the United States, Canada, Australia, and China. Antarctica also holds ninety percent of the world's fresh water, a fact that holds growing importance in these days of global climate change, when its melting glaciers threaten to change the size and composition of the oceans. Of course many maps of Antarctica do exist. But it is usually presented on its own, out of context from the rest of the world. In fact, at the beginning of this dissertation, I presented a map of this nature, a map which isolates rather than includes Antarctica in the world. But through the dissertation, I have demonstrated ways that Antarctica is actually closely connected to the other themes in global world history, particularly in connection to the history of science, the late-British Empire, and late-Dominion New Zealand. Therefore, the following map, which is a Lambert Azimuthal Equal Area Projection with the central meridian at 60° E, might be more appropriate. While quite an unusual projection, this map situates Antarctica in the world on equal terms with other land masses and in relation to the seven countries that still maintain sovereignty claims in the region.

Figure 17. Map of the World[1071]

Additionally, when people think about Antarctica, they usually do not think about people. It is often perceived as a wilderness, separate from people and untainted by human history, with scientific knowledge waiting to be discovered by intrepid explorers and brave scientists. Yet, as this dissertation demonstrates, Operation Tabarin and to a greater extent, the IGY, began a period of intensive and even violent human occupation of the continent. The present day McMurdo Station, the US base on the Ross Island, can support over 1250 residents; more of a small town than an isolated outpost. Moreover, humans have made an enormous impact on the environment of the continent, including harvesting some Antarctic species to the verge of extinction, killing and disturbing other species, contaminating the soils, and discharging sewage to the sea and leaving rubbish, cairns and tracks in even the most remote parts. This is not to mention our indirect impacts, such as the rapidly melting ice cap, stemming from anthropogenic global climate change. This occupation would not be possible if not for the enormous logistical, geopolitical, financial, and intellectual networks around the world that maintain the human

[1071] Laura Gerrish, British Antarctic Survey

presence. Even the knowledge gleaned from Antarctica is not produced in a vacuum. In fact, as this dissertation shows, the production of scientific knowledge cannot be separated from the political, imperial, national, environmental, geographical and ideological context in which it was produced. Antarctica is not separate from human history. In contrast, the seventh continent, as it is today, was completely forged by human history.

British and New Zealand research programs in Antarctica during the late 1950s can be characterized by disunity and distrust in nearly every way. Many of the issues that I explored in the chapters still exist today. Just like then, various bases are maintained to some extent for political reasons. In theory, the Antarctic Treaty, signed in 1959, which aimed to keep the IGY going in Antarctica in perpetuity, ended the geopolitical struggles over Antarctica. After all, France, Norway, the United Kingdom, New Zealand, Australia, Chile, and Argentina all agreed to suspend, without renouncing, their claims to the continent. Yet the claims still exist and are even enforced to some extent by the claimant countries. For example, no claimant country maintains a base outside of their own territorial claim, despite the fact that over forty countries now have some permanent presence on the continent. Argentina has an image of their Antarctic territorial claim on their passports and when recently applying for a job in the UK, the application specified that if I were born in Antarctica, my nationality was British. While no acts of war have been committed over the continent itself since 1959, the sub-Antarctic island of South Georgia is still a heavily contested territory and during the Falklands War in 1982, a battle was fought at Grytviken between Argentinian naval forces and Royal Marines during which three men were killed.

Additionally, politics over data sharing between countries has continued. While countries no longer make geopolitical arguments for control over Antarctic territory, scientific research

programs and their credibility became a 'convertible currency' for influence on the continent.[1072] Having good data replaced a good geographic claim in the political economy of the continent. In that way, the research done by the British Antarctic Survey as its international credibility and legitimacy abroad is what continues to give Britain a large voice in the region. Even recently, investments in polar research have been a priority to British science policy. As the bipolar climate of the Cold War elbowed the UK out of much of its international political influence, they continued to exert dominance in the area of Antarctic science, maintaining several bases, and publishing the major journals. *Polar Record, Antarctic Science,* and the *Journal of Glaciology,* to name a few are published in Cambridge. The Secretariat for the Scientific Committee for Antarctic Research is also located in Cambridge. Additionally, within the larger British Commonwealth, even today, three of the five Antarctic 'gateway' cities are Hobart, Christchurch, and Capetown.

But despite the UK's dominance in the world of Antarctic research, disputes over Antarctic science continue within the UK. In 2012, coincidently the year I began formulating this project, journalist Paul Bignell reported that the National Environmental Research Council (NERC), which funds BAS, was proposing a 25% budget cut, arguing that some of their work could be carried out cheaper at British universities. The result was "one major casualty, a furious interdepartmental row in Whitehall and… the intervention of the Prime Minister." When the director of BAS, Nicolas Owens, was made aware of these proposed cuts, he took the matter to the Foreign Office over the head of Duncan Wingham, who is still the director of the NERC, thereby prompting a political maelstrom. Bignell reported that "MPs intend raising in the Commons concerns about what is considered to be a jewel in the crown of British science, and it

[1072]Katrina Dean et al., "Data in Antarctic Science and Politics," *Social Studies of Science* 38, no. 4 (August 1, 2008): 571–604. 573

is understood that Foreign Office officials intend to contest the funding cuts to the bitter end…At stake is one of the most respected groups of scientists in the world."[1073] David Cameron pledged support for the work of BAS, and ordered the funding dispute be resolved, but the crisis worsened after not only Owens was suspended, but replaced temporarily replaced by Ed Hill, the director of the National Oceanographic Centre, rather the existing deputy director. When Wingham proposed merging BAS and the National Oceanographic Centre later that year, he was called before Commons to answer for both these controversial administrative moves as well as his merger plans. He was sharply castigated by the MPs "for failing to justify the move on cost or scientific grounds; for failing to consult properly, and not taking into account the survey's geopolitical role in the South Atlantic."[1074] The next day, NERC dropped the merger plan. While Britain dominates polar research, it still serves as a point of conflict in the scientific community.

Gender, a running theme in this dissertation, continues to be a source of conflict in Antarctic research. First, while George Dufek declared in 1956 that "women will not be allowed in the Antarctic until we can provide one woman for every man,"[1075] since women's presence on Antarctica "would wreck men's illusions of being heroes and frontiersmen,"[1076] the first American women researchers came to Antarctica in 1969. Though outnumbered, American women took on increasingly significant roles through the 70s and 80s. Gender equality came slower in the United Kingdom. As stated in Chapter Six, Vivian Fuchs was firmly opposed to the presence of women in the British Antarctic Survey, which he directed until 1973. While geologist Janet Thompson was able to visit in an official capacity in 1983, women were

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[1073] Paul Bignell, "Exclusive: British Polar Research in Crisis," *The Independent Online*, April 7, 2012, sec. Science News.
[1074] Damian Carrington and Robin McKie, "Research Boss Wingham in Trouble Over British Antarctic Survey Claim," *The Guardian*, November 3, 2012, United States edition.
[1075] Elizabeth Chipman, *Women on the Ice: A History of Women in the Far South* (Carlton, Victoria: Melbourne University Press, 1987). 86
[1076] Beau Riffenburgh, *Encyclopedia of the Antarctic* (Taylor & Francis, 2007). 1093

essentially barred from using British bases and logistics until 1987. They could not participate in all BAS activities, specifically, wintering-over, until 1996. And the inclusion of women scientists does not mean that this issue is resolved. In 2013, the BAS Club Magazine face criticism after they graced their May cover with a photo of American model Kate Upton, wearing a bikini, kneeing in the Antarctic snow, in the same issue where paleoclimatologist Jane Francis' appointment as the first female director of BAS was announced.[1077] The BAS Club reissued this edition after complaints from members.

Besides these political issues, the material environment still manages to assert itself in the production of scientific research. For example, anthropologist Jessica O'Reilly has shown that in the case of Antarctic research, knowledge is often produced through the tactile relationships formed by scientists, specifically glaciologists, with the ice shelf. She has argued that it is through these relationships that scientists are able to make predictions and extrapolations that do not come from data, but from their intimacy with their subject. Yet their very relationships with the materiality of the ice come not from any innate or instinctual ability, but are instead "bound up in the complexities of nationalism, scientific translations of scale, and boundary skirmishes over what counts as expertise from within scientific disciplines."[1078] Even instrument use in extreme environments are still largely restricted to the limitations of environment. Anthropologist Antonia Walford has shown that scientists and technicians in the Brazilian rainforests often have troubles with the operation of their instruments, and like in the 1950s Antarctic, are forced to use behavioral and technical adaptions to operate their instruments and

[1077] Bob Burton, "The Changing Face of Antarctica," *BAS Club Magazine*, May 2013.
[1078] Jessica O'Reilly, "Sensing the ice: field science, models, and expert intimacy with knowledge," *Journal of the Royal Anthropological Institute* 22, no. S1 (April 14, 2016): 27–45.

interpret sometimes problematic data.[1079] Additionally, in Amazonian climatic research, "The ability of any instrument to measure correctly depends on the intervention of correction factors that have to be constantly updated. This immediately suggests that calibration has the power to construct what it measures."[1080] Likewise, Stefan Helmreich has demonstrated the complex ways in which people, instruments, and the environment interact in deep sea oceanic research. The material environment continues to impact that ways in which people are able to conduct scientific research programs and this is never more evident than in extreme environments.

Ever since humanities scholars and social scientists began to study Antarctica, they have focused on the idea that despite the efforts and rhetoric of some scientists and policymakers seeking to reserve Antarctica "for scientists as a kind of great laboratory kept insulated from political and other pressures,"[1081] Antarctic politics, economics, geographies, and science have always been deeply interwoven. My dissertation, which traces the organization, funding, implementation, execution, and aftermath of several large and small scale scientific expeditions, not only situates Antarctica within greater world history, but highlights several major issues in science and technology studies. These issues include space and place, instrumentation, gender, the credibility of scientists, and geopolitics. These issues are still rampantly present in Antarctica. My dissertation therefore seeks to shift the historiography of Antarctica. Scientists and policy makers did not fail to make Antarctica into a laboratory for science. They absolutely succeeded. And just like every other laboratory in the world, constructed to bring legitimacy to

[1079] Antonia Walford, "Double Standards: Examples and Exceptions in Scientific Metrological Practices in Brazil," *Journal of the Royal Anthropological Institute* 21, no. S1 (2018): 64–77.
[1080] Antonia Walford, "Limits and Limitlessness: Exploring Time in Scientific Practice," *Social Analysis* 57, no. 1 (Spring 2013): 20–33. 27
[1081] Peter J. Beck, *The International Politics of Antarctica* (Kent: Croom Helm, 1986).7

scientific work[1082] and to use that legitimacy to make knowledge claims, within a specific social, political, and material context, Antarctica was truly crafted into a laboratory at the bottom of the world.

Figure 18. An Emperor Penguin and the *Endeavour*[1083]

[1082] Steven Shapin, "The House of Experiment in Seventeenth-Century England," *Isis* 79, no. 3 (1988): 373–404. Bruno Latour, "Give Me a Laboratory and I will Raise the World," in M. Mulkay K. Knorr-Cetina (eds.), *Science Observed, Perspectives on the Study of Science*, (London: Sage, 1983). pp.141-170

[1083]Photo by John Clayton, Antarctica New Zealand Pictorial Collection

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