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**Local Cryo-history:
Redefining the Creation, Transformation and Circulation of Aotearoa's
Nineteenth Century Glacier Knowledge**

A thesis

submitted in partial fulfilment
of the requirements for the degree

of

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THE UNIVERSITY OF
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Abstract

The creation, transformation and dissemination of knowledge constantly shapes the narrative of glacier history. However, the intersecting layers that human encounters with the frozen environment, Indigenous knowledge, and popular thought add to glacier histories is often overlooked. By analysing the trends and intellectual traditions that emerged in nineteenth century New Zealand, a period defined as glaciology's 'classical' era of study, this thesis aims to broaden the Southern Alps' local science-focused glacier discourse.

Māori, for example, possessed unique mātauranga (knowledge) that was documented through Europeans employing local guides to accompany them across the Southern Alps. This mātauranga shaped some encounters nineteenth-century scientists, surveyors, and travellers had with Kā Tiritiri o te Moana's glacier environment. New Zealand scholars like Julius von Haast and James Hector, on the other hand, further refined their understanding of New Zealand glaciers through the transnational exchange of knowledge and intellectual debates. A combination of Enlightenment rationalism and Romantic aesthetic also influenced popular glacier narratives that emerged during the nineteenth century. For example, the imagination of journalists, mountaineers and travellers reflected the broader cultural trends that circulated from Europe to New Zealand before their knowledge was disseminated to the public.

By interrogating mātauranga Māori, formal scientific study, and popular settler imagination about glaciers, this thesis redefines New Zealand's nineteenth-century glacier history as inherently multilayered through the circulation, creation, transformation and dissemination of glacier knowledge. In doing so, it highlights glaciers not only as physical entities defined by scientific study but as ideas shaped by diverse knowledge systems, cultural perceptions, and historical contingencies.

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Introduction

In 2015, Sverker Sörlin, Swedish historian and academic scholar of the arctic polar environment, coined the term cryo-history to refer to ice centric histories from a humanities' perspective. Defined as a "quest for a new integrative narrative of humans and the rapidly changing environment", when it comes to ice, cryo-history considers both terrestrial and marine ice as key components to the development of nations, cultures, economies and communities.¹ Sörlin further argues that the social aspect of cryo-history has the ability to broaden the scholarly understanding of ice in the Anthropocene.² In slightly simpler terms, it can be inferred that cryo-history brings deeper social understanding to the world's continued "global environmental predicament" by examining the way the frozen environment was interpreted in the past.³ By redefining the current hegemony of a history of science regarding New Zealand's Southern Alps glaciers into a wider cryo-history as defined by Sörlin, my overall research question asks how the creation, dissemination and circulation of glacier knowledge was shaped by trends in European thought about the environment.

According to Sörlin, there is a dearth of historical research in the social sciences and humanities field when it comes to glaciers.⁴ He argues that, currently, there are only two main topics of research present in cryo-history: 1) how academic institutions, people and scientists study the phenomenon, 2) how local perceptions of glaciers and ice (and popular practices relating to the phenomenon) are understood.⁵ I argue it is possible to create a third, more inclusive, cryo-history in countries where evidence exists of both the scientific study of the phenomenon and Indigenous

¹ Sverker Sörlin, 'Cryo-History Ice, Snow, and the Great Acceleration', in *Ice and Snow in the Cold War: Histories of Extreme Climatic Environments*, ed. by Julia Herzberg, Christian Kehrt and Franziska Torma (New York: Berghahn Books, 2018), pp. 20-46 (p. 24-25), JSTOR <<https://www.jstor.org/stable/j.ctvw048zz.5>> [accessed 12 May 2024]; Sverker Sörlin, 'Cryo-History: Narratives of Ice and the Emerging Arctic Humanities', in *The New Arctic*, ed. by Birgitta Evengård, Joan Nyman Larsen and Øyvind Paasche (Heidelberg: Springer Link, 2015), pp. 327-340, (p. 335).

² The Anthropocene, in this case, is defined as a new moment in the geological epochs of the planet. A term Paul Crutzen defined as a new era where human action has begun to impact the natural environment and the "quiet persistence of microbes and the endless wobbles and eccentricities in the Earth's orbit." Sörlin, as well, defines the Anthropocene as an era "where environmental and climate change is more deeply embedded" in the past, present and future of our planet. See: J. R McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene since 1945* (London: Harvard University Press, 2016), p. 2, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=4502489>> [accessed 30 December 2024]; Sörlin, 2018, p. 34; Sörlin, 2015, p. 334.

³ Sverker Sörlin and Paul Warde, *Nature's End: History and the Environment* (London: Palgrave Macmillan, 2009), p. 2, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/reader.action?docID=533558>> [accessed 13 March 2024].

⁴ Sörlin, 2015, p. 334.

⁵ Sörlin, 2015, p. 334-335.

people and/or colonial settlers that explicitly express their knowledge of the frozen environment. New Zealand shows a clear intersection of this trend, especially in the way Europeans recorded the way Indigenous Māori knew glaciers, imperial scientists studied the phenomenon in the Southern Alps and how that knowledge was communicated to the public. Knowledge about nineteenth century glaciers in Aotearoa was therefore shaped by the ways of knowing terrestrial and marine ice that trickled down from the larger European community.

At its heart, this thesis analyses how the specific creation, interpretation and performance of glacier knowledge was known, understood, circulated and disseminated to the settler public from the earliest known acknowledgement of European glacier knowledge printed in Wellington in 1859 to the later record James Herries Beattie made of the way Ngāi Tahu kaumatua (elders) conveyed, observed, interacted and understood their natural environment. I openly acknowledge that Māori have their own mātauranga and ways of interacting with glaciers. Nevertheless, I have not been able to collate enough research to foreground the way glacier mātauranga (knowledge) may have shaped the wider nineteenth century cryo-knowledge this thesis discusses. This is, in part, because I have yet to build the language skills necessary to translate Te Reo Māori sources and am situated too geographically and culturally distant to build the relationships necessary to conduct face-to-face interviews and attend local hui (Māori ceremonial assemblies) dedicated to discussing the topic. This thesis, thereby can only analyse the way Māori knowledge regarding New Zealand glaciers was recorded and interacted with through the lens of colonial settlers, travellers and scientists from the mid-nineteenth to early twentieth century.

From a solely environmental perspective, glaciers and glacier-carved landscapes have always been a vital part of Aotearoa's alpine mountainscape. Long before Polynesian voyagers alighted these shores, Kā Tiritiri o te Moana, an unbroken mountain chain stretching from the Kaikōura range to Te Rua o te Moko/Fjordland, has been steeped in multiple eras of retreating and advancing glaciation.⁶ Aotearoa's has had twelve glacial and interglacial periods, half of which were responsible for the advance of Te Waipounamu's piedmont and valley glacier systems.⁷ The Ōtira, the most recent glaciation, took place between 70000 – 14000 BC and left its mark in the

⁶ Sean J. Fitzsimons and Heinz Veit, 'Geology and Geomorphology of the European Alps and the Southern Alps of New Zealand: A Comparison', *Mountain Research and Development*, 21.4 (2001), 340–49 <<https://www.jstor.org/stable/3674295>> [accessed 2 August 2024] (pp. 340, 345).

⁷ Valley Glaciers: rivers of ice that usually follow the topographical layout of mountain valleys and have tributary glaciers (such as the Godley), they are also longer than they are wide. Piedmont Glaciers: found at the foot of mountain ranges (where the Franz Josef Glacier originally terminated/ Hooker Glacier at the below Aoraki). Mark Meier, 'Classification of mountain glaciers', in *Britannica Academic*, <<https://academic.eb.com/levels/collegiate/article/glacier/108438>> [accessed 12 July 2024]; Fitzsimmons and Veit, p. 345, 346.

form of towering South Island moraines, glacier-eroded troughs, fiords and a significant hundred-and-twenty metre drop in sea-level.⁸

In simple terms, glaciers are large bodies of frozen water that are found at high altitudes in mountainous regions or in the cold climates situated at the earth's poles.⁹ They are made up of interlocking crystals of ice that are formed by the accumulation of snow, "collected year by year above the snowline" and become buried, deeper, by fresher ice crystals.¹⁰ As the result of increasing pressure, the crystals then slowly transform into compact layers of ice before they flow forward under their own weight.¹¹ I limit my case studies to the mountain glaciers found in the Southern Alps of New Zealand such as the Hooker, Tasman, Ball, Fox and Franz Josef Glacier.

The definition of 'public' that I use in this thesis refers to "a section of the community, or of the human race, having a particular interest or connection" with New Zealand during the nineteenth century.¹² An accurate definition of the word 'public' is difficult to grasp according to Johan Östling. He argues that there are three main definitions currently debated throughout the humanities: one is that the public is constantly in flux. The inherent meaning of 'public' as a term remains a "historically changing phenomenon" that is shaped by individual scholars.¹³ Second, the public is not homogeneous. It is a living entity that is made up of the several other overlapping connections between people.¹⁴ Third, the meaning of the word 'public' is continuously being altered by institutions and individuals that either maintain or delimit its meaning.¹⁵ By taking into account the essence of Östling's argument, I limit the use of public in this thesis to those who were connected through their access to newspapers, rate of literacy, had a relationship with those capable of sharing information and could speak, read or suitably relay knowledge to others during the nineteenth century.

⁸ Currently, Aotearoa is in the Aranui interglacial period – a period of warming/retreating ice from 14500 BC to today. As a result, the massive forms of ice in the Southern Alps have retreated significantly. Cambell S. Nelson, *Geological History of New Zealand*, (Auckland: Auckland Geography Teachers Group, 1977) p. 181; Eileen McSaveney, 'Glaciers and Glaciation – the Ice Ages' in *Te Ara – the Encyclopaedia of New Zealand*, <<http://www.TeAra.govt.nz/en/diagram/10741/glacial-periods-in-new-zealand>> [accessed 11 June 2024]; Lynley Hargreaves, *Vanishing Ice: Stories of New Zealand's glaciers* (Nelson: Putton & Burton, 2022) p. 8; Fitzsimmons and Veit, p. 345.

⁹ Mark Meier, 'Glacier', in *Britannica Academic*, <<https://academic.eb.com/levels/collegiate/article/glacier/108438>> [accessed 12 July 2024].

¹⁰ Helgi Björnsson, *The Glaciers of Iceland: A Historical, Cultural and Scientific Overview* (Paris: Atlantis Press, 2016), p. 9, Springer Nature Link <<https://link.springer.com/book/10.2991/978-94-6239-207-6>> [accessed 03 March 2025].

¹¹ Björnsson, p. 9.

¹² *Oxford English Dictionary* (Oxford: Oxford University Press, 2024), <<https://doi.org/10.1093/OED/2178190663>> [accessed 29 June 2024] s.v. public, 4a, n.

¹³ Johan Östling, 'Circulation, Arenas, and the Quest for Public Knowledge: Historiographical Currents and Analytical Frameworks', *History and Theory*, 59.4 (2020), 111–126 <<https://doi.org/10.1111/hith.12184>> (p. 121).

¹⁴ Östling, p. 121.

¹⁵ Östling, p. 121.

A pivotal point in the collation of New Zealand glacier knowledge can also be found after the signing of Te Tiriti o Waitangi in 1840 and a demographic increase of Te Waipounamu's European population. In the search of gold, scientific knowledge and an accurate survey of Southern Alps, greater geological interest was cultivated regarding the environment.¹⁶ The physical, theoretical and artistic interaction that individuals had with glaciers during the nineteenth century became more commonplace. The nineteenth century was also an era where philosophical thought entwined with scientific rigidity. By drawing from the core ideas of Romanticism and the Enlightenment, I consider that the way the New Zealand settler public thought about glaciers played a considerable role in the types of glacier knowledge that were created.

The other core component of analyses in this thesis is taken from J. Donald Hughes three main principles that make up environmental history. He argues that “the study of human thought about the natural environment and attitudes towards it” is one of the core types of history found in the environmental history field.¹⁷ He further considers that interrogating the way various aspects of nature interact with systems of thought such as religion, politics, science, philosophy and popular culture has the ability to link environmental history to other academic fields like the history of science, knowledge, and culture.¹⁸ In this case, systems of nineteenth century thought like Romanticism, the Enlightenment and the Sublime contributed to the creation and circulation of glacier knowledge in Aotearoa specifically. A more inclusive history of Aotearoa glaciers can be measured thematically by individuals physically encountering the natural phenomenon, its formal study by scientists and the way it was written about and visualised by the public.

This thesis is situated, therefore, in the wider environmental history field as a cryo-history of knowledge that analyses the traceable creation, movement and dissemination of glacier knowledge as it was transformed through European settlers physically interacting with, studying, writing and visualising Aotearoa glaciers.

Historiographies of Glaciers, Knowledge and Science

When it comes to the historiography of glacier and cryo-histories both inside and outside New Zealand, Sörlin's argument that there is a substantial lack of humanities and social science

¹⁶ James Beattie, 'Fashioning a Future. Part I', *International Review of Environmental History*, 6.2 (2020), 75–102 <<https://search.informit.org/doi/abs/10.3316/informit.584404529168637>> (p. 80-81).

¹⁷ J. Donald Hughes, *What Is Environmental History?* (New Jersey: Polity Press, 2015), p. 11, ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=4182797>> [accessed 26 July 2024].

¹⁸ Hughes, p. 11.

research regarding the natural phenomenon is quite noticeable.¹⁹ Among the international authors who study glaciers from a social sciences perspective, Michael Bravo stands out. His work focuses on the importance of Indigenous Inuit guides and the knowledge they shared with Moravian settlers when exploring the Labrador Coast in 1810. He argues that the exchange of Indigenous knowledge assisted in nation building and that the social aspect of knowledge is not limited to a single European view.²⁰ Additionally, he also considered that the communication and analyses of knowledge has the ability to situate even complex histories of ice such as the Arctic where history is seen as a “cosmographic prism” as opposed to linear narratives of discovery.²¹

Other types of glacier histories from a perspective outside the history of science, focus on the way Indigenous language was shaped by the natural phenomenon and human-ice relations that reached beyond the usual glacier “narrative of global collapse”.²² From a science of history perspective, glacier historiographies often interrogate the way past scholars recorded, theorised and studied the phenomenon.²³ In opposition, Mark Carey created a multidisciplinary approach to question how glaciers were historically thought about before they became seen as ‘endangered’.²⁴

¹⁹ Sörlin, 2015, p. 334.

²⁰ Michael Bravo, ‘Indigenous Voyaging, Authorship, and Discovery’, in *Curious Encounters: Voyaging, Collecting, and Making Knowledge in the Long Eighteenth Century*, ed. by Adraina Craciun and Mary Terrall (Toronto: University of Toronto Press, 2019) pp. 71-112 (p. 73), JSTOR <<https://www.jstor.org/stable/10.3138/j.ctvbj7gc7>> [accessed 13 September 2024].

²¹ Michael Bravo, *North Pole: Nature and Culture* (London: Reaktion Books Ltd, 2019), p. 9, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5631455>> [accessed 23 September 2024].

²² Julie Cruikshank, *Do Glaciers Listen? Local Knowledge, Colonial Encounters, & Social Imagination* (Vancouver: UBC Press, 2006), ProQuest eBook Central, <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3412087>> [accessed 7 October 2024]; Dani Inkpen, ‘Even Higher: the mountain cryosphere’, in *Ice Humanities: Living, working, and thinking in a melting world*, ed. by Klaus Dodds and Sverker Sörlin (Manchester: Manchester University Press, 2022), pp. 72 – 88 (p. 75), JSTOR <<https://www.jstor.org/stable/jj.21996546.10>> [accessed 20 March 2025].

²³ For further reading that focuses on the way histories of science relate to glaciers, Astrid Ogilvie, Erik Isberg and Sverker Sörlin all interrogate that way glaciology defined the study of past glaciers and ice. For example: how sixteenth century Icelandic scholars recorded their interactions with sea ice, the newer study of ice-cores temporalized the Earth sciences and the way scientific study of glaciers was conducted before they were established as indicators of climate change. See: Astrid Ogilvie, ‘Writing on sea ice: early modern Icelandic scholars’, in *Ice Humanities: Living, working, and thinking in a melting world*, ed. by Klaus Dodds and Sverker Sörlin (Manchester: Manchester University Press, 2022), pp. 37 – 56, JSTOR <<https://www.jstor.org/stable/jj.21996546.8>> [accessed 20 March 2025]; Erik Isberg, ‘Frozen archives on the go: ice cores and the temporalization of Earth system science’, in *Ice Humanities: Living, working, and thinking in a melting world*, ed. by Klaus Dodds and Sverker Sörlin (Manchester: Manchester University Press, 2022), pp. 266 – 283, JSTOR <<https://www.jstor.org/stable/jj.21996546.20>> [accessed 20 March 2025]; Sverker Sörlin, ‘The Global Warming That Did Not Happen: Historicizing Glaciology and Climate Change’, in *Nature’s End: History and the Environment*, ed by Sverker Sörlin and Paul Warde (London: Palgrave Macmillan, 2009), pp. 93-114, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/reader.action?docID=533558>> [accessed 13 March 2024].

²⁴ Mark Carey, ‘The History of Ice: How Glaciers Became an Endangered Species’, *Environmental History*, 12.4 (2007), 487-527 <<https://www.jstor.org/stable/25473130>> [accessed 10 March 2024].

He used ideals of thought from the Enlightenment and Romantic eras to analyse the way glaciers were publicly known during the nineteenth century. By following his example, I assert that it is undeniable that the creation, dissemination and communication of knowledge remains at the heart of how glaciers were engaged with historically.

A similar trend of knowledge creation and exchange can also be found in several social, geographical, scientific and Indigenous histories of Aotearoa. For example, the narratives of Māori guiding Europeans across the New Zealand landscape and sharing their knowledge during the early days of European exploration can be found in the work of Giselle Byrnes, John McCrystal and Nic Low.²⁵ Although Byrnes studies the history of surveying in colonial New Zealand, she also provides valuable insight into how Māori/Pākehā relationships wrote and rewrote Aotearoa's history of colonisation. Furthermore, at the heart of her argument is a "post-colonial unravelling of the many shifts and subtleties of the colonial project."²⁶ This thesis may not pursue a post-colonial narrative of glacier history, in itself, but it does explore the way Europeans recorded Māori knowledge of glaciers and reinscribed their own views and interpretation on the country's frozen landscape.

When analysing the impact that Māori guides had on communicating knowledge about the landscape to others, it is also vital to understand why Europeans sought to record, circulate and categorise knowledge of the environment from foreign lands. An analysis of imperial science practiced by the British Empire, according to Joseph M Hodge, provides a dynamic clue about how circuits of knowledge "enable us to think about the relationality of colonial, metropolitan, and even extra-imperial sites."²⁷ Knowledge circulation also makes it possible to "follow the movements not only of capital and commodities, but of crucial ideas, practices and people."²⁸ When it comes to the study of imperial science, Hodge also argues that is imperative that careful consideration must be given to the inequalities of power that was rife between specific networks of imperial science and the "hybridized nature of scientific knowledge making."²⁹ Tony Ballantyne, similarly, asserts that

²⁵ Giselle Byrnes, *Boundary Markers: Land Surveying and the Colonisation of New Zealand* (Wellington: Bridget Williams Books, 2001), Bridget Williams New Zealand History Collection <<http://dx.doi.org/10.7810/9781877242908>> [accessed 10 September 2024]; John McCrystal, *Singing the Trail: The Story of Mapping Aotearoa New Zealand* (Allen & Unwin, 2020), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5972405>> [accessed 10 December 2024]; Nic Low, *Uprising* (Vicotria: Text Publishing Company, 2021).

²⁶ Byrnes, p. 5.

²⁷ Joseph M. Hodge, 'Science and Empire: An Overview of the Historical Scholarship', in *Science and Empire: Knowledge and Networks of Science Across the British Empire, 1800-1970*, ed. by B. Bennet and J. Hodge (London: Palgrave Macmillan, 2011), pp. 3 – 29 (p. 16), ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=785022>> [accessed 20 September 2024].

²⁸ Hodge, p. 16.

²⁹ Hodge, p. 3.

colonisation allowed for ideas to be expressed and moved between individuals and colonies.³⁰ Rather than being static, knowledge is inherently mobile and constantly in dialogue with different cultures.

In the academic field of knowledge circulation, Johan Östling states that “public circulation implies that knowledge should be studied as a broad, societal phenomenon” and that “crucially, the social reach and relevance of the knowledge under scrutiny must reside at the core of analysis.”³¹ As one of the main topics studied in this field, I relate this thesis to the way a history of knowledge challenges the established knowledge of glaciers and tracks the public narrative surrounding it.³² Radu Leca’s study, for example, argued that maps acted as “intermediaries in the process of knowledge negotiation” between Japan and nineteenth century western cartographers.³³ He further considered that maps were vehicles of knowledge that were exchanged and “shaped far less by Western science and its search for objectivity than by transcultural social interactions between peers.”³⁴ Scholars in Aotearoa, on the other hand, seem to pay less attention to the way knowledge was created, transformed and circulated inside and outside national borders.

The closest contender of a history of knowledge regarding glaciers was written by the New Zealand author Lynley Hargreaves. Her book *Vanishing Ice: Stories of New Zealand’s Glaciers* brings into focus the way Māori voyagers, nineteenth and twentieth century scientists, glaciologists, travellers and later-day eco-tourists interact with New Zealand glaciers.³⁵ Writing from a history of science perspective, Hargreaves provides a pivotal analysis on the way glaciology developed as a science in Aotearoa. What anchors her work as a history that moves away from the usual science-centric narrative, is the careful attention she pays to the social and cultural analyses of Māori knowledge regarding New Zealand’s frozen environment. Another similar publication is Allison Ballance’s *Southern Alps: Nature & History of New Zealand’s Mountain World*.³⁶ Highlighting the ecological and geological processes that shaped Aotearoa’s glaciers, Ballance’s work, parallel to Hargreaves’, provides a compact study of an environmental aspect by submersing the reader in a broad history considering the human study of the natural environment and the

³⁰ Tony Ballantyne, *Webs of Empire: Locating New Zealand’s Colonial Past* (Vancouver: UBC Press, 2012), ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3412915>> [accessed 12 June 2024].

³¹ Östling, p. 120.

³² Östling, p. 112.

³³ Radu Leca, ‘Maps as Knowledge Vehicles: Insights from the Collections of Leiden University Library’, in *Mapping Asia: Cartographic Encounters Between East and West*, ed. by M Storms, and others (Berlin: Springer Nature, 2019), pp. 147–67, Springer Nature Link <https://doi.org/10.1007/978-3-319-90406-1_9> [accessed 9 March 2025].

³⁴ Leca, p. 164.

³⁵ Lynley Hargreaves, *Vanishing Ice: Stories of New Zealand’s glaciers* (Nelson: Putton & Burton, 2022).

³⁶ Allison Ballance, *Southern Alps: Nature & History of New Zealand’s Mountain World* (Auckland: Random House, 2007).

ecological biography of the Southern Alps.³⁷ What their histories are especially useful for in this thesis, is the detailed background they provide about human interaction with glaciers and the ecological biography of Te Waipounamu's alpine environment.

When looking at the way histories of knowledge are studied in Aotearoa, James Beattie and Ruth Morgan argue that a 'history of knowledge' is more feasible when analysing colonial histories of science as it opens a perspective to explore "the complex ways in which knowledge-making...arose from both Indigenous and non-Indigenous traditions, perspectives and practices."³⁸ A history of knowledge in New Zealand is, therefore, especially relevant when it comes to tracing Indigenous and non-Indigenous interactions with the natural environment. Māori have an inherently different view and purpose when it comes to expressing and understanding knowledge about the natural world than their Pākehā counterparts. Hirini Moko Mead, for example, argues that Māori mātauranga is not an information archive, but rather a tool that helps iwi think, organise, collate and consider the ethics and appropriateness of knowledge that enlightens them about their world and their "place in it."³⁹ Mātauranga about the environment then, as a result, "takes many forms and expressions, based on different tribal histories, local geographies, norms and practices."⁴⁰

The authors Atholl Anderson, Barry Brailsford, James Beattie and Harry Evison place particular emphasis on Ngāi Tahu histories that span the majority of the South Island.⁴¹ With a tribal rohe (tribal boundary) that stretches from Te Parinui o Whiti (White Bluffs), to Mount Mahanga and Kahurangi Point in Rakiura (Stewart Island), Ngāi Tahu histories often include a

³⁷ The difference in topics between Hargreaves and Ballance is also related to the individual purpose of their publications. Hargreaves is science writer that has skill in communicating more complex ideas, whereas Balance is a zoologist, film-maker and author. Both these individuals have different focuses when communicating and presenting their histories to the public.

³⁸ James Beattie and Ruth Morgan, 'From History of Science to History of Knowledge? Themes and perspective in colonial Australasia', *History Compass*, 19.5 (2021), 1-5 <<https://compass.onlinelibrary.wiley.com/doi/full/10.1111/hic3.12654>> (p.1).

³⁹ Hirini Moko Mead, *Tikanga Māori: Living by Māori Values* (Wellington, Huai Publishers, 2016), p. 33.

⁴⁰ D.N.T King, A. Skipper and W.B Tawhai, 'Māori environmental knowledge of local weather and climate change in Aotearoa – New Zealand', *Climate Change*, 90.4 (2008), 385-409 <<https://doi.org/10.1007/s10584-007-9372-y>> (p. 387). 'Ngāi Tahu Pepeha', *Ngāi Tahu Pepeha Resources* (2025) <<https://ngaitahu.maori.nz/ngai-tahu/>> [accessed 1 September 2025].

⁴¹ Some further authors that are vitally important in Kāi Tahu histories are: Michael Stevens' approach that considers personal experience and pairs it with archive research as "opposed to the application of abstract theories and idealized models." And Tipene O'Regan who wrote on the establishment of the Waitangi Tribunal and the history that was included in the Ngāi Tahu Claim of 1986. See: Michael Stevens, 'A 'Useful' Approach to Māori History', *New Zealand Journal of History*, 49.1 (2015) 54-77, <<https://muse.jhu.edu/article/880624/pdf>> [accessed 6 March 2025] (p. 55 - 56); Tipene O'Regan, *New Myths and Old Politics: The Waitangi Tribunal and the Challenge of Tradition* (Wellington: Bridget Williams Books, 2014), ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/reader.action?pq-origsite=primo&ppg=3&docID=1718212>> [accessed 4 April 2025].

“many layer” approach that untangles multiple narratives of history from different perspectives.⁴² An important environmental layer to Ngāi Tahu history, according to James Beattie, can be found in the forest clearance and native grasses planted by Māori before the boom in European settlement during the early nineteenth century.⁴³ Two additional layers are the archaeological finds that dotted the pounamu trails that Ngāi Tahu walked across the Southern Alps and the nineteenth century political narratives that colonised the South Island.⁴⁴ By analysing the distinct perspective of Ngāi Tahu histories, it is possible to link the Māori mātauranga and history to the geographical location of glaciers found in the Southern Alps.

When it comes to the history of glaciology in Aotearoa, however, little attention is given to Māori interpretations of the natural phenomenon. Colin Burrows argues, similarly, that even Julius von Haast’s tireless work with New Zealand glaciers received relatively little recognition for the depth and breadth of the contribution he made to the scientific field.⁴⁵ In 1861 when Julius von Haast was appointed Canterbury’s provincial geologist, he was tasked with analysing the types of mineral ores and mineable resources that were attainable from the province’s surrounding landscape.⁴⁶ He was also tasked with compiling a detailed geological report and accurate map of the Southern Alps so future road structures and potential settlement spots could be deliberated.⁴⁷ The three main expeditions Haast led from 1861-1863 started in the Rangitata Valley, moved through the Central Southern Alps in 1862 and later found a notable low-altitude passage to Te Tai Poutini on the West Coast. Haast’s research from 1861-1872, as a result, meticulously recorded Kā Tiritiri o te Moana’s glacier landscape and the basis of how glacial geology shaped Canterbury’s present mountainscape. Reference to Haast’s three expeditions can be seen throughout the thesis, related to all the major themes of glacier knowledge I interrogate through the physical exploration

⁴² A. H Carrington, Atholl Anderson and Te Maire Tau, *Ngāi Tahu: a migration history, the Carrington text* (Wellington: Bridget Williams Books, 2008) p. 17;

⁴³ James Beattie, ‘Fashioning a Future. Part I’, *International Review of Environmental History*, 6.2 (2020), 75–102 <<https://search.informit.org/doi/abs/10.3316/informit.584404529168637>> (p. 79).

⁴⁴ Barry Brailsford, *Greenstone Trails: The Māori and Pounamu* (Hamilton: Stone Print Press, 1996); Harry C. Evison, *Te Waipounamu: The Greenstone Island – A History of the Southern Māori during the European Colonization of New Zealand* (Christchurch: Aoraki Press in association with the Ngāi Tahu Māori Trust Board and Te Rūnanga o Ngāi Tahu, 1993).

⁴⁵ The primary sources that supplemented Burrows detailed examination of Haast’s life was donated to the Alexander Turnbull Library after Haast’s son’s death. Sascha Nolden, in the last decade, has sorted, collected, translated and published Haast’s correspondence with several prominent nineteenth century scientists in English. Sascha Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast, 1859-1887* (Wellington: Geoscience Society of New Zealand Inc, 2012); Sascha Nolden, Rowan Burns and Simon Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887* (Wellington: Geoscience Society of New Zealand Inc, 2012); Sascha Nolden, ‘The Correspondence of Sir Julius von Haast’, in *Canterbury Museum Bulletin No. 11*, ed by Sascha Nolden, George Hook & Simon Nathan (Christchurch: Museum of Canterbury, 2022); Burrows, p. 14.

⁴⁶ Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005) p. 28-30.

⁴⁷ Burrows, p. 30.

of the frozen alps, their scientific study, the way the public read about the phenomenon and visualised.

In 2005 Burrows set about correcting the lack of acknowledgement of the evidence and research Julius von Haast contributed to the scientific study of glaciers. As a European geologist that settled in Aotearoa during the late 1850s, Haast's name would become synonymous with the early study of glaciers in New Zealand. Burrows argues that the geologist's lifelong achievement in glacier geology and the meticulous research he contributed to today's Quaternary glacier studies, drew strong inspiration from the debates that raged in Europe at the time.⁴⁸ Another example of New Zealand science history focuses on the centennial achievements of New Zealand's Royal Society, the communication of non-Indigenous and Indigenous ways of science and the later survey of how science was practised from 1769 to 1992.⁴⁹ From the general history of science in New Zealand, it is entirely possible to trace the way science knowledge was communicated specifically and the detailed glacier data gathered by the country's earliest prolific glacier scientist.

Other disciplines that this thesis draws from can be found in the academic field of literature and art. Nineteenth century travel writing, for example, combined written accounts of individuals exploring new places and recording their personal observations, scientific endeavours and/or emotional response to the environment.⁵⁰ As such, first-person narratives often conveyed to their audience the author's expertise, excellent moral character and credibility on a specific subject.⁵¹ Furthermore, travel-related and travel-derived images played a large role in the way knowledge about the environment was circulated.⁵² Lee Davidson, for example, analyses the importance newspaper resources, travel writing, politics and visual culture had on the communication and circulation of New Zealand mountainscapes.⁵³ She argues that the inherent duality of mountains viewed through a Māori and European lens highlights elements of cultural

⁴⁸ David Oldroyd argues that the influence of Haast's contemporaries in Europe shaped the theories about glacier action he developed during the 1860s. As a result, his work tracks the changes in the field as it trickled down from the Northern Hemisphere. See: David Oldroyd, 'Haast's Glacial Theories and the Opinions of His European Contemporaries', *Journal of the Royal Society of New Zealand*, 3.1 (1973), 5–14.

⁴⁹ Charles Flemming, *Science, Settlers and Scholars: The Centennial History of the Royal Society of New Zealand* (Wellington: Wright & Carman Ltd, 1987); Jean Fleming and others, 'Aotearoa New Zealand: Participatory science and bicultural knowledge communication', in *Communicating Science: A Global Perspective*, ed. by Toss Gascoigne and others (Canberra, ANU Press, 2020), pp. 71-102, JSTOR Autoholdings Books <<https://www.jstor.org/stable/j.ctv1bvntz>> [accessed 9 August 2024]; Rebecca Priestley, 'A Survey of the History of Science in New Zealand 1769–1992', *History Compass*, 8.6 (2010), 474–90, <<https://doi.org/10.1111/j.1478-0542.2010.00684.x>>.

⁵⁰ Carl Thompson, 'Nineteenth-Century Travel Writing', in *The Cambridge History of Travel Writing*, ed. by Nandini Das and Tim Youngs (Oxford: Cambridge University Press, 2019), pp. 108–24 (p. 116), Cambridge Core <<https://doi.org/10.1017/9781316556740.008>> [accessed 1 April 2025].

⁵¹ Thompson, p. 116.

⁵² Thompson, p. 109.

⁵³ Lee Davidson, 'Seeing Differently: Understanding Pakeha Constructions of Mountain Landscapes in Aotearoa', *Public History Review*, 29 (2022), 96 - 113 <<https://doi.org/10.5130/phrj.v29i0.8199>>;

colonisation that Europeans imposed on the alpine environment. Ian Grant and Lydia Wevers, contrastingly, highlights the inherent link that exists between the movement of ideas and text.⁵⁴ This link is vitally important to this study as almost all nineteenth century primary sources about Aotearoa glaciers are recorded in media print, letters, landscape art, photographs and maps.

The visualisation of glaciers that includes landscape painting, photography and the creation of maps can also be linked to the larger nineteenth century philosophical movement of Romanticism and the idea of the sublime. According to Francis Pound, Romanticism can be defined as “the feeling of man’s smallness in the vast face of nature.”⁵⁵ The painting of sublime landscapes, therefore, transforms the viewer and artist’s interpretation of nature through the incorporation of abandoned spaces, massive expressions of size, obscurity, darkness and sudden transitions in composition.⁵⁶ The historiography of photography in Aotearoa, similarly, argues that photographs were used to recollect, interpret and redistribute current ideas and views of nature to the wider public. Jarrod Hore, for example, argues that the visualisation of nature through the eyes of European settlers was directly associated with a “feeling of belonging” and allowed outsiders to create an affinity with foreign space.⁵⁷ The trend in landscape art and photography during the nineteenth century is, therefore, related to the way nature was constructed through current European views of the natural environment.

The historiography this thesis relies on is multifaceted to reconstruct the way nineteenth glaciers and the glaciated environment was understood by the public. There is no singular field of study, like interrogating the way glaciology developed as a science when it comes answering the

⁵⁴ Ian Grant, *Lasting Impressions: The Story of New Zealand’s Newspapers, 1840-1920* (Masterton: Fraser Books, 2018); Lydia Wevers, *Country of Writing: Travel Writing and New Zealand 1809-1900* (Auckland: Auckland University Press, 2002).

⁵⁵ Francis Pound, *Frames on the Land: Early Landscape Painting in New Zealand* (Auckland: William Collins Publisher’s Ltd, 1983), p. 19.

⁵⁶ Similar analyses of the sublime expressed during the nineteenth century can be found in works by Geoffrey Belknap and Michelle Facos. Belknap investigated the value photographs added when paired with textual communication where he argues that photographs were not static and shifted their values and meanings when embedded in different media forms. Michelle Facos, on the other hand, analysed Romantic and sublime art through the “new awareness of nature” that evolved during the eighteenth century and bled over into the nineteenth century. See: Geoffrey Belknap, ‘The Reproduction of Photographs in Nineteenth-Century Scientific Communication’, in *Photography and Other Media in the Nineteenth Century*, ed. by Nicoletta Leonardi and Simone Natale (Philadelphia: Pennsylvania State University Press, 2019), pp. 131 – 146, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=6224491>> [accessed 26 April 2025]; Michelle Facos, *An Introduction to Nineteenth Century Art* (New York: Routledge, 2011), pp. 110 - 139, Taylor & Francis Group <<https://www.taylorfrancis.com/chapters/mono/10.4324/9780203833070-6/shifting-focus-art-natural-world-michelle-facos?context=ubx&refId=3ef03317-addb-494a-b74b-d4b3bbf4ca4e>> [accessed 9 April 2025]; Pound, p. 19.

⁵⁷ Jarrod Hore, *Visions of Nature: How Landscape Photography Shaped Settler Colonialism* (Oakland: University of California Press, 2022), EBSCOhost <<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip.sso&db=nlebk&AN=3186437&authtype=shib&site=ehost-live>> [accessed 22 November 2024].

overall question of this thesis. Rather, a multidimensional approach is needed. The influence and movement of knowledge is vital to situating the nineteenth century scientific study of glaciers, Māori guiding foreigners through the alpine landscape and the frozen environment was viewed through physical study, written text and environmental imagery. These are all vital aspects of study to consider when writing a more inclusive cryo-history of South Island glaciers.

Source and Thesis Limitations

In this thesis, my analysis is based on evidence found in two main types of primary sources. The first draws evidence from several forms of written sources such as letters, books, newspapers, magazines and gazettes. The second relies on the way glaciers were disseminated visually through maps, paintings, nineteenth century field sketches and early glacier photography. I would also note that among the text-based sources I analyse, I pay attention to the scientific theories early glacier scientists, geologists and naturists debated in their private correspondence and formal publications. These are based on the information their authors gathered from studying the environment at the time. The knowledge gathered in their sources, therefore, do not necessarily reflect the way we understand glaciers today.

Furthermore, the sources this thesis relied on were limited by my geographical distance from the Southern Alps. I conducted most of my research in and around Auckland and had to rely on sources about glaciers that were available remotely or digitized for easier access. Secondly, as mentioned earlier, I do not have the necessary skill to translate or analyse Te Reo sources in detail. Therefore, the most glaring limitation of the sources I relied on was the lack of primary sources that contained a Māori perspective. What Māori glacier knowledge I did rely on came from several first-person interviews James Herries Beattie conducted with Ngāi Tahu kaumatua (tribal elders) during the early twentieth century.⁵⁸ These came with their own set of limitations as Beattie's collection of Māori knowledge was not specifically geared toward glaciers and some of his records were fragmented without full reference to the individuals he interviewed. Other Māori glacier knowledge that I relied on could also, only, be traced through the interactions Europeans had with Māori guiding them through the New Zealand environment.

This thesis can, therefore, only claim to represent a Māori view on glaciers through the lens of Europeans who gathered information about the subject from their interactions with Māori when physically encountering the natural phenomenon. This is the main reason why I situate my

⁵⁸ Herries Beattie, 'Art. Xiii. —Nature-Lore of the Southern Māori', *Transactions and Proceedings of the Royal Society of New Zealand*, 52 (1920); Herries Beattie, *Traditional Lifeways of the Southern Māori* (Dunedin: University of Otago Press, 1994b); Herries Beattie, *Māori lore of lake, alp and fiord: folk lore, fairy tales, traditions and place names of the scenic wonderland of the South Island* (Christchurch: Cadsonbury Publications, 1994a).

thesis as a New Zealand cryo-history that questions how European settlers mostly interacted with, studied, wrote about and visualised glaciers during nineteenth century. With the Māori glacier knowledge I do represent however, I still attempt to create as comprehensive an analysis as possible within the restriction the sources provide.

This thesis, therefore, does not represent a Māori view on glaciers cultivated before and after European arrival. Rather, it analyses the way Indigenous knowledge about glaciers was communicated through the physical encounters between European and Māori during the nineteenth century. There is also the deliberate erasure of Māori Indigenous knowledge in favour of European forms of knowledge creation to be discussed, a theme I revisit in the upcoming chapters.

Chapter Summaries

The creation, transformation and dissemination of knowledge constantly shapes the narrative of glacier history. By analysing the trends and intellectual traditions that emerged in nineteenth century New Zealand, a period defined as glaciology's 'classical' era of study, this thesis aims to broaden the Southern Alps' local science-focused glacier discourse. By interrogating mātauranga Māori, formal scientific study, and popular settler imagination about glaciers, this thesis redefines New Zealand's nineteenth-century glacier history as multilayered.

I divided my chapters into four thematic sections, each focusing on the way knowledge about glaciers was recorded, created and disseminated to the New Zealand public. The narrative of each chapter is guided by variations of the same question with different thematic focuses: 1) how glaciers were physically interacted with, 2) scientists studied the phenomenon, 3) newspapers and popular print recorded knowledge about the frozen environment, 4) the ways glacier knowledge was conveyed through visual images.

The first chapter asks how early New Zealand glacier knowledge was transformed through physical encounters (both Māori and European) with the Southern Alps. By looking at mātauranga Māori (traditional Māori knowledge) and the way Europeans physically recorded their encounters with the mountains, I argue that the role Māori played in guiding Europeans across the Southern Alps and its perilous, glacier environments was much more involved than European records of encountering glaciers in Aotearoa would have one believe. Indigenous ways of knowing the environment also helped shape the way European settlers, surveyors and scientists first came in contact with New Zealand's glacier environment.

Chapter two focuses on the early circulation of European scientific glacier ideas, theories and ideologies that helped shaped the way New Zealand glaciers were studied. I trace the way European ideas such as the study of glacier motion, erratics and ancient glaciations influenced the

personal debates and discussions between prominent New Zealand scientists Ferdinand von Hochstetter, Julius von Haast and James Hector. Furthermore, I also consider the role the *Transactions and Proceedings of the New Zealand Institute* played in advancing the circulation of glacier knowledge both inside and outside Aotearoa.

Chapter 3 looks at the knowledge of glaciers distributed in popular print during the nineteenth century. By analysing the influence Romantic ideas of the natural environment had on newspaper reports, tourism and travel writing, I argue that Europeans engaging with glaciers typically viewed the frozen environment through a sublime lens. At its heart, the sublime is a dualistic response that saw the grandeur of nature as both immensely terrifying but capable of evoking great awe. In New Zealand, the sublime constantly reflected the way glaciers were presented to the public in a combination of both written and visual media.

Chapter 4 questions the way glaciers were projected by early nineteenth century artists, cartographers and photographers. The visualisation of glaciers during the nineteenth century acted as a medium to express thoughts of the sublime that became more easily accessible to the public through advancing print technology. I, therefore, argue that the glaciers expressed in landscape art, maps and photographs contained elements of science and Romanticism at their core. As a result, the images of glaciers conveyed different types of knowledge to different types of viewers.

Overall, this thesis considers the way glacier knowledge was generated by the scientific elite and public in Aotearoa. The purpose of this cryo-history is to represent a wider and more accurate collation of Aotearoa glacier history during the early contact Europeans had with the phenomenon. Furthermore, the thesis also analyses the way the public was influenced to think about the glacier environment and created their own types of knowledge. Whether this be through the topic of science, cartography, tourism, art, newspapers, print or personal recollections.

Chapter 1:

Nineteenth Century Exploration of the Southern Alps' Glacier Landscape

Observation of and physical interaction with the mountains were central to the development of glacier knowledge in nineteenth century Aotearoa, then spread through various national and transnational circuits. From an environmental perspective Kā Tiritiri o te Moana/ the Southern Alps' and its three thousand glaciers played a key role in shaping Te Waipounamu's high alpine terrain.¹ Māori interaction with New Zealand glaciers before European arrival showed incredible ingenuity in surviving the elements, relying on high-altitude resource harvesting, searching for viable pathways across the five-hundred-kilometre mountain-divide and establishing trade routes with Te Tai Poutini/West Coast iwi. The nineteenth century arrival of Europeans in Aotearoa, on the other hand, promoted a more bureaucratic approach to exploring the local topography, colonial boundaries and large tracks of land needed for pioneer sheep runs. This chapter interrogates the intersection of glacier mātauranga (traditional knowledge) and nineteenth century Pākehā exploration of the Southern Alps that circulated from a European viewpoint.

Mātauranga, as defined by Linda Tuhiwai Smith (Ngāti Awa, Ngāti Porou), is a generational accumulation of knowledge that makes sense of the natural world through Māori world views and philosophy.² As part of the “seascape, landscape and mindscape that has informed and constituted the legacies of language,” Smith also considers mātauranga as “the storying of peoples and the understandings of human endeavour and survival.”³ The glacier mātauranga referred to in this chapter is linked to the accumulation of Māori knowledge about the glaciated environment

¹ Glacier statistic taken from Trevor Chinn's inventory study of New Zealand's glaciers in 2001. A later iteration of his research (2014) made note that a third of the permanent snow and ice of the Southern Alps have disappeared. The 170 km³ ice extent of the Southern Alps in 1890 had been reduced to a lower 36.1 km³. See: Trevor Chinn, Jim Salinger and Blair Fitzharris, 'New Zealand's Southern Alps have lost a third of their ice', *The Conversation*, 29 July 2014, <<https://theconversation.com/new-zealands-southern-alps-have-lost-a-third-of-their-ice-28916>> [accessed 7 February 2024]; Trevor Chinn, 'Distribution of the Glacial Water Resources of New Zealand', *Journal of Hydrology New Zealand*, 40.2 (2001), 139–87 <<https://www.jstor.org/stable/43922047>> [accessed 9 September 2024] (p. 151); Sean J. Fitzsimons and Heinz Veit, 'Geology and Geomorphology of the European Alps and the Southern Alps of New Zealand: A Comparison', *Mountain Research and Development*, 21.4 (2001), 340–49 <<https://www.jstor.org/stable/3674295>> [accessed 2 August 2024] (p. 345).

² Linda Tuhiwai Smith and others, 'Indigenous Knowledge, Methodology and Mayhem: What Is the Role of Methodology in Producing Indigenous Insights? A Discussion from Mātauranga Māori', *Knowledge Cultures*, 4.3 (2016), 131–156 <<https://www.proquest.com/scholarly-journals/feature-article-indigenous-knowledge-methodology/docview/1906047044/se-2>> [accessed 9 September 2024] (p. 132).

³ Smith, p. 132.

through pūrākau (stories), weather kupu (words) and material artifacts used to survive the inhospitable alpine terrain.

In answer to the thesis' main question that asks how the circulation of glacier knowledge was shaped by trends in European thought about the glacier environment, I argue that even among the Pākehā dominant narrative of New Zealand glacier exploration it is possible to trace three types of cross-cultural moments of exchange between glacier mātauranga and European methods of studying the environment. One studies the integration of mātauranga Māori that Pākehā used when exploring Aotearoa's frozen environment, the second traces the way mātauranga Māori was documented for later study and the third analyses the way Europeans understated or excluded their reliance on Indigenous forms of knowledge when recording their physical exploration of the Southern Alps. The best way to analyse these intersections is by tracing the history of Māori guides that were employed by surveyors, prospectors, travellers and pioneers.

Kā Tiritiri o te Moana, the Southern Alps, according to the *New Zealand: Earth's Mythical Islands* 2016 documentary, is a "fractured, high-altitude, frozen kingdom" that is the "most inhospitable of all New Zealand."⁴ The mid-nineteenth century demographic increase of Te Waipounamu's European population, as a result of the New Zealand Company's efforts to colonise the South Island, allowed geographical expeditions, perilous scientific studies and European survey mapping to prosper.⁵ I also consider that certain glacier mātauranga were used by different people for different ends. For example, the first section of this chapter analyses the letters West Coast surveyor Gerhard Mueller exchanged with his wife, Bannie, in 1865.⁶ Referencing the lifelong friendship Mueller cultivated with Kere Tutoko (Ngāi Tahu), the former's more informal way of writing captured many of the mātauranga Kere relied on to guide them up the West Coast.

Section 1.2 traces the glacier mātauranga recorded by James Herries Beattie (1881-1972) in the early twentieth century. Beattie's meticulous interviews with Ngāi Tahu kaumatua (tribal elders) provide significant insight into the way South Island Māori studied weather patterns, recorded their knowledge of the land and thrived in the hostile glacier environment before European arrival. Nic Low's current-day journey that traces the pathways his Ngāi Tahu ancestors walked across the Southern Alps, similarly, provides valuable insight into some of the lesser-known mātauranga not recorded by Beattie.

⁴ When the documentary was broadcast in September 2024 in New Zealand, it was under the title *Wild New Zealand*. See: 'Episode 2: Wild Extremes', *New Zealand: Earth's Mythical Islands*, BBC Earth, 7 October 2024.

⁵ James Beattie, 'Fashioning a Future. Part I', *International Review of Environmental History*, 6.2 (2020), 75–102 <<https://search.informit.org/doi/abs/10.3316/informit.584404529168637>> (p. 80-81).

⁶ Gerhard Mueller, *My Dear Bannie: Gerhard Mueller's Letters from the West Coast 1865 – 1866*, ed. by Mildred Violet Muller (Christchurch: The Pegasus Press, 1958) p. 86.

Section 1.3, lastly, looks at the more formal relationship of study and data collection scientists such as Julius von Haast had with New Zealand’s glaciers. Haast’s 1861, 1862 and 1863 geological expeditions in the Southern Alps, for example, was written from a mostly scientific point of view. However, in the periphery of his text there are several, small moments of reliance on glacier mātauranga to navigate the South Island’s environment. The most acknowledged of which, was the method Māori relied on to cross fast flowing rivers with the assistance of a pole.

Overall, this chapter considers how glacier mātauranga influenced some of the early European explorations of the Southern Alps. As a result, a more comprehensive cryo-history of New Zealand’s Southern Alps includes not only the way physical interaction was linked with glaciers in the nineteenth century but how Europeans and Māori used and combined their own methods to navigate the frozen alpine environment.

1.1 Te Waipounamu Māori Guides

A ‘guide’ according to the *Oxford English Dictionary* is someone who “leads or shows the way, especially to a traveller in a strange country.”⁷ This definition further highlights that guides conduct “travellers or tourists (e.g. over a mountain, through a forest, or over a city or building)” and illustrates objects of interest to their clients.⁸ Nineteenth century Māori guides in the South Island, as a result, were often hired by European explorers, travellers and tourists to lead them over unknown landscapes and how to survive Kā Tiritiri o te Moana’s ‘wilderness’.⁹ Giselle Byrnes, in contrast, notes that the agency Māori enacted when sharing the knowledge they refined over many generations is considerably less acknowledged by current scholars.¹⁰

She writes, instead, that nineteenth century explorers, settlers and surveyors often “demanded local knowledge not as it came, structured in indigenous ways of seeing, but broken

⁷ *Oxford English Dictionary* (Oxford: Oxford University Press, 2024), <https://www.oed.com/dictionary/guide_n?tab=meaning_and_use#2304997> [accessed 3 October 2024] s.v. guide, 1.a., n.

⁸ OED, s.v. guide, 1.a., n.

⁹ Wilderness, in this sense, is a nineteenth-century concept that European viewed untamed places of nature through the “savagery of the human and non- human inhabitants.” It is a landscape that would eventually be defined as ‘sublime’ and be juxtaposed against the more mathematical and scientific ideals of the Enlightenment (a point I will further extrapolate in Chapter 3 and 4 of this thesis). See: Mike Boyes and Susan Houge Mackenzie, ‘Concepts of the wilderness experience and adventure mountaineering tourism’, *Mountaineering Tourism*, ed. by Ghazali Musa, James Higham and Anna Thompson- Carr (London: Routledge, 2015), pp. 66 – 84 (p. 68), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3569264>> [accessed 4 September 2024].

¹⁰ Giselle Byrnes, *Boundary Markers: Land Surveying and the Colonisation of New Zealand* (Wellington: Bridget Williams Books, 2001), p. 94, Bridget Williams New Zealand History Collection <<http://dx.doi.org/10.7810/9781877242908>> [accessed 10 September 2024]

down into data that they could then fit into their own geographical scheme.”¹¹ Explorers would actively reduce the information they received from its conceptual Māori structures and appropriate small nodes of mātauranga for themselves. Consequently, Māori (whether they be guides, hosts or assistants) would often deliberately collate and share only the knowledge they *wanted* their European counterparts to know.¹²

Indigenous people played numerous roles beyond just conducting European explorers over unknown lands. As Micheal Bravo notes “guides were far more complex figures.”¹³ Their exchange of knowledge with outsiders often included playing host to travelling parties, being leaders out in the field and active negotiators between different tribes.¹⁴ Whether they were navigators, interpreters or ethnographers for their own culture, Māori guides became an invaluable asset for Europeans to employ. Several noteworthy encounters, both positive and negative for example, were recorded between Ngāi Tahu and foreign explorers.

One of the earlier exchanges of mātauranga in the South Island took place in Te Manahuna/the Mackenzie Basin on the flooded plains of the snow-fed Waitaki. A traditional tawhito (travel route) that allowed South Island Māori access to the interior of Te Waipounamu, Te Manahuna valley was seasonally fortified with vital resources like tuna (eel) and weka (Māori hen). It was here that Edward Shortland recorded the placement of inland settlements, trails, place names and various oral histories of the South Island from Te Huruheru.¹⁵ Te Huruheru shared some of his geographical and environmental knowledge with Shortland as they waited for a mokihi (flax raft) to ferry the explorer and his party across the flooded Waitaki.¹⁶ The hand drawn map Te Huruheru created for Shortland also contained the history and placement of Tioripatea pass that Te Pūoho (Ngāti Tama and Ngāti Toa) used in the 1836 campaign to claim the lucrative trade route between Te Ara-a-Kiwa (Foveaux Strait) and Murihiku (Southland).¹⁷

¹¹ Byrnes, p. 94.

¹² Byrnes, p. 94.

¹³ Note: Tense change in quoted sentence [present to past]. Micheal Bravo, ‘Indigenous Voyaging, Authorship, and Discovery’, in *Curious Encounters: Voyaging, Collecting, and Making Knowledge in the Long Eighteenth Century*, ed. by Adraina Craciun and Mary Terrall (Toronto: University of Toronto Press, 2019) pp. 71-112 (p. 91), JSTOR <<https://www.jstor.org/stable/10.3138/j.ctvbj7gc7>> [accessed 13 September 2024].

¹⁴ Bravo, p. 91.

¹⁵ As the Rangatira of Te Puna-a-Marū pā, Te Huruheru was a distinguished Ngāi Tahu leader who fought against Te Rauparaha in 1833. He was also in charge of the eeling camp near the mouth of the Waihao river north of the pā. See: Te Rūnanga o Ngāi Tahu, ‘Waitaki – A Food Gathering Highway’, *Kā Huru Manu – Ngāi Tahu Atlas* (2023) <<https://kahurumanu.co.nz/ka-ara-tawhito/waitaki/>> [accessed 28 September 2024]; Atholl Anderson, ‘Te Huruheru’, in *Te Ara – The Encyclopaedia of New Zealand* <<https://teara.govt.nz/en/biographies/1t37/te-huruheru>> [accessed 20 May 2025].

¹⁶ Te Rūnanga o Ngāi Tahu.

¹⁷ Te Pūoho, also known as Te Pūoho-o-te-rangi, launched his bid to lay claim to Kāi Tahu land by subduing village after village and moving south to north like scaling a fish. He would eventually be defeated

Te Pūoho-o-te-rangi, the Rangatira of Ngāti Tama and Ngāti Toa, launched a war campaign to subdue Ngāi Tahu villages one by one, moving from south to north like scaling a fish.¹⁸ Although Te Pūoho was defeated by Ngāi Tahu leader Te Tūhawaiki after reaching the Matura Valley north of Gore, the passage he walked over the Southern Alps was well recorded and sought after by European travellers.¹⁹ Te Huruhuru's record of the passage would later convince Julius von Haast to search for a similar path in the same location during his 1863 geological survey of the Mackenzie basin.

Another well-remembered Māori and European encounter across the Southern Alps took place between the surveyor, Thomas Brunner, and his guide, Kehu (Ngāti Tūmatakōkiri). Kehu's background as a former mōkai (slave) who guided Poutini Ngāi Tahu up the coast during seasonal migrations, allowed him to not only guide Brunner across Kā Tiritiri o te Moana's hostile environment but later save the surveyor's life.²⁰ In December 1846 when Kehu and Pitewate, another guide, accompanied Brunner on his journey to map the West Coast, Brunner ended up suffering a debilitating stroke a few months into the expedition.²¹ Pitewate believed Brunner was "as good as dead" and abandoned the party to return home.²² Kehu, on the other hand, stayed with

by Kāi Tahu leader Te Tūhawaiki after they reached Matura Valley on the other side of Gore. Shortland, on the other hand, spent a total of six days in Te Huruhuru's presence, referring to his host as a "man of singularly pleasing manners and address." See: Atholl Anderson, 'Edward Shortland', in *Te Ara – The Encyclopaedia of New Zealand* <<https://teara.govt.nz/en/biographies/1s11/shortland-edward>> [accessed 11 October 2024]; Te Rūnanga o Ngāi Tahu, Te Karaka, p. 28; Atholl Anderson, 'Te Pūoho-o-te-rangi', in *Te Ara - the Encyclopaedia of New Zealand*, <<https://teara.govt.nz/en/biographies/1t59/te-puoho-o-te-rangi>> [accessed 16 January 2025]; William Anderson Taylor, *Lore and History of the South Island Māori* (Christchurch: Bascands Limited, 1950) p. 13; Ross Calman and Tamihana Te Rauparaha, *He Pukapuka Tataku i Nga Mahi a Te Rauparaha Nui / A Record of the Life of the Great Te Rauparaha*, (Auckland: Auckland University Press, 2020), p. 257, ProQuest Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=6407713>> [accessed 7 October 2024]; 'Kā ara Tūpuna', Te Karaka, 61 (2014), 28-29 <<https://media.kareao.nz/images/Public/Text/2018-0539-NTCTK-061.pdf>> [accessed 10 October 2024] (p. 28); Steven Oliver, 'Te Rauparaha', in *Te Ara - The Encyclopaedia of New Zealand*, <<https://teara.govt.nz/en/biographies/1t74/te-rauparaha>> [accessed 7 October 2024]; Heinrich Ferdinand von Haast, *The life and times of Sir Julius von Haast* (Wellington: the Author, 1948) p. 275.

¹⁸ Ross Calman and Tamihana Te Rauparaha, *He Pukapuka Tataku i Nga Mahi a Te Rauparaha Nui / A Record of the Life of the Great Te Rauparaha*, (Auckland: Auckland University Press, 2020), p. 257, ProQuest Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=6407713>> [accessed 7 October 2024]; Anderson, 'Te Pūoho-o-te-rangi'; Oliver.

¹⁹ Heinrich Ferdinand von Haast, *The life and times of Sir Julius von Haast* (Wellington: the Author, 1948) p. 275; Atholl Anderson, 'Te Pūoho-o-te-rangi'; Calman and Te Rauparaha, p. 275; Taylor, p. 13.

²⁰ Emily Host, *Thomas Brunner: His Life and Great Journeys*, ed. by Vivienne Nelson (Nelson: Nikau Press, 2006), p. 58.

²¹ John McCrystal, *Singing the Trail: The Story of New Zealand Mapping* (Auckland: Allen & Unwin, 2020), p. 162, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5972405>> [accessed 17 September 2024].

²² McCrystal, p. 162.

Brunner until they were able to return to Nelson.²³ By successfully completing a journey that took over five hundred and fifty days there was no question that Kehu's knowledge of the Southern Alps' environment was central to their survival. Brunner would eventually immortalise Kehu as his friend and guide by naming a peak in the Travers Range after him.²⁴

It is slightly more difficult to trace the way Māori guides brought European explorers in contact with the Southern Alps' glacial environment. What evidence there is, according to William Anderson Taylor and Barry Brailsford, can be related to pounamu (greenstone) implements found at the head of Sealy Pass connected to the Godley Glacier.²⁵ Nic Low, similarly, argued that before European arrival Ngāi Tahu came in contact with glaciers by travelling across the Southern Alps during winter and living in sub-zero temperatures during their seasonal harvests high in the mountains.²⁶ Māori would have been dressed in layers of whītau (finely woven flax) garments, dog skin cloaks, flax capes and pārekareka (woven gaiters) stuffed with insulating grass to protect them from the freezing climate.²⁷ They would also carry long tokotoko (wooden staffs) with sharpened pītauau (tips) that served as a hiking pole and pounamu toki (adze) to cut steps into the glacier ice.²⁸

The knowledge Kerei Tūtoko (Te Tai Poutini) acted on as a guide for Gerhard Mueller in 1865 would prove invaluable as they navigated the West Coast environment shaped by glaciers. Kerei was a descendent of one of Hinetamatea's two sons, the three central figures that discovered Noti Hinetamatea (Copland Pass) between Aoraki/Mount Cook and Westland. When Hinetamatea and her two sons, Tātāwhākā and Marupeka, travelled up the Karangarua River they spotted a tui flying down from Mount Aoraki to eat a red totara berry.²⁹ They believed the land the tui hailed from was prosperous and set out to reach its location by crossing the Southern Alps.³⁰ Although Hinetamatea passed away on the journey and was buried in the shadow of Mount Aoraki, her two sons went on to discover a settlement where the land was rich with kiwi, weka and kakapo.³¹ By examining Hinetamatea's pass at a later date, it is possible to conclude that travellers, well into the twentieth century, came into direct contact with the Hooker Glacier.³² Both Māori and European explorers following Hinetamatea path were forced to navigate the glacier's hazardous terrain.

²³ McCrystal, p. 162 -163.

²⁴ Host, p. 61.

²⁵ Brailsford, Barry, *Greenstone Trails: The Māori and Pounamu* (Hamilton: Stone Print Press, 1996), p.162; Taylor, p. 93.

²⁶ Nic Low, *Uprising* (Vicotria: Text Publishing Company, 2021) p. 188-189.

²⁷ Low, p. 188-189.

²⁸ Low, p. 189.

²⁹ Low, p. 177.

³⁰ Low, p. 177.

³¹ Low, p. 176-178, 196.

³² Low, p. 198.

As a descendent of Hinetamatea, Kerei also walked from the West Coast to Māwhera (Greymouth), over the Southern Alps, inland rivers and plains Kaiapoi as a rite of passage in 1835.³³ A rite of passage that Kerei's son, too, would walk with his father and Mueller's party in 1865. According to Mueller, his West Coast travelling party consisted of three Māori (Kerei, Bob and Jacob), Jacob's wife, Kerei's twelve-year-old son and four European settlers.³⁴ Mueller's letters to his wife, at the time, highlight the invaluable friendship and generous hospitality Kerei provided during their several-month-long survey journey along the Tai Poutini coast.

The mātauranga Kerei relied on regarding glaciers, snow and ice, was shared in the form of crossing icy snow-fed rivers, making flax mats to provide a stable surface to knead bread, sourcing tuna and weka from the wild and building temporary shelters to shield the party from the elements.³⁵ When leading Mueller's party across the Karangarua River in December 1865, the same river his ancestors transversed, Kerei relied on the 'pole method' to navigate the rapids.³⁶ This method, as shown in Fig. 1, is carried out by the party entering the river perpendicular to the current with a pole stretched between evenly spaced party members.³⁷ Mueller, in a letter posted from Ōkārito in December, explained that when using the Māori 'pole method' to cross dangerous rivers "certain things must have attention paid to them."³⁸ First, the pole had to be kept breast high. Second, the party needed to walk with small steps and keep in direct line of the current. Third, the leader of the pack had to take on the brunt of the rapidly moving water.³⁹



Fig. 1: Artist Unknown, *Crossing the River Taramakau*, woodblock print [newspaper illustration], 1865, from *Illustrated London News*, vol 47. No Known Copyright – copyright expired 1904.

³³ The total of the roundtrip Kerei took would have been more than thousand kilometres. Low, p. 191.

³⁴ Mueller, p. 86.

³⁵ Mueller, p. 87, 114, 122.

³⁶ Mueller, p. 88.

³⁷ 'Crossing the Taramakau', woodblock print, *Illustrated London News*, 1865, Vol. 47, p.352.

³⁸ Mueller, p. 88.

³⁹ Mueller, p. 88.

Mueller also mentioned that crossing other glacier-fed rivers such as the Waihao (cited as “one of the very worst rivers of the West Coast”) could only be done when the water was lower than two-and-a-half feet and a knowledgeable pilot navigated the party over the tributaries.⁴⁰ The Waihao, for example, regularly overflows from the influx of glacial meltwater that runs down from Kā Roimata o Hine Hukatere/the Franz Josef Glacier. The disturbed sediment at the bottom of the river bed then dyes the water a milky white that makes it difficult to see the bottom of the river to know where to cross.⁴¹

Another element of knowledge Kerei relied on to guide Mueller and his party across the West Coast was traditional manaakitanga (hospitality). According to Soren Larsen and Jay Johnson, manaakitanga is “the process of encouraging the spiritual force of others toward life affirming ways.”⁴² It is a virtue that takes everyone at face-value, regardless of religion, tribe, nationality or colour, and shows them equal generosity and welcome.⁴³ Kerei’s actions, at the time, went beyond just a guide. He also assisted Mueller in snaring tuna (eels) for abundant suppers and providing Manuka tea when the party’s pantry supplies ran low. Kerei would also build a temporary wharepuni (sleeping hut) for his employer when a flood made it impossible to use canvas tents.⁴⁴ During the same year, Mueller also met Te Koeti Tūranga (Poutini Ngāi Tahu and Kāti Māmoe), an important figure and father to three of Aotearoa’s most accomplished Māori mountaineers.⁴⁵

One of Te Koeti Tūranga’s sons, Tane Dan Te Koeti, showed an affinity for crossing vast stretches of ice. After Edward Fitzgerald and Mattius Zurbriggen, Fitzgerald’s Swiss guide, met the younger Te Koeti at Andrew Scott’s sheep run in 1895, they asked him to join them on the next part of their journey to ascend Mount Cook.⁴⁶ Travelling from the Karangarua River to Gillespies Beach and up the Fox Glacier, Fitzgerald was the first to note Te Koeti’s ability to walk across the ice.⁴⁷ Although Te Koeti told Fitzgerald that this was his first journey across a glacier, his experience as an alpine shepherd would have made him familiar with snow-covered terrain.⁴⁸ Te Koeti’s brother Pahikore Te Koeti Tūranga (1883-1964) also helped guide Europeans across

⁴⁰ Mueller, p. 91.

⁴¹ Mueller, p. 91

⁴² Soren Larsen and Jay T. Johnson, ‘Manaakitanga’, in *Being Together in Place, Indigenous Coexistence in a More Than Human World* (Chicago: University of Minnesota Press, 2017), pp. 158–83 (p.159, 177), JSTOR <<https://doi.org/10.5749/j.ctt1pwt81r>> [accessed 12 January 2025].

⁴³ Larsen and Johnson, pp. 159, 177.

⁴⁴ Mueller, pp. 114-115.

⁴⁵ Te Koeti Tūranga (1802-1892) was married to Kerei’s daughter, Ripeka Patiere (1840-1909), and a total of eleven children from their marriage. See: Bob McKerrow, ‘Māori Mountaineers of South Westland’, in *To the Mountains*, ed by. Laurence Fearnley and Paul Hersey (Dunedin: Otago University Press, 2018), pp.115-124 (p.116).

⁴⁶ McKerrow, p. 116.

⁴⁷ McKerrow, pp.116-117.

⁴⁸ McKerrow, p. 117.

Mount Cook's glacier terrain. Pahikore would lead Annie Lindon and her husband up the Tasman Glacier Dome in 1905.⁴⁹ He would also cross Noti Hinetamatea in a speedy fifteen hours, help build the Hermitage and work as an experienced guide in the Southern Alps. The achievements of Kerei and the Te Koeti brothers undoubtedly show that Māori had considerable familiarity with Kā Tiritiri o te Moana's glacier environment and knew how to lead others safely across the alpine terrain. The glimpses of knowledge Māori guides showed their European counterparts would also become crucial to helping foreigners transverse and survive Aotearoa's frozen landscape.

The function of Māori guides was not just one of conducting outsiders over foreign land. They also lived, helped cook, provided information and navigated treacherous rivers by their employer's side. Indigenous guides had a clear and complex multi-faceted role as Bravo claimed, relaying their knowledge through both explicit and implicit means. The glacier mātauranga that Ngāi Tahu refined for many generations, however, is yet to be discussed. In the next section, I analyse the way physical interaction and observation of the environment shaped Māori knowledge of glaciers.

1.2 Glacier Mātauranga

By the time Te Waipounamu's founding iwi Hawea, Te Rapuwai and Waitaha laid the roots of their whakapapa (genealogy) on the land by naming the coastal and mountain regions during the thirteenth and fourteenth centuries, the massive spectres of ancient glaciers were already part of Aotearoa landscape they encountered.⁵⁰ The Little Ice Age, a climate event that prompted an even more notable advance in New Zealand's glaciers from the fourteenth to nineteenth centuries, would have magnified the size and scope of the frozen environment Hawea, Te Rapuwai and Waitaha encountered.⁵¹ Therefore, some of the Southern Alps' glaciers before European

⁴⁹ McKerrow, p. 117.

⁵⁰ When it comes to the Pepeha of Kāi Tahu, the Hawea was the first tribe to settle the South Island in the Kapakitia canoe. The second tribe who populated the area around Lake Kaitangata was Te Rapuwai and the Waitaha, who settled the South Island (1477-1577) had Pa at Lake Te Anau, Wakatipu and Oamaru. They arrived on Te Waka a Raki. Karaitiana Taiuru, 'Ngāi Tahu Pepeha: Ancient Iwi', *Ngāi Tahu Pepeha* <<https://ngaitahu.maori.nz/ancient-iwi/#:~:text=Waitaha%2FTe%20Kapuwai,Anau%2C%20Lake%20Wakatipu%20and%20Oamaru.>> [accessed 12 August 2024]; Tipene O'Regan, 'Old Myths and New Politics: Some Contemporary Uses of Traditional History', *New Zealand Journal of History*, 26.1 (1992) 5-27 <<https://muse.jhu.edu/article/872213/pdf>> [accessed 7 June 2024] (p. 6).

⁵¹ Climate fluctuations as a result of the Little Ice Age (LIA), occurring in the Northern Hemisphere from the sixteenth to nineteenth century, show a distinctly different pattern in New Zealand than Europe. Kirsta Mckinzey's study of Ka Roimata o Hine Hukatere/the Franz Josef Glacier speleothem record suggests that glaciers such as Haupapa/Tasman Glacier, Cameron Glacier and Franz Josef Glacier reached their terminal maximums a century or two earlier than glaciers situated on the other side of the equator. This places their Little Ice Age maximums in and around the era of Polynesian voyagers reaching New Zealand shores. Krista M. McKinzey, 'The Little Ice Age Glacial Record at Franz Josef Glacier, New Zealand', in *Glacier Science and Environmental Change*, ed. by Peter G Knight (New Jersey: John Wiley & Sons, Ltd, 2006), pp. 272-74, Wiley Online Library

arrival in the late eighteenth century would have already reached their glacier maximum and started retreating.

Early South Island Māori hailed from East Polynesia's tropical climate. The humid weather and lush environment they were familiar with would have been completely different to the frozen winters and icy terrain they encountered in the Southern Alps. Nonetheless, Ngāi Tahu collated an extensive repertoire of Te Reo kupu and generations of refined snow, glacier and ice mātauranga that were remarkably in-depth. In contrast to Māori, Lynley Hargreaves notes that Europeans only officially began using the globalised word 'glacier' from 1744.⁵² Because South Island Māori had such detailed knowledge regarding the Southern Alps' geography and how to navigate the mountain chain's wintery elements, they were "indispensable guides for European explorers."⁵³ Their vast understanding of the South Island's glacier landscapes added immense value to the mātauranga they exchanged with their European counterparts.

When James Herries Beattie (1881-1972) documented numerous oral histories about Māori life in Te Waipounamu during the late nineteenth century from Ngāi Tahu kaumātua (elders), he unravelled not only the important nomenclature of the land but also the meaning of Te Reo words.⁵⁴ From there, he also considered the use of material objects, climate phenomena and generations of careful observation on Kā Tiritiri o te Moana. Beattie's work may have taken place in the early twentieth century, just outside the time period of this thesis; however, the knowledge he collated included both Māori-specific definitions and encounters with glaciers before European arrival. His collection of mātauranga remains invaluable in measuring the depth of glacier knowledge Ngāi Tahu kaumātua were willing to share with their European counterparts. Below, as tabulated, is the glacier kupu and definitions Beattie collected over the course of his career.

<<https://doi.org/10.1002/9780470750636.ch54>> [accessed 12 May 2024] (p. 272); Hargreaves; p. 11.

⁵² Hargreaves, p. 11.

⁵³ Lee Davidson, 'Seeing Differently: Understanding Pakeha Constructions of Mountain Landscapes in Aotearoa', *Public History Review*, 29 (2022), 96 - 113 <<https://doi.org/10.5130/phrj.v29i0.8199>> (p. 99).

⁵⁴ Barry Brailsford, *Greenstone Trails: The Māori and Pounamu* (Hamilton: Stone Print Press, 1996), p. 1,2; Hargreaves, p. 23; Herries Beattie, 'Art. Xiii.—Nature-Lore of the Southern Māori', *Transactions and Proceedings of the Royal Society of New Zealand*, 52 (1920); Herries Beattie, *Traditional Lifeways of the Southern Māori* (Dunedin: University of Otago Press, 1994b); Herries Beattie, *Māori lore of lake, alp and fiord : folk lore, fairy tales, traditions and place names of the scenic wonderland of the South Island* (Christchurch: Cadsonbury Publications, 1994a).

Kupu (Te Reo)	Translation
huka	snow
hukahoro	avalanche
hukakapu	snowflakes
hukamania	snow-slide
hukamaro	hail
hukanehunehu	fine snow
hukapapa	snowfield
hukapo	glacier
kopaka	frost
kipakanui	ice
patahuka	hail
punuhunehu	fine driving snow
waihuka	solid water
whenuahuka	perpetual snow

The word ‘huka’ features heavily as a prefix for weather elements and natural phenomena related to glaciers. ‘Huka’ is defined by Te Aka (the online Māori dictionary) as “snow, foam, froth” and a generalisation of any form of white precipitation.⁵⁵ The root of the word feeds into a more physical description of the mountains’ frozen environment that different iwi encountered. Glacier kupu represent the way environmental snow and ice events became part of Māori language and from there developed their knowledge by physically coming into contact with the glacier environment.

Physically navigating the frozen environment was slightly trickier, however. For example, the glacier pass that existed between Lake Tekapō and Whataroa, transversing many kilometres of the icy Whimaihoa (Godley River), could only be safely crossed by observing which side of the mountain peak was foggy.⁵⁶ The unnamed kaumātua that recited the knowledge for Beattie stated that “fog on one side meant you could get through; fog on the other side warned you not to attempt to cross.”⁵⁷ A similar story advises how to survive on Aoraki with the sudden onset of a blizzard.

⁵⁵ John C. Moorfield, *Te Aka – Māori Dictionary*, (London: Longman/Pearson Education New Zealand, 2011),

<<https://www.maoridictionary.co.nz/search?idiom=&phrase=&proverb=&loan=&histLoanWords=&keywords=huka+>> [accessed 4 August 2024] s.v. huka, n; Brailsford, p. 2.

⁵⁶ Beattie 1994b, p. 68; Te Rūnanga o Ngāi Tahu, ‘Whataroa – Rangitata’, *Kā Huru Manu – Ngāi Tahu Atlas* (2023) <<https://kahurumanu.co.nz/atlas>> [accessed 16 September 2024].

⁵⁷ Beattie 1994b, p. 68.

The interviewee states that digging a hole in the snow and crouching down to stop breathing in the punuhunehu (fine driving snow) would prevent suffocation.⁵⁸ A warning the kaumātua claimed would have prevented the death of several Europeans determined to scale Mount Cook.⁵⁹

There are a few crucial glacier pūrākau, still recounted today, that convey the dangers of the snow and ice in the Southern Alps. The nomenclature behind Kā Roimata o Hine Hukatere (the tears of Hine Hukatere) or the Franz Josef Glacier, for example, tells the story of Hine Hukatere who loved climbing mountains. One day, when taking Tauwe (her lover) with her to explore the snowclad regions of the Waiho river, Tauwe slipped from a great height and plummeted to his death.⁶⁰ The story goes that Kā Roimata o Hine Hukatere was created from the memorialised tears Hine Hukatere cried over her lover's body. Ranginui, the atua (deity) of the sky, was so moved by Hine Hukatere's sorrow that he froze her tears as a permanent commemoration to her lover.⁶¹ The tragedy of Tauwe's death highlights the dangers that surround glaciers as well as the rich oral history Māori wove about the natural environment.

Nevertheless, the circulation of certain mātauranga outside the iwi would have been highly restricted. According to Peter Holland, certain forms of mātauranga could only be “retained by carefully selected, highly trained individuals on behalf of whānau and hapū, and orally transmitted to those with the right to have it.”⁶² The arrival of settlers in the late eighteenth century would not have changed the laws regarding the circulation of that knowledge. Furthermore, King, Skipper and Tawhai assert that environmental mātauranga specifically take on “many forms and expressions, based on different tribal histories, local geographies, norms and practices.”⁶³ Indigenous environmental knowledge in Aotearoa is, therefore, formed “from an enduring and close association with the land and its resources.”⁶⁴ It is only through the close spiritual relationship Māori developed with the natural world that the knowledge they collated could be

⁵⁸ Beattie, 1994b, p. 80.

⁵⁹ Beattie, 1994b, p. 80; Hargreaves, p. 23.

⁶⁰ Paul Madgwick, *Aotea: A History of the South Westland Māori* (Greymouth: Greymouth Evening Star, 1992) p. 65.

⁶¹ Hargreaves, p. 21; Madgwick, p.65.

⁶² Peter Holland, *Home in the Howling Wilderness: Settlers and the Environment in Southern New Zealand* (Auckland: Auckland University Press, 2013), pp. 16-18 (p. 16), ProQuest eBooks Central <<https://ebookcentral-proquest-com.ezproxy.waikato.ac.nz/lib/waikato/detail.action?pq-origsite=primo&docID=1531118>> [accessed 20 March 2024]; James Cook, *Captain Cook's Journal During the First Voyage Round the World* (London: Elliot Stock, 1893) Gutenberg Project <<https://www.gutenberg.org/files/8106/8106-h/8106-h.htm>> [accessed 11 August 2024]; D. Hikuroa, 'Mātauranga Māori—the Ūkaipō of Knowledge in New Zealand', *Journal of the Royal Society of New Zealand*, 47.1 (2017), pp. 5–10 <<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,sso&db=a9h&AN=121664251&site=ehost-live&custid=s4804380>> (p. 5,6).

⁶³ D.N.T. King, A. Skipper and W.B. Tawhai, 'Māori environmental knowledge of local weather and climate change in Aotearoa – New Zealand', *Climate Change*, 90.4 (2008), 385-409 <<https://doi.org/10.1007/s10584-007-9372-y>> (p. 387).

⁶⁴ King, Skipper and Tawhai, p. 387.

incorporated into the traditional practices and histories of the whenua (land) that passed down the generations.

The above information Beattie collected from Ngāi Tahu elders, therefore, is only partial. As Peter Holland argues, the lack of environmental knowledge shared between Māori and Pākehā in the nineteenth century is because mātauranga Māori had a lower standing than Western science at the time.⁶⁵ The influx of scientists, explorers and settlers in Aotearoa showed a preference for following their own methods of analyses, observation and communication.⁶⁶ This way of thinking, Tony Ballantyne argues, was a direct result of Ngāi Tahu knowledge already recorded in printed travel narratives, charts, maps and government documents.⁶⁷ The creation of such texts rendered “actual Ngāi Tahu people marginal” and disembodied Māori knowledge by “allowing it to circulate quickly and cheaply beyond the context of its initial transmission.”⁶⁸ Furthermore, the influx of European migrants in Te Waipounamu during the 1850s caused a demographic shift where Europeans began outnumbering Māori.

Colonists believed that claiming and creating new knowledge was an essential part of sculpting an effective government.⁶⁹ The settlers’ new world, then, was to be “structured around the routines of bureaucratic practice, statistical collation, and a boundless enthusiasm for the power of the printed word”, as Ballantyne writes.⁷⁰ A fervent exploration of the interior and mountains of Te Waipounamu would later become a vital interest at the head of Aotearoa’s early scientific expeditions. Yet to be mentioned is the glacier mātauranga some explorers displaced and excluded in lieu of foregrounding the value of imperial science. In the next section, I analyse Julius von Haast’s fervent exploration of Te Waipounamu’s glacier environment and how he rarely acknowledged the mātauranga he relied on during his three most famous geological expeditions.

1.3 Haast’s Nineteenth Century Geological Expeditions in the Southern Alps

Before analysing how Haast compiled his knowledge of glaciers and the important Māori resources he chose to sideline in lieu of a scientific narrative, it is vital to understand how the network of European ideas circulated during Aotearoa’s colonisation. In 2011 Josef M. Hodge interrogated the past and present historiography that existed between colonisation and the

⁶⁵ Holland, p. 18.

⁶⁶ Holland, p. 34

⁶⁷ Tony Ballantyne, ‘Strategic Intimacies: Knowledge and the Colonization of Southern New Zealand’, *Journal of New Zealand Studies*, 14 (2013), 4-18 <<https://doi.org/10.26686/jnzs.v0i14.1744>> (p. 14).

⁶⁸ Ballantyne, p. 14.

⁶⁹ Ballantyne, p. 14.

⁷⁰ Ballantyne, p. 14.

circulation of knowledge.⁷¹ Drawing on the scholarship of David Lambert and Alan Lester, he summarised that the connection between ideas, practices and individual lives is better understood through “a ‘networked’ conception of empire.”⁷² This conception foregrounds the idea that multiple discourses can exist at the same time and that the path of knowledge, institutions and practices can be changed through encounters with Indigenous cultures.⁷³ As a result, there will never be just *one* path (or type) of knowledge in colonised countries.

The idea that knowledge is transformed through Indigenous and imperial encounters can be traced to Richard White’s concept of the ‘middle ground’. According to White, the concept of the ‘middle ground’ was created to “find a means, other than force, to gain the cooperation or consent” to assimilate different cultural premises between colonists and Indigenous societies.⁷⁴ Lynn Zastoupil expands on this idea by writing that the ‘middle ground’, a boundary where cultures, diplomacy and ambiguous identities overlap, is “a melting pot of detangling colonial intimacies.”⁷⁵ In other words, the middle ground where European and Indigenous cultures intersect, allows Indigenous traditions and knowledge to be repurposed through attempts to “synthesize, rather than divide, European and non-European traditions.”⁷⁶ When it comes to Haast’s geological reports however, his reliance on mātauranga Māori was rarely acknowledged.

Overall, there is a considerable difference in the value Ngāi Tahu attached to Te Taiao (the natural world) and imperial scientists mapped and studied the South Island’s far-reaching mountain range. European explorers preferred to preserve their knowledge of the physical environment through studying the topography of the land, sketching maps and pursuing scientific and mathematical enquiry of their surroundings by renaming physical features. By rendering the mountainscape as ‘seen’ and ‘known’, Lee Davidson notes that Europeans could enact their own authority over their ‘discovery’ and possess it for themselves.⁷⁷ Māori, on the other hand, envisioned the mountains as their sacred tūpuna (ancestors). The landscape’s very existence was

⁷¹ Joseph M. Hodge, ‘Science and Empire: An Overview of the Historical Scholarship’, in *Science and Empire: Knowledge and Networks of Science Across the British Empire, 1800-1970*, ed. by B. Bennet and J. Hodge (London: Palgrave Macmillan, 2011), pp. 3 – 29 (p. 16), ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=785022>> [accessed 20 September 2024].

⁷² David Lambert and Alan Lester, ‘Introduction: Imperial Spaces, Imperial Subjects’, in *Colonial Lives Across the British Empire: Imperial Career in the Long Nineteenth Century*, ed. by David Lambert and Alan Lester (Cambridge: Cambridge University Press, 2006) p. 8; Hodge, p. 16.

⁷³ Hodge, p. 21.

⁷⁴ Richard White, *The Middle Ground: Indians, Empires and the Republics in the Great Lakes Region, 1650-1815* (Cambridge: Cambridge University Press, 2010) p. 52.

⁷⁵ I explored this type of intimacy in Section 1.1 by looking at the relationships that existed between Kere Tukoto and Gerard Mueller. Lynn Zastoupil, ‘Intimacy and Colonial Knowledge’, *Journal of Colonialism and Colonial History*, 3.2 (2002), <<https://muse.jhu.edu/pub/1/article/7470>> [accessed 27 September 2024] (para. 11).

⁷⁶ Hodge, p. 21-22.

⁷⁷ ‘Discovery’ in parenthesis because of the European disregard for the landscape Māori already named, trod and explored. Davidson, p. 96.

blessed with mauri (life force) that should always be approached respectfully and appropriately so as to not weaken the authority and mana (prestige) the environment was blessed with.⁷⁸ The encounters that took place in the middle ground of these two overlapping ideals can be seen from a solely European perspective in Julius von Haast's personal account of his three most important geological expeditions.

In 1861, the Canterbury Provincial Government contracted Julius Haast to assess the province's potential metal ore and coal resources.⁷⁹ Among his original task, Haast also compiled a detailed topographical map of the Southern Alps.⁸⁰ Earlier maps of the South Island, like Walter Mantell's 1848 sketch map of the South Island (Fig. 2 on p. 30), were mostly concerned with capturing an immediate outline of the coast, lakes and harbours so later additions, such as resources, sheep runs, and potential infrastructure could be added.⁸¹ Mantell's map, in particular, relied on Māori knowledge to supplement the South Island's topographical outline.

According to John McCrystal, it was common for Europeans to continually add to information portrayed in earlier maps, even stating that "once the first lines had been inked onto the blank spaces, knowledge began to spread inward."⁸² It was a task Haast took on to completely and accurately map the existing and unknown contours of the Southern Alps. He generated with the help of various scientific tools and careful calculation. Drawing from an inventory list Haast compiled during his first independent geological expedition in 1860, he would have used a prismatic compass to help guide his direction, a pocket sextant to measure his longitude and

⁷⁸ A more in-depth explanation, extrapolated by Hirini Moko Mead, defined mauri as a "spark of life" and as the "active component that indicates a person/nature/object is alive" [*nature/object added to the definition by author*]. Whereas mana is defined as a supernatural force representative of prestige, authority, power, status, influence and charisma that is instilled in person at birth, through experience, in places and treasured objects. Hirini Moko Mead, *Tikanga Māori: Living by Māori Values* (Wellington, Huai Publishers, 2016) p. 33-34, 394, 395; Te Aka, s.v. mana, n; Davidson, p. 99

⁷⁹ Referred to as Julius Haast here because Haast was yet to be awarded his Austrian title of 'von' for the achievements he contributed to the Austro-Hungarian Empire. For more information on Julius von Haast's Austrian knighthood, see: Martin Krenn, 'Searching for the "von": Details on the Elevation of Julius von Haast to the Austrian Nobility', in *Canterbury Museum Bulletin No. 11*, ed by Sascha Nolden, George Hook & Simon Nathan (Christchurch: Museum of Canterbury, 2022), pp. 117-132 (p. 117); Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005) p. 28-30.

⁸⁰ Burrows, p. 30.

⁸¹ **Note:** *Fig 2. situated on next page:* Walter Mantell, 'Map of South Island & Stewart Island', sketch map, from *Scrapbook 1840-1872*, (Ref: c-103-049), Alexander Turnbull Library, Wellington.

⁸² John McCrystal, *Singing the Trail: The Story of Mapping Aotearoa New Zealand* (Allen & Unwin, 2020), p. 12, ProQuest eBook Central
<<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5972405>> [accessed 10 December 2024].

latitude, two aneroid barometers to determine the altitude of the alpine terrain and four thermometers to measure the temperature of his surroundings.⁸³



Fig. 2: Walter Mantell, 'Map of South Island & Stewart Island', 1848, sketch map, from *Scrapbook 1840-1872*, (Ref: c-103-049), Alexander Turnbull Library, Wellington. [records/22832610](#) Copyright Expired

⁸³ The Nelson Province had employed Haast (on Hochstetter's recommendation) to search for useful mineral resources, like coal, that could be exploited. For further information on Haast's use of barometers and boiling point apparatus, see: Burrows, p. 21, 44; Hargreaves, p. 52.

In Rangitata, 1861, Haast employed a small party of explorers consisting of himself, Dr Andrew Sinclair (an amateur botanist) and Richard Stringer (attendant to the horses) to accompany him on his first expedition.⁸⁴ Before encountering their first glacier several months into the new year, Haast noted that the Rangitata Valley itself contained evidence of significant past glaciation events, widespread glacial deposits and well-preserved glacier moraines.⁸⁵ His first physical description of a Southern Alps glacier reads:

Towering to the blue heaven two gigantic pyramids here stand, the one in front of the other, the wild majesty of which defied description. Between them glaciers of the second order descend, their white masses shining like molten silver, but only visible where deep rents seem to have cloven the mountain asunder.⁸⁶

The two ‘pyramids’ Haast referred to above were renamed Mount D’Archiac after French geologist Adolphe D’Archiac (1802-1868) and Irish-born physicist John Tyndall (1820-1893).⁸⁷ There is no acknowledgement in his work that the newly named Mount D’Archiac was already a precious maunga (mountain) known to Ngāi Tahu as Kāhui Kaupeka (the gathering place of water).⁸⁸ The event of renaming locations was a well-observed custom during the era of European exploration, a way Europeans imposed Indigenous “erasure on the landscape” and recast the environment “in the image of its imperial surveyors.”⁸⁹

Another example of Europeans generating and recording their own forms of knowledge about glaciers came from the scientific and mathematical evaluation of the natural phenomenon. Julius Haast’s interaction with the two glaciers he observed, named the North and South Forbes Glacier, recorded their altitude, location and size.⁹⁰ Physically, he also attempted to scale the glacier surface to find the icefield’s projected terminus above 3837 feet.⁹¹ Although Haast failed in

⁸⁴ Burrows, p. 22.

⁸⁵ Burrows, p. 44, 45, 46.

⁸⁶ Julius von Haast, *Geology of the Provinces of Canterbury and Westland, New Zealand: a report comprising the results of official explorations* (Christchurch: Times Office, p. 1879) p.5; Burrows, p. 47.

⁸⁷ Tyndall was a big name in the study of glaciers in the European Alps during the mid-nineteenth century. It should be noted that Haast named three different locations after the scientist, even though the one stated above would later become known as Ourum rather than remain as ‘Tyndall’. Burrows p. 47, 48.

⁸⁸ ‘Te Kahui Kaupeka Conservation Park’, *Department of Conservation – Te Papa Atawhai* (2024) <<https://www.doc.govt.nz/parks-and-recreation/places-to-go/canterbury/places/te-kahui-kaupeka-conservation-park/>> [accessed 3 October 2024].

⁸⁹ Micheal Bravo, ‘Indigenous Voyaging, Authorship, and Discovery’, in *Curious Encounters: Voyaging, Collecting, and Making Knowledge in the Long Eighteenth Century*, ed. by Adraina Craciun and Mary Terrall (Toronto: University of Toronto Press, 2019) pp. 71-112 (p. 92), JSTOR <<https://www.jstor.org/stable/10.3138/j.ctvbj7gc7>> [accessed 13 September 2024].

⁹⁰ Burrows, p. 48.

⁹¹ Data taken from Haast’s observations, not the 3450 ft that was correct measurement at the time. Burrows, p.48; Haast, p. 7.

reaching the end point of the glacier's névé, the numerical data he collected set the precedent for all future glaciers he came across. The most important find of the party's 1861 expedition was undoubtedly the Ashburton Glacier, a significant topographical discovery that followed a few days after Andrew Sinclair's accidental drowning.⁹² Haast was quick to note that the Ashburton was the largest glacier he came across so far, the extremity presenting a "straight wall of an altitude of 150 feet" and large boulders imbedded in the glacier's extensive ice vault.⁹³ Further investigation also revealed that the centre of the glacier acted like a conveyor belt for broken rock fragments, the slow movement of the ice causing the scree to eventually plummet from the Ashburton's elevated terminus with a tremendous sound.⁹⁴

The subsequent 1862 expedition, carried out with a slightly different aim than the 1861 expedition, consisted of Haast, a small three-man party and no Māori guide. Whilst travelling with two professional survey assistants (Arthur Dobson and William Young) and another unnamed individual, the main purpose of Haast's 1862 expedition was to find evidence of gold and record the geological features of the Waitaki Basin.⁹⁵ The heart of the explorations took place in the Mackenzie Basin, a sacred landscape known to Ngāi Tahu as Te Manahuna (the place of enlightenment/energy). Although the purpose of finding gold in the main expedition would fail, Haast still paid considerable attention to the geology and topography of the surrounding landscape.

Haast's study of the Mackenzie Basin made no mention of encountering or relying on Māori knowledge to aid in his journey. He did, however, make note of a few Māori placenames like Lake Takapō, Lake Pukaki and the Ōhau river.⁹⁶ An important takeaway from Haast's 1862 geological expedition was, undoubtedly, the significant evidence Haast found of past glaciations recorded around what he called 'Lake Tekap' (the early European misspelling of Takapō). Haast also recorded the greatest number of glaciers during his 1862 expedition as the Classen, Mueller, Hooker, Godley and Tasman. The Tasman Glacier in particular, named after the seventeenth century Dutch explorer credited with the 'discovery' of New Zealand, stretched across an incredible eleven-mile (approx. 18 km) ice field.⁹⁷ The glacier made such a vivid impression on the Canterbury geologist that he wrote:

⁹² Sinclair's drowning happened on 25 March 1861 and Haast 'discovered' the Ashburton Glacier on the 9th of April. Burrows, p. 49.

⁹³ Haast would capture the approach of the Ashburton Glacier and its origin in two sketches that would eventually be transformed into compelling 1862 watercolour scenes by John Gully that Haast would use as visual aids for his lectures both nationally and internationally. These paintings will be discussed in more depth in *Chapter 4: The Visual Histories of Te Waipounamu's Glacier Landscapes*. For further information on sketch, see: Burrows, p. 49, 57; Haast, p. 13.

⁹⁴ Haast, p. 13.

⁹⁵ Burrows makes the argument, however, that the unnamed party may have been R. L. Holmes who would later accompany Haast with Young to Awarua. See Burrows, p. 51.

⁹⁶ For placenames mentioned (Kōwhai, Takapō, Pukaki, Ōhau) see: Haast, p. 19, 27, 34, 35, 38, 39, 42.

⁹⁷ Haast, p. 31.

As far as the eye could reach everywhere snow and ice and rock appeared around us, and in such gigantic proportions that I sometimes thought I was dreaming, and instead of being in New Zealand I found myself in the Arctic or Antarctic mountain regions.⁹⁸

Haast lauded not only the incredible size and scope of the Tasman Glacier's ice vault, but also the vegetation, alpine plants and cryptogams that grew in and around its inhospitable environment.⁹⁹ Haast also experienced the danger of travelling across the Tasman glacier first hand. He writes that a sweeping avalanche took place whilst he was "travelling on the glacier" and "listening to the strange gurgling sounds of the water, flowing under our feet."¹⁰⁰ The roaring sound of several ice barrages fell as the expedition party crossed the glacier, a dangerous event that could have caused serious injury if the party happened to be in the path of the ice.

Despite Haast's meticulous measurement and recording of glaciers during his first two expeditions, it would not be until January 1863 that he mentioned using mātauranga to assist in his exploration. Starting from the southernmost end of the Machenzie Basin and searching for passage to the West Coast, Haast's entire 1863 expedition was based on finding the Tioripatea pass that stretched from the edge of Lake Wanaka to the West Coast. With his party consisting of himself, William Young, R. L. Holmes, former soldiers F. Warner, Charles Häring and a dog named Prince, Haast hoped to find the Māori passage Te Pūoho made use of in 1836 that Edward Shortland gathered from Te Huruwharu several years earlier.¹⁰¹ Although it is impossible to tell if Haast came across information regarding the passage from Shortland or other records of colonial exploration in the Southern Alps, he did mention looking for confirmation of the passage from an "aged" Māori at Waimate.

He writes that "from him I heard that the track lay by the Wilkin, a main branch of the Makarora, joining it some miles above the lake, and that it would bring me in two days to the mouth of the Awarua river on the West Coast".¹⁰² What is particularly notable in this instance is Haast's personal examination of the landscape beyond Ōtānenui (Wilken River). He immediately dismissed his informer's knowledge as incorrect and sought his own path across the Southern Alps instead. The pass he did 'discover' during the expedition would bear the geologist's name until it was retitled Tioripatea/Haast Pass by the *Ngāi Tahu Claims Settlement Act* in 1998.¹⁰³

⁹⁸ Haast, p. 31.

⁹⁹ Haast, p. 29 - 32.

¹⁰⁰ Haast, p. 33.

¹⁰¹ The record of Tioripatea Pass, as discussed, was made by Te Huruwharu and shared with Edward Shortland earlier in this chapter. Burrows, p. 58; Haast, p. 47-48.

¹⁰² Burrows, p. 58; Haast, p. 48; H. F. von Haast, p. 275.

¹⁰³ Haast, 48; H. F. Von Haast, p. 275-276; *Ngāi Tahu Claims Settlement Act*, 1998, No 97, Schedule 96.

The only other allusion Haast made to relying on Māori knowledge in his 1863 expedition was connected to crossing the partially flooded Clarke and Burke Rivers. In *Geology of the Provinces of Canterbury*, Haast mentioned looking for flax to construct a mohiki so he and his party could cross the latter that flooded.¹⁰⁴ Mohiki rafts, “a large compact bundle, which was as long as an ordinary canoe and oval-shaped”, were quick and easy to construct from Bulrush flax and bound with twine in large bundles.¹⁰⁵ The rafts were used by Māori to cross calmer bodies of water. For Haast there was no flax resources at the site of the Burke and was forced to rely on constructing a makeshift catamaran of dead trees.¹⁰⁶

Haast did rely on Māori knowledge when it came to crossing the braided branches of the Clarke River. He writes of the river’s silt-stirred waters as “the day being hot and the sky cloudless, I mistook this occurrence for the usual discolouring of a glacier near its source.”¹⁰⁷ Haast’s hasty observation was costly mistake that indicated a rapid-moving, unsafe river rather than a glacier fed stream.¹⁰⁸ The expedition party could only cross the Clarke by relying on the Māori ‘pole method’.¹⁰⁹ By making use of the same method Kerei used to help guide Gerhard Mueller across the partially-flooded Karangarua earlier in the chapter, Haast and his party successfully reached the opposite river bank. Without a proper pilot to guide them across the river, as Mueller warned, the rapid current carried away two of his men. The geologist stated that “had I not taken the precaution to have none but experienced swimmers in my party, a sad accident may have happened.”¹¹⁰ It was a certain amount of luck that no death occurred that day, an event that showed the inherent danger of the Southern Alps’ glacier-fed braided rivers.

Haast’s 1863 expedition is considered one of his most famous, for both its discovery of the low altitude pass to the West Coast and his naming of the Haast River. The journey was punctuated by the perilous crossings of difficult terrain, large avalanche blocked paths, walking inside fantastical ice caverns and surviving near-starvation. The party travelled fifty-six miles (ninety kilometres) over the span of thirty days, half of which was spent curtailed by rain and flooded rivers.¹¹¹ There were some encounters with glaciers and the glaciated environment on this trip. For example, the Wilken River that had its source in Mount Aspiring with the meltwater of the Dart

¹⁰⁴ Haast, p. 51.

¹⁰⁵ Domenico Felice Vaggioli and John Crockett, *The Māori: A History of the Earliest Inhabitants of New Zealand* (Lewiston: The Edwin Mellen Press, 2009), p. 318, EBSCOhost
<<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip.sso&db=nlebk&AN=502355&authtype=shib&site=ehost-live>> [accessed 12 January 2025].

¹⁰⁶ Haast, p. 51.

¹⁰⁷ Haast, p. 51.

¹⁰⁸ Haast, p. 51; ‘River Safety’, *Mountain Safety* (2024)
<<https://www.mountainsafety.org.nz/learn/skills/river-safety>> [accessed 5 October 2024].

¹⁰⁹ Haast, p. 51.

¹¹⁰ Haast, p. 51.

¹¹¹ Burrows, p. 59; Haast, p. 47 – 55.

Glacier and Olivine Ice Plateau.¹¹² However, Haast only mentioned these glaciers in passing, rather than faithfully measuring their size and scope as he did during his previous expeditions. This was, most likely, because the 1863 expedition was more focused on finding a successful passage across the Alps and the steep terrain surrounding the glaciers was too perilous to scale.

Haast's 1863 expedition in the Southern Alps was not his last. The Canterbury Provincial Geologist would go on to record many other glaciers in the Southern Alps. For example, in 1864, Haast successfully mapped the Hawker Glacier, travelled the West Coast, climbed the Franz Josef Glacier in 1865 and named the hanging Ross Glacier on an expedition to the Rakia Valley in 1866.¹¹³ A common thread of Haast's expeditions is the meticulous mathematical measurements and topographical mapping he recorded of Aotearoa glaciers. Although there is evidence that he relied on some mātauranga to help in his journey, such as crossing the river with the pole method', it only represented a small percentage of the credit Haast dedicated to his own feats of exploration instead. The reason for such a lack of acknowledgement, according to Linda Tuhiwai Smith and others, is because Indigenous knowledge was "seen as a primitive non-scientific form of knowing" and how mātauranga was articulated was often dismissed because of its lack of empirical evidence.¹¹⁴

What mātauranga Haast relied on in his expeditions was overshadowed by "existing forms of knowledge such as topographic maps or land surveys" created by previous European explorers or by Haast himself.¹¹⁵ Therefore, the dearth of glacier mātauranga Haast failed to acknowledge falls in line with the popular idea that Indigenous knowledge was of lower standing than Western science during the nineteenth century. The most prolific scientific collator of glacier knowledge in Aotearoa showed a definite preference for European methods of scientific analyses, observation and communication as opposed to environmental glacier knowledge about Kā Tiritiri o te Moana Māori, arguably, gathered for generations.

Conclusion

When it comes to physically encountering glaciers and the glaciated environment in Kā Tiritiri o te Moana during the nineteenth century, it is possible to trace three distinct ways that

¹¹² Haast, p. 55.

¹¹³ Burrows, p. 61-66.

¹¹⁴ Felix Driver and Lowri Jones would make a similar statement in 2009, stating "although the information provided by locals and intermediaries could be vital, its status and reliability was often questioned." They go on to note that "local knowledge and skill was appropriated by Europeans, especially where it could easily be fitted into existing forms of knowledge, such as a topographic map or a land survey." See: Felix Driver and Lowri Jones, *Hidden Histories of Exploration Researching the RGS-IBG Collections* (London: Royal Holloway, 2009) p. 13; Smith and others, p. 4.

¹¹⁵ Driver and Jones, p. 15.

European explorers integrated, recorded and overshadowed their interactions with glacier mātauranga. This triality of cross-cultural moments shows that glacier mātauranga, although rarely acknowledged in formal scientific reports such as Haast’s three geological expeditions, had an undeniable part in the collation of nineteenth century glacier knowledge. As the chapter shows, certain forms of mātauranga like crossing glacier-fed braided rivers by pole was adopted, appropriated and integrated by Europeans to further their physical exploration and navigation of the Southern Alps’ glacier environment.

The first reaction Europeans had to glacier mātauranga was to integrate that knowledge by hiring Māori guides to share their knowledge, hospitality and history on how to survive the frozen environment. Secondly, Europeans meticulously recorded mātauranga Māori like James Herries Beattie to codify and compile the evidence of how Māori perceived the climate and frozen environment before European arrival. The third way was how a glacier scientist like Julius von Haast overshadowed his reliance on glacier mātauranga by scarcely acknowledging the whenua (land) and mātauranga he relied on during his expeditions. He most likely, as a scientist and geologist, saw it as his duty to distil the glacier knowledge he recorded in a way that his employers, audience and contemporaries could understand.

Furthermore, Tony Ballantyne mentioned that by the time European explorers turned their attention to the interior of the Southern Alps during the mid-nineteenth century, most Ngāi Tahu knowledge (both in topography of the landscape and useful mātauranga) had been distilled into printed matter like maps, charts and government documents by other parties.¹¹⁶ The knowledge and guidance Māori circulated after that time frame, therefore, was marginalised. Lynley Hargreaves also noted that Māori did not “appear to have held icy areas in especial awe.”¹¹⁷ That viewpoint, however, does not diminish the knowledge of glaciers that Ngāi Tahu refined and relied on for generations.

As the foundation of a rewriting a New Zealand cryo-history, it can be concluded that more than one narrative (or way of understanding glaciers) existed in Aotearoa. In contrast, the next chapter interrogates the way scientific knowledge about glaciers, both in Aotearoa and beyond, circulated amongst the scientific elite, overseas journals and institutions.

¹¹⁶ Ballantyne, p. 14.

¹¹⁷ Hargreaves, p. 21.

Chapter 2:

The Early Study and Circulation of Glacier Knowledge in Aotearoa

Glaciology, or glacier science, is an academic field concerned with the study of glaciers, ice and other natural phenomena associated with the cryosphere.¹ The cryosphere, as defined by Polish glaciologist Antoni Dobrowolski, is an amalgamation of all the frozen water on the earth and can be linked geographically, physically or politically to the natural environment.² The field of glaciology has recently evolved to include more diverse disciplines such as geology, meteorology, hydrology, climatology and geography.³ These disciplines are used in tandem to understand, predict and conserve the dynamic relationship that exists between water, ice, glaciers and the corporeal environment.⁴ By tracing the history of glaciology as it developed in New Zealand during the nineteenth century, this chapter brings into focus the local glacier knowledge that emerged from what Wilfried Hagg referred to as glaciology's era of 'classical' study.⁵ It was through the observation, debate and study of New Zealand glaciers that Charles Darwin, Julius von Haast and James Hector situated New Zealand in the wider European conversation about the frozen environment.

According to Mark Carey, the early precepts of glaciology helped form the basis of how glaciers are viewed today. He states that after scientific and symbolic value was attached to glaciers during the Enlightenment era, the natural phenomenon slowly transitioned into an 'endangered' phenomenon "victimized as 'innocent Nature despoiled' by rampant capitalism, pollution, and overconsumption."⁶ Consequently, the revolution of scientific thought that took

¹ Wilfried Hagg, *Glaciology and Glacial Geomorphology* (Berlin: Springer, 2022), p. 3, Springer Link <<https://link.springer.com/book/10.1007/978-3-662-64714-1>> [accessed 13 May 2024].

² Sverker Sörlin, 'Cryo-History Ice, Snow, and the Great Acceleration', in *Ice and Snow in the Cold War: Histories of Extreme Climatic Environments*, ed. by Julia Herzberg, Christian Kehrt and Franziska Torma (New York: Berghahn Books, 2018), pp. 20-46 (p. 20), JSTOR <<https://www.jstor.org/stable/j.ctvw048zz.5>> [accessed 12 May 2024].

³ Hagg, p. 3.

⁴ Hagg, p. 3.

⁵ The belief that glaciology evolved the most during the nineteenth century is a theory is similarly reflected by Garry Clark and Mark Carey. Both infer that the 'classic era' of glaciology lay in scientific and Romantic ideals like the Enlightenment and Sublime, a revolution of thought that will be further discussed later in the chapter. See: Mark Carey, 'The History of Ice: How Glaciers Became an Endangered Species', *Environmental History*, 12.4 (2007), 487-527 <<https://www.jstor.org/stable/25473130>> [accessed 10 March 2024]; Garry Clark, 'A Short History of Scientific Investigations on Glaciers', *Journal of Glaciology*, 33.1 (2018), 4-24 <<https://doi.org/10.3189/S0022143000215785>>; Hagg, p. 6.

⁶ Narrative, in regards to this chapter, defined as: "a representation of a history in which a sequence of events has been constructed into a story in accordance with a particular ideology" the ideology being the investigation of human thought on 'glaciers' and the role it was perceived to play in the environment. *Oxford English Dictionary* (Oxford: Oxford University Press, 2024), <<https://doi.org/10.1093/OED/2178190663>> [accessed 29 June 2024] s.v. narrative, n; Mark Carey, 'The History of Ice: How Glaciers Became an Endangered Species', *Environmental History*, 12.4

place from the eighteenth to nineteenth century (where scholars openly began challenging purely Biblical explanations for natural phenomenon), is vital to writing a socially and scientifically inclusive cryo-history.⁷

Garry Clark, similarly, argues that late eighteenth and early nineteenth century glacier methodology evolved from protoscience to practicing scientific method by incorporating measured and precise observations of the natural environment.⁸ Accordingly, glaciological methodology was created by the work of early glacier theorists Louis Agassiz (1807-1873), James Forbes (1809-1868), Thomas Huxley (1825-1895) and John Tyndall (1820-1893).⁹ The fundamental basics of observation and recording that the above scientists collated during the nineteenth century are still practiced by current glaciologists. It can be concluded that the cultivation of scientific knowledge about glaciers in nineteenth century New Zealand played a significant role in the way the environmental phenomenon was first encountered, presented and understood by the scientific elite before it was disseminated to the wider public.

By analysing a combination of personal correspondence, geological reports, surveys, scientific journals and author monographs, this chapter argues that both national and international nineteenth century scientists drove the topographical and formal study of local New Zealand glaciers. Furthermore, the creation, collation and dissemination of New Zealand glacier knowledge went through a rigorous cycle of personal observation and peer-to-peer debate before being disseminated through formal scientific publishing. The study of Aotearoa glaciers and the glaciated landscape was, therefore, driven by the cross-examination and evolution of already extant nineteenth century European scientific thought about the cryosphere. I divide the core of this chapter as follows:

Section 2.1 that analyses the earliest known documentation of glacier science that was exchanged between Sir Charles Darwin and Sir George Grey in Aotearoa. Darwin's search for erratics in the South Island (large boulders of mysteriously unmovable rock found miles from their points of origin), for example, is related to the early nineteenth century's most enduring glacier

(2007), 487-527 <<https://www.jstor.org/stable/25473130>> [accessed 10 March 2024] pp. 487, 488, 499.

⁷ For further reading of how science histories shaped sixteenth to nineteenth century thought see: Jean Fleming and Jeremy Star, 'The Emergence of Science Communication in Aotearoa New Zealand', *Journal of Science Communication*, 16.3 (2017), 1-19 <<https://doi.org/10.22323/2.16030202>>; Hargreaves; Bruce Hevly, 'The Heroic Science of Glacier Motion', *Osiris*, 11(1996), 66-88 <<https://www.jstor.org/stable/301927>> [accessed 2 July 2024]; David Oldroyd, 'Haast's Glacial Theories and the Opinions of His European Contemporaries', *Journal of the Royal Society of New Zealand*, 3.1 (1973), 5-14 and Rebecca Priestley, 'A Survey of the History of Science in New Zealand 1769-1992', *History Compass*, 8.6 (2010), 474-90, <<https://doi.org/10.1111/j.1478-0542.2010.00684.x>>. Additional footnote for the challenging of biblical explanations: Carey, p. 506.

⁸ Clark, p. 4.

⁹ Clark, p. 4.

mysteries. Furthermore, an early article published in a monthly periodical communicated the big ideas of glacier mechanics to Wellington's wider settler audience through privileging the ideas of Scottish scientist James David Forbes.

Section 2.2 investigates the personal and professional correspondence Julius von Haast shared with Ferdinand von Hochstetter and James Hector during the mid-nineteenth century. Their lively debates regarding notable glacier theories and their personal observations about the subject helped further the formal scientific understanding of New Zealand glaciers that was communicated among themselves.

Section 2.3, lastly, tracks the circulation of the knowledge Haast, Hector and Hochstetter fostered in the national and international scientific community. The circulation of glacier knowledge they communicated, at the time, situated New Zealand as part of the wider European debate about the formal study of the cryosphere.

By bringing into the focus the way that knowledge was constructed, rather than claiming the knowledge was already seamlessly formed, I consider James Secord's argument that science needs to be viewed as a form of communication in order to diversify the framework of a history of science.¹⁰ That way locating glaciers' histories in Aotearoa can move away from situating specific scientific knowledge "in as tight a context as possible."¹¹ In other words, rather than just conveying the conclusion of glacier knowledge in New Zealand, I emphasize the circulation of scientific thought that took place in Aotearoa from the earliest recorded acknowledgement of scientific enquiry to the later nineteenth century dissemination of formal papers published in the New Zealand Institute's *Transactions* and *Proceedings*.

2.1 The Enlightenment, Erratics and Early Glacial Theories

The concept of glaciers and glacier environments that the first European settlers brought to New Zealand during the nineteenth century was crafted from three centuries of scientific study, human curiosity and Enlightenment ideology. John Gribbon, author of *Science a History*, defines the system of philosophical thought behind the Enlightenment period as humankind starting to openly questioning orthodox religion regarding natural phenomena and superstition by relying on mathematical and scientific reason.¹² Enlightenment ideology, similarly, brings into focus "a rationalist and scientific approach to understanding...human society, the law, education, the

¹⁰ James Secord, 'Knowledge in Transit', *Isis*, 95.4 (2004), 654-572, <<https://doi.org/10.1086/430657>> [accessed 25 March 2025] (p. 654).

¹¹ Secord, p. 657.

¹²; John Gribbon, *Science A History: 1543-2001* (London, Penguin Books, 2002) p. 241.

economy, nature, the earth and philosophy.”¹³ Vincenzo Ferrone and Elisabetta Tarantino supplement this definition by claiming that the Enlightenment also assisted in institutionalising the sciences and giving rise to growing academic circles in the northern hemisphere.¹⁴

By circulating scientific research and communicating scientific thought to journals, media, gazettes and personal monographs, there is no doubt nineteenth century scientific writing became central to influencing the way the public thought about glaciers. According to Sarah Dry, “until the nineteenth century, most scientists wrote books for everyone to read”, and by studying them now, we can trace what kind of public knowledge existed at the time.¹⁵ She goes on to write that John Tyndall wrote “books that invited general readers to feel their fear, wonder, and awe as they encountered sublime phenomena such as cloud forms and majestic glaciers” before the author would explain the theories and predictions of those formerly unscientifically defined glaciers.¹⁶

To further analyse the scientific theories that helped shape the way New Zealand glaciers were seen and interacted with, it is important to understand the root of European glacier knowledge. For example, the start of Western scientific fascination with ice can be traced to the sixteenth and early seventeenth centuries. Roger Barry and Thain Yew Gan posit that the first appearance of the word ‘gletscher’ was on a map of the European Alps in 1588.¹⁷ The German word ‘gletscher’, derived from the Latin ‘glacies’, took its Latin meaning from the root word for ‘ice’.¹⁸ Hagg, in contrast, traced the oldest mention of glaciers, the Rhone Glacier specifically, to the *Cosmographia* — a German compilation of global history that was created in 1546.¹⁹ Max Leonard, on the other hand, attributed the beginning of scientific interest in ice to the German

¹³ The *Oxford English Dictionary* defines the Enlightenment as “the dominant European intellectual culture in the 18th century which typically emphasized freedom of thought and action without reference to religious and other traditional authority. Furthermore, Enlightenment ideology from the eighteenth and nineteenth century insisted “on See: *Oxford English Dictionary* (Oxford: Oxford University Press, 2024), <https://www.oed.com/dictionary/enlightenment_n?tab=meaning_and_use#5441399> [accessed 29 June 2024] s.v. enlightenment, 2, n.

¹⁴ Vincenzo Ferrone and Elisabetta Tarantino, *The Enlightenment: History of an Idea* (New Jersey: Princeton University Press, 2015), p. 76, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?pq-origsite=primo&docID=1883964>> [accessed 6 August 2024].

¹⁵ Sarah Dry, *Waters of the World: The Story of the Scientists Who Unravelled the Mysteries of Our Oceans, Atmosphere, and Ice Sheets and Made the Planet Whole* (Chicago: The University of Chicago Press, 2019) p. 15.

¹⁶ Dry, p. 22.

¹⁷ Roger Barry and Thain Yew Gan, *The Global Cryosphere: Past, Present and Future* (Cambridge: Cambridge University Press, 2011), p. 85, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=774997>> [accessed 10 August 2024]; Hagg, p. 4.

¹⁸ Hagg, p. 4.

¹⁹ Hagg, p. 5.

treatise *A New-Year's Gift: or On the Six-Cornered Snowflake* by Johannes Kepler.²⁰ He argued that Kepler's work highlighted snowflakes falling from the sky in hexagon shapes because of the internal, unseen, structure of ice.²¹ It is fairly difficult to pinpoint the exact turning point when glaciers became a focal point for study in Europe however, as each country, scholar and historian has their own narrative when considering the movement and value of glacier knowledge.

What *does* remain central to many of the early scientific inquiries on glaciers is the downward flow glacier ice created. According to Dry, this is because Tyndall and his contemporaries contributed to the idea that “truth can be found in the science of glacier motion” and that “some truths about glaciers— for example, how quickly they move- are truer than others.”²² Genuine scientific interest in glacier motion came from Sveinn Pálsson in 1795 and his theory that physically deforming a substance and placing it under severe stress caused it to move.²³ Coincidentally, Horace-Bénédict de Saussure's similarly timed *Voyages dans les Alpes*, theorised that glaciers moved as a result of pressure.²⁴ Another common link to the interest in glacier movement came from the complex scientific mystery behind erratics—large, many-ton metamorphic rocks that were deposited, seemingly randomly, on the land without any physical or human means of moving them.

Pictured below, from George Murray Webster's 1870 photograph album, is a large erratic situated in front of Mont Blanc. The image, showing two ant-sized human figures sitting atop the erratic boulder, indicates the sheer size of the monolith and how impossible it would have been for humans to shift them.²⁵ There were two main schools of scientific thought that theorised how the boulders moved from their parent rocks to the places they were discovered. The Plutonists believed that erratics moved through volcanic explosions and earthquakes.²⁶ The Neptunists, on the other hand, believed they were transported through the movement of ice, rivers and catastrophic floods.²⁷

²⁰ Along with the physical experiments of Robert Boyle examining ice under a microscope, Kepler's treatise. See: Max Leonard, *A Cold Spell: A Human History of Ice* (London: Bloomsbury Publishing, 2023) p. 81, 82.

²¹ Leonard, p. 82.

²² Dry, p. 15.

²³ Haukur Tomassón, 'The History of Mapping in Iceland, with Special Reference to Glaciers', *Annals of Glaciology*, 8 (1986), 4–7 <<http://dx.doi.org/10.3189/S0260305500001026>> (p.5).

²⁴ Information on publication years, names and brief descriptions supplemented from Wikipedia. 'Voyages dans les Alpes', in *Wikipedia*, <https://fr.wikipedia.org/wiki/Voyages_dans_les_Alpes> [accessed 12 August 2024]; 'Horace Bénédict de Saussure', in *Encyclopaedia Britannica* <<https://www.britannica.com/biography/Horace-Benedict-de-Saussure#ref247045>> [accessed 16 August 2024]; See: Hagg, p. 6; Barry and Gan, p. 85.

²⁵ George Murray Webster, *La Pierre de Beranger et chaine du Mont Blanc*, photograph, 1870, University of Otago Digital Collections, Dunedin <<https://hocken.recollect.co.nz/nodes/view/59478>> [accessed 10 August 2024].

²⁶ Hagg, p. 6.

²⁷ Hagg, p. 6.

The observation of erratics in Aotearoa can also be attributed as the first recorded glaciological enquiry that took place in the country.



Fig. 3: George Murray Webster, *La Pierre de Beranger et chaine du Mont Blanc, Europe, ca.*, photograph, 1870, University of Otago Digital Collections, Dunedin. [P1995-042](#) Copyright: Copyright Expired 1928

During the short nine-day stop that the HMS *Beagle* made in 1835 at the Bay of Plenty, the survey vessel Charles Darwin joined to conduct his studies of the natural environment, Darwin observed what he assumed was the presence of erratics in New Zealand.²⁸ He later wrote to George Grey that “I saw inland of the Bay of Islands, large rounded blocks of greenstone” but that he was unable to ascertain if the boulder’s parent rocks were further afield.²⁹ Darwin further explained, at the time of his 1847 letter, that a clear consensus had been reached between geologists that glaciers and icebergs were responsible for the movement of erratics.³⁰ In 1847, Darwin also believed that the presence of erratics would bring new bearing on world’s past climate, mentioning to Grey that he lamented not seeing “the full importance of the question (of erratics)” at the time of his stopover in Aotearoa.³¹

²⁸ ‘Charles Darwin leaves New Zealand after nine-day visit’, in *New Zealand History*, <<https://nzhistory.govt.nz/charles-darwin-leaves-nz-noting-that-it-is-not-a-pleasant-place>> [accessed 1 May 2025]; Hargreaves, p. 37; Hagg, p. 6.

²⁹ In regards to the veracity of the claim, it is in question whether Darwin saw greenstone, or Pounamu, specifically as nephrite is found solely on the South Island. Charles Darwin to George Grey, “Letter no. 1135,” University of Cambridge - *Darwin Correspondence Project*, 13 November 1847, DCP-LETT-1135 <<https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-1135.xml>> [accessed on 17 June 2024].

³⁰ Darwin to Grey, 1847; Hargreaves, p. 29, 37.

³¹ Darwin to Grey, 1847.

For Darwin tracing the presence of erratics in New Zealand was only definitively proved in 1856 when Walter Mantell visited the scientist in London. According to Hargreaves, the survey sketches Mantell did of the Southern Alps showed indications of erratics in the rugged landscape.³² The challenge with finding erratics in Aotearoa, however, came from the “shattered, uplifting, erosion-ridden land.”³³ Large rock monoliths were easily broken down and subsumed by sediment before being hidden underground.³⁴ Nevertheless, the vague proof of erratics in Mantell’s sketches were enough for Darwin to argue that south of the equator evidence of past glacial action was undoubtedly present.³⁵

Another indication of erratics in Aotearoa can be traced to the main nineteenth century glacier theories that were circulated publicly in gazettes or periodicals. The 1850 periodical, the *New Zealand Evangelist*, published by Wellington’s Evangelical Alliance, provided further interest in the movement of erratics observed by scientists.³⁶ The bimonthly publication, put together by protestant miners in 1846, had a prospectus that reads “the press is universally admitted to be one of the most powerful moral agencies of the present day” and that “if religious periodicals are found of such value in old and settled countries— they are still more needed in new and scarcely organized colonies.”³⁷ The reason why a protestant publication, in Aotearoa, was concerned with glaciers can be traced to the *New Zealand Evangelist*’s sister journal, the *Scottish Presbyterian*, that was published in Glasgow at the same time. The article on Glacier Theories, published in the *New Zealand Evangelist*, was a four-page excerpt taken directly from the latter publication and highlights the national pride the authors had in James Forbes’ scientific work.

James David Forbes (1809-1868) and his study of electricity, meteorology, the physics of temperature and glaciology placed him at the heart of scientific correspondence and continental travel during the mid-nineteenth century.³⁸ His studies in nature eventually led to his election as Professor of Natural Philosophy at the University of Edinburgh from 1833 to 1859.³⁹ The article in the *New Zealand Evangelist*, specifically highlighted Forbes’ study of glacier motion by stating

³² Hargreaves, p. 42.

³³ Hargreaves, p. 41.

³⁴ Hargreaves, p. 41.

³⁵ Hargreaves, p. 42; Charles Darwin, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* [2nd Edition] (New York: D. Appleton and Company, 1860) p. 325.

³⁶ Rev. Samuel Ironside and Rev. John Inglis, ‘The Glacier Theories’, *The New Zealand Evangelist* [Vol. 2], (Wellington: Wellington Independent; 1850) p. 296-299.

³⁷ Rev. Samuel Ironside and Rev. John Inglis, ‘Prospectus’, *The New Zealand Evangelist* [Vol. 1], (Wellington: Wellington Independent; 1848) p. 1.

³⁸ ‘Papers of James David Forbes’, *University of St Andrews Special Collections - Archive Hub* (2025) <<https://archiveshub.jisc.ac.uk/search/archives/2360031e-d7c7-3561-8113-2f11487681c4>> [accessed 17 March 2025].

³⁹ ‘Papers of James David Forbes’.

that if stating “stones of colossal size are hourly in motion, traversing great distances, and transported solely in their mystic journey by the agency of ice,” then what moves glacier ice?⁴⁰

By answering that question, the article unravelled the four main glacier hypotheses that Horace-Bénédict de Saussure (1740 – 1799), Jean de Charpentier (1786-1855), Louis Agassiz (1807-1873) and James David Forbes crafted from their investigation of glaciers in the European Alps. The first to be mentioned was gravitation theory (or sliding theory) that was spearheaded by de Saussure in 1779. Saussure claimed that ice moved under the weight of gravity and water flowing at the bottom of a glacier.⁴¹ Believed to be the singular explanation for glacier movement during the late eighteenth century, de Charpentier and Agassiz later provided a second theory of glacier mechanics in contrast to de Saussure by observing the dilation and expansion of ice that took place at a glacier’s edges.⁴² They speculated that freezing water was liable to expand and drive the ice to move more rapidly where water flowed into the glacier’s naturally creviced sides.⁴³

The authors of the *New Zealand Evangelist* article argued, however, that dilation theory and its predecessors had been dismissed by Forbes’ study of glaciers in 1842⁴⁴ Forbes had already proven that glaciers moved fastest at their centre and viscosity defined glaciers as an “imperfect fluid, or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts.”⁴⁵ The crux of these three theories of glacier movement may only represent a very brief overview of glaciology at the advent of glaciology as a science in New Zealand. The article, however, highlights a condensed version of the type of glacier knowledge that emerged from Europe in the early half of the nineteenth century. These were the theories that future colonial scientists were familiar with before they had a chance to study New Zealand glaciers for themselves.

Darwin’s letters and the *New Zealand Evangelist* periodical indicates that there was already an interest in the study of glaciers and glacial landscapes in Aotearoa before the official correspondence between valued colonial scientists like Ferdinand Hochstetter (1829-1884), Julius von Haast (1822-1887) and James Hector (1834-1907) transformed glacier knowledge in Aotearoa through study and debate. It is the chronological starting point of Aotearoa’s cryo-history from the perspective of a history of science and the nexus upon which later glacier knowledge would evolve and circulate through individual study, formal dissemination and transnational publication.

⁴⁰ Rev. Samuel Ironside and Rev. John Inglis, p. 296.

⁴¹ Rev. Samuel Ironside and Rev. John Inglis, p. 297; Clark, p. 7.

⁴² Rev. Samuel Ironside and Rev. John Inglis, p. 298; Clark, p. 5.

⁴³ Rev. Samuel Ironside and Rev. John Inglis, p. 298; Clark, p. 5.

⁴⁴ Rev. Samuel Ironside and Rev. John Inglis, p. 298.

⁴⁵ Rev. Samuel Ironside and Rev. John Inglis, p. 298

2.2 Hochstetter, Haast & Hector: The Science Letters

Before New Zealand's nineteenth century glacier knowledge could circulate in the global scientific network, the learned elite had to collect and debate new observations, data and theories about glaciers with like-minded peers. Most colonial scientists, whether permanent New Zealand settlers or scholars staying in New Zealand for the duration of their studies, often cultivated close personal relationships with other experts in their field. For example, the personal correspondence between Julius von Haast and Ferdinand von Hochstetter had several references to the two geologists' key observations and disagreements about new scientific theories regarding European glaciers. They would prove or disprove those glacier theories by studying Aotearoa glaciers.

To better understand New Zealand's early cryo-history from the perspective of a history of knowledge, it is important to analyse the methodologies and collections of knowledge that nineteenth century scholars used to refine and further debate their scientific studies. Lindsey O'Neill writes that "more scientific societies (or academies) were beginning to interact with one another" during the late eighteenth century. She also argued that it became easier for the information those societies pooled, referred to as intellectual capital, to reach beyond national borders.⁴⁶ This was a network of exchange that European explorers, scientists, surveyors and pioneers of New Zealand became increasingly familiar with.

Another way knowledge was collated, according to Rebecca Priestly, was highlighted by the fact that scientific discovery and European exploration went hand in hand with the Enlightenment era. She states that the prestige of scientific discovery prompted many "gentlemen naturalists" to travel from Europe to New Zealand in "search of exotic biological specimens to grace the emerging natural history museums of Europe – and the curiosity cabinets of private collectors".⁴⁷ It was this form of intellectual trade that brought into focus the fact building, collection and scientific analysis that was prevalent at the start of Aotearoa's scientific study.⁴⁸ The first use of scientific method in New Zealand was implemented by botanists Joseph Banks (1743-1820) and Daniel Solander (1733-1782) during James Cook's first voyage to New Zealand in 1769.⁴⁹ Both Banks and Solander gathered specimens of flora, fauna and seashells during the *HMS*

⁴⁶ Lindsay O'Neill, *The Opened Letter: Networking in the Early Modern British World* (University of Pennsylvania Press, Inc, 2014), p. 166, De Gruyter Brill <<https://doi.org/10.9783/9780812290189>> [accessed 12 June 2024].

⁴⁷ Priestly, p. 475.

⁴⁸ Ruth Barton, "'Not Merely a Scientific Society': The New Zealand Institute and Its Affiliates c.1868–1900", *Journal of the Royal Society of New Zealand*, 47.1 (2017), 33–40, <<https://doi.org/10.1080/03036758.2016.1207680>> (p. 34).

⁴⁹ Priestly, p. 475.

Endeavour's circumnavigation of New Zealand for their personal study before they catalogued their finds as scientific curiosities and a possible future resources for England.⁵⁰

Glaciers, however, are fundamentally different from a collectable resource. Made of ice and compacted snow, it is nearly impossible to study the phenomenon outside its natural alpine setting and strict laboratory conditions. As such, nineteenth century scientists and geologists relied on *in situ* surveys, field notes, sketches and developing theories to further their knowledge of glaciers. Charles Gillispie argues that geology introduced a historical dimension to science during the Enlightenment era and that "the geologist, like the historian, had to rely largely on interpreting relics of change."⁵¹ Geologists could "neither experiment nor quantify" their studies beyond relying on environmental productions and generalisations.⁵² As such, the origin of geology represents "a coming together of lore from the ancient practice of minerology with speculations about the origins of the earth."⁵³

Guided by the meaning that geology was a study of the past described by creative thinking, present observation and evidence derived from physical rocks, Haast carried out his own study of New Zealand glaciers.⁵⁴ Haast was a prolific correspondent with a vast network of acquaintances, the hundred-and-twenty-six international letters exchanged between Hochstetter and Haast shows the deep "reciprocal nature of the relationship between two important scientists working in full support of each other at opposites ends of the globe."⁵⁵ The further exchange of three-hundred letters between Hector and Haast, on national soil, follows a similar but more contested pattern. According to Sascha Nolden, the letters between Haast and Hector connected two "dominant personalities in the scientific life of late nineteenth century New Zealand" and the debated agreements and disagreements they shared.⁵⁶

The years between 1861 and 1864, specifically, contained considerable reference to glaciers among other geological debates. Haast's first public lecture on the geology of Canterbury (with special emphasis on glaciers) in 1861, argued that the rising and sinking of New Zealand was responsible for the moraine debris found in the Southern Alps. The evidence of moraine debris

⁵⁰ Priestly, p, 475.

⁵¹ Charles Coulston Gillispie, *The Edge of Objectivity: An Essay in the History of Scientific Ideas* (Princeton: Princeton University Press, 2016), p. 291, JSTOR <<https://www.jstor.org/stable/j.ctvc779t6.12>> [accessed 19 March 2025].

⁵² Gillispie, p. 291.

⁵³ Gillispie, p. 291.

⁵⁴ Gillispie, p. 293.

⁵⁵ Sascha Nolden, 'The Correspondence of Sir Julius von Haast', in *Canterbury Museum Bulletin No. 11*, ed by Sascha Nolden, George Hook & Simon Nathan (Christchurch: Museum of Canterbury, 2022), pp. 165-184 (p. 166, 167); Sascha Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast, 1859-1887* (Wellington: Geoscience Society of New Zealand Inc, 2012) p. 20.

⁵⁶ Sascha Nolden, Rowan Burns and Simon Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887* (Wellington: Geoscience Society of New Zealand Inc, 2012) p. 3.

Haast relied on in his below theory was collected from the 1861 expedition the latter completed in the Rangitata, Havelock and Clyde Valleys.⁵⁷ By defining the leading theory behind glacier moraines, he states:

Enormous glaciers descended till they reached the water, which transported their detached ends covered with detritus into the sea in the form of large icebergs. So covered, as we now see them, they melted and strewed their loads over the bottom of the sea, forming strata often several thousand feet thick. Afterwards the country rose again, the climate became warmer, the rivers excavated their old channels; but nearly everywhere in those latitudes, the remains of this glacial period remained.⁵⁸

Colin Burrows claims that the Rangitata Valley was the first place in New Zealand where Haast encountered extensive glacial deposits.⁵⁹ The valley, in particular, showed evidence of end, lateral and recessional moraine features that indicated “ancient and major glacial event.”⁶⁰ The deep discussion prompted from Haast’s find, however, placed Hochstetter in vehement opposition to the use of Agassiz’s theory of glaciation— a theory that argued glacier action (the grinding down and movement of debris by ancient glaciers) was responsible for depositing debris in the rivers and sea.⁶¹ Even though Haast’s above theory contained a mixture of both Lyell’s drift theory and Agassiz’ theory of glaciation, Hochstetter still declared Agassiz’s theory of glaciation “rubbish” and further noted that the debris Haast found in Canterbury could only have come from the “rising and lowering [of the land]” as proved by Lyell’s drift theory.⁶²

Although this would be the sole theoretical discussion about glaciers between Hochstetter and Haast, glaciers were by no means an abandoned topic.⁶³ There was frequent mention in the two geologists’ correspondence of Hochstetter advising Haast about current geological and scientific glacier studies the latter would find useful. Hochstetter also informed Haast that some of his 1861

⁵⁷ Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005), p. 46, 47-48, 49.

⁵⁸ ‘Lecture’, *Lyttelton Times*, 23 October 1861, p. 4.

⁵⁹ Burrows, p. 46.

⁶⁰ Burrows, p. 46.

⁶¹ A theory that, a few years later, would be widely accepted as true. David Oldroyd, ‘Haast’s Glacial Theories and the Opinions of His European Contemporaries’, *Journal of the Royal Society of New Zealand*, 3.1 (1973), 5–14.

⁶² Lyell’s drift theory, in particular, hypothesised that glacier erratics were transported by drifting icebergs, which, when melted, deposited sediment, debris and accompanying boulders at their current resting place. Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 78, Oldroyd, p. 6.

⁶³ It should be noted that the correspondence between Hochstetter and Haast is limited because only Hochstetter’s letters, as preserved by Haast, has survived. Haast’s personal letters to Hochstetter, unfortunately, have not. As such, much of the discussion represented here is in the form of Hochstetter responding to words, theories and notes from Haast that are unknown. Nevertheless, Hochstetter’s succinct manner of writing makes it easy to follow the thread of conversation between the two scientists. Although some of the more subtle nuances are not visible, the main thread of conversation is still discernible.

field sketches had successfully been forwarded to Friedrich Simony (1813-1896) to be adapted into artistic landscape paintings.⁶⁴ Most memorably was the series of glacier paintings John Gully (1819-1888) completed on Haast's request in 1863, an event Hochstetter made deliberate reference to when he informed Haast that the glacier paintings the former forwarded to be showcased to the Emperor of Austria in Vienna had been delivered in 1865.⁶⁵ For Haast, Hochstetter was crucial in connecting his work to the wider scholarly audience of Europe. Hochstetter often wrote to Haast to let him know if one of his scientific papers was accepted by overseas scientific journals or looked over by other lecturers.

The correspondence between Haast and Hector, contrastingly, was fraught with disagreements, rivalry and clashing personalities.⁶⁶ What is immensely valuable about Haast and Hector's correspondence is the existence of both sides of the conversation. Their discussion surrounding glacier environments in the South Island featured most heavily from the year 1862 to 1863. Haast, in particular, started their debates with the assertion that a combination of ice-age and *drift* theory— that was so vehemently dismissed by Hochstetter — was present in New Zealand. This theory, coined by Andrew Ramsey (1814-1891) as the glacial-submergence theory, stated:

A glacial epoch had formerly affected the mountains of North Wales. This frigid period had then supposedly been followed by a period of submergence, during which shells and gravels were deposited on the flanks of Moel Tryfan and other mountains. Icebergs broke off and floated away, eventually depositing their loads in neighbouring regions. The subsequent withdrawal of the waters was followed by a further extension of the glaciers, with consequent deposition of quantities of morainic material, some of the "drifted" material being ploughed away by the extended glaciers.⁶⁷

James Hector, on the other hand, openly questioned the presence of glacial drift in New Zealand.⁶⁸ Writing from the viewpoint of Otago's newly appointed provincial geologist, he writes to Haast:

⁶⁴ Simony was a valued Austrian geologist and artist employed by the University of Vienna, he would bring to life field sketches in more vivid and artistic detail. Additionally, there is also discussion, in the letters, of the lithographs Hochstetter was charged with overseeing the creation of in Vienna for Haast's monograph book of Canterbury. Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 86.

⁶⁵ The reason why Haast forwarded John Gully's watercolour landscapes of the Southern Alps glaciers to the palace in Vienna was because Haast 'named' the Francis Josef Glacier after Emperor Franz Josef I of Austria in 1865. Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 120, 122.

⁶⁶ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p. 3.

⁶⁷ Oldroyd, p. 7.

⁶⁸ Glacial drift, or drift theory as discussed before, was the theory that the rising and sinking of the land below sea level allowed for moraine debris to accumulate in ancient river beds and the sea floor. It should also be noted that the discussion between Haast and Hector took place before Haast's paper *On the Physical Geography and Geology of New Zealand* was read before the Royal Society of

I fear if any traces of Glacial drift occur in this province (Otago), they have altogether escaped me. However, with you (in Canterbury) they may be confined to high elevations, but if so, it is difficult to conceive any cause for their absence from the low grounds...supposing that I understand you right in taking your remarks as applying to Glacial drift not Glacier Phenomena merely.⁶⁹

The reason Hector sought clarification between ‘glacial drift’ and ‘glacier phenomena’ is because nineteenth century scientists did not use ‘glacial’ to refer to the ‘ice age’ theory but rather the drift theory.⁷⁰ Hector, therefore, drew his own conclusions from Agassiz’s theory of glaciation being present in Otago. Although Haast later shifted his support to Agassiz’s theory of glaciation in 1864, his response to Hector in 1862 was annotated with a detailed sketch that showed the different types of terrace lines in the Southern Alps.⁷¹ He explained that “one is horizontal, of marine origin, the other sloping down from 3 to 1 degree of glacial origin.”⁷² Drawing on evidence observed two miles from the Tasman Glacier, Haast further argued that the glacier’s drift formation “consists really of the deposits of Icebergs” because erratic blocks, weathered smoothly, were present amongst the glacier debris.⁷³

The presence of marine origin drift, Haast theorised was present on the sea floor where fine-grain till accumulated.⁷⁴ He concluded that the terrace lines in the Southern Alps showed signs of both marine and glacial action— a requisite for Ramsey’s glacial-submergence theory. According to Burrows, Haast’s version of the drift theory claimed that “glaciers from the east side of the Southern Alps had reached the sea when its level was high” and that “melting icebergs originating from these floating glacier tongues disposed unsorted debris on the sea floor.”⁷⁵ His theory, formed between 1861-1863, shows significant influence by prominent European scientists he was in contact with at the time.⁷⁶ Hector, on the other hand, had a different view. He argued that “were the Island to be submerged, the snow line & therefore terminal line of Glacier Ice would rise, not descend with decrease of altitude.”⁷⁷ This means that glaciers and their accompanying

Victoria in 1862. Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.11-15; Oldroyd, p. 8; Hargreaves, p. 66.

⁶⁹ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.7.

⁷⁰ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.7, Hargreaves, p. 66.

⁷¹ The reason for Haast’s shift in support to Agassiz in 1864 will be discussed later in the section. Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.12.

⁷² Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.12.

⁷³ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.15.

⁷⁴ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.15.

⁷⁵ Burrows, p. 123.

⁷⁶ The catalogue of books H.F von Haast sold after his father’s death included works by prominent European glacier scientist and enthusiasts like James Forbes, Charles Lyell, Roderick Murchison, John Tyndall and Henry De la Beche. The names of which he inscribed on the Southern Alps glaciers and peaks as he completed his expeditions. See: Burrows, p. 122, 124.

⁷⁷ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.15.

névé would have become inherently smaller as they fell in altitude, not become larger as the moraines indicated.

The debate about glacier motion between Haast, Hector and Hochstetter closely mirrored the corresponding scientific discussion that took place in Europe regarding glacier motion.⁷⁸ The influence of Darwin's theory of evolution that advocated for much slower changes to the world climate in the 1860s, opened the path for Agassiz's theory that glaciers were solely responsible for creating and depositing glacier debris to be accepted. It would only come to pass in 1864 that the land-ice/theory of glaciation was definitively proved as correct.⁷⁹ At the time, Charles Lyell, the proponent supporter of the drift theory, recanted his theory to acknowledge Agassiz and Darwin's theory in 1863 instead.⁸⁰ A recant that trickled down to the world and New Zealand not long after.

In April 1864, for example, Haast claimed to have reached his own conclusion that land ice from ancient glaciers was responsible for the massive moraines and terraces surrounding the Cameron Glacier.⁸¹ Considering the posthumous catalogue of books Haast owned and *The Geological Evidences of the Antiquity of Man* (the volume Lyell published after his recant), his catalogue contained, it is possible Haast corroborated his evidence from the findings written in Lyell's publication.⁸² Hochstetter, as well, shifted his previous support of the drift theory to acknowledge Agassiz ice-age theory. By following in Haast's footsteps in 1867, Hochstetter reworked the English translation of his book, *New Zealand: Its physical geography, geology and natural history*, to support Agassiz's theory of glaciation.⁸³

Hector's response to Haast accepting proof of Agassiz's theory being present in Aotearoa was somewhat different. He accused Haast of plagiarising his idea regarding the "previous extensive development of glaciers" the former cited in his 1863 paper.⁸⁴ Haast denied this and openly offered evidence to the contrary, stating that his view that glaciers had excavating power and how "from plateau like ranges through glacial action (meaning the action of glaciers) sharp peaks were formed," had already been noted in a paper he read in Victoria before the Royal Society in 1862.⁸⁵ He even offered to let Hector view the general bearings of his report and journal

⁷⁸ Hargreaves, p. 60.

⁷⁹ Oldroyd, p. 7, 11.

⁸⁰ The seminal book Lyell recounted his theory in was *The Geological Evidences of the Antiquity of Man*, published in 1863. Hargreaves, p. 70.

⁸¹ Hargreaves, p. 69, 70.

⁸² Burrows, p. 122.

⁸³ Hargreaves, p. 70.

⁸⁴ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.63.

⁸⁵ The same publication first alluded to in the first exchange of letter between Hector and Haast - *On the Physical Geography and Geology of New Zealand, principally in reference to the Southern Alps*. Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.64.

notes on the formation of the Canterbury Plains he began constructing in 1863.⁸⁶ This however, was not the last academic dispute that would erupt between Haast and Hector; the Sumner Cave Affair from 1874 was also the cause of personal correspondence between the two dwindling into a silence that lasted years.⁸⁷

The fact that the debate regarding glacier motion in New Zealand corresponded so closely to the discussions taking place in Europe shows the considerable influence scientific ideas had on colonial scientists studying New Zealand's glacier environment during the nineteenth century. The evidence Hector and Haast gained through physically observing, recording and theorising about the landscape was meticulously cross-referenced with the publications and theories developed in Europe at the same time.

It would only be in 1867, with Hector's appointment as president and editor of the New Zealand Institute, that the more formal institutionalisation and dissemination of scientific knowledge began to take shape in Aotearoa.⁸⁸ At the time, Hector wielded a certain monopoly over the scientific papers published in New Zealand's *Reports of Geological Explorations* and the *Transactions and Proceedings of the New Zealand Institute*.⁸⁹ The final section of this chapter will discuss the more formalised arguments about glaciers in New Zealand and how scientific papers helped situate Aotearoa in science in a broader global context.

2.3 Glacier Science in the New Zealand Institute's *Transactions and Proceedings*

Much of New Zealand's nineteenth-century glacier history connects to the cross-examination and evolution of existing nineteenth-century European scientific thought. Furthermore, Haast, Hochstetter, and Hector's glacier observations could add New Zealand-specific histories to the broader European discussion of the cryosphere. This section examines how

⁸⁶ Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.63, 64; Oldroyd, p. 13.

⁸⁷ The Sumner Cave Affair happened when the premature results from Haast's excavation on Moa bones was published without Haast's consent by his field assistant Alexander McKay. The paper was then read before the Wellington Philosophical Society by Hector, its president. The Wellington Philosophical Society, established in 1851 by Sir George Grey would eventually be incorporated under the New Zealand Institute Act of 1867 (the original name of the Royal Society of New Zealand) – to be further discussed in Section 2.3 of this chapter. 'Wellington Philosophical Society', *National Library of New Zealand* (2024) <<https://natlib.govt.nz/records/22358153>> [accessed 12 August 2024]; Francis Reid, 'The Sumner Cave Controversy Reconsidered: Provincialism, Identity and 'Colonial'', *New Zealand Journal of History*, 43.1(2009), 18-38, <https://www.nzjh.auckland.ac.nz/docs/2009/NZJH_43_1_02.pdf>, [accessed 27 June 2024] (p. 20); Nolden, Burns and Nathan, *The Correspondence of Julius Haast and James Hector, 1862-1887*, p.4,5.

⁸⁸ Charles Flemming, *Science, Settlers and Scholars: The Centennial History of the Royal Society of New Zealand* (Wellington: Wright & Carman Ltd, 1987) p. 17.

⁸⁹ Flemming, p. 17.

New Zealand glacier knowledge was disseminated in formal scientific publications before reaching international audiences. In doing so, the section addresses the gap identified by James Secord, who argued that the common belief that specialized knowledge flows from distinct sites of production to the general public overlooks the more nuanced ways scientific knowledge was transformed locally.⁹⁰ Therefore, tracing the way knowledge circulated to New Zealand and back again, New Zealand glacier research tentatively entered into the international networks of exchange before and after the establishment of the *Transactions* and *Proceedings* of the New Zealand Institute.

One of the first instances of New Zealand glacier knowledge being disseminated in formalised print comes from Ferdinand von Hochstetter in 1860. When the Austrian geologist left Nelson and his work with fellow geologist Julius von Haast to return home in 1859, the correspondence between Haast and Hochstetter often circulated not only scientific specimens and ideas but also new glacier publications beyond New Zealand borders. In 1863, Hochstetter set a precedent for relaying knowledge about New Zealand glaciers to the public in his multi-disciplinary publication, *Neu-Seeland*. At the time, Hochstetter asked Haast to write the chapter on the Southern Alps for his new book.⁹¹ The completed work, containing over five-hundred pages of meticulous research about the natural history, geology and botany of the country, was circulated across international waters through the connection the Hochstetter had with Haast.

In a letter addressed to Haast geologist, Hochstetter noted that a total of thirteen copies of the book had been shipped to Auckland, Nelson and Haast himself.⁹² One was signed and intended for his friend and the rest Hochstetter states, “I am sending...so that you may do with them what seems most fitting.”⁹³ At the time, Hochstetter also lamented not being able to send a copy to the New Zealand Society in Wellington because of the cost it would incur.⁹⁴ Several copies were specifically set aside for the New Zealand Government, Nelson, Auckland and the politician Sir David Monro.⁹⁵ Although Hochstetter’s book circulated among the scientific elite, it also opened the possibility for his studies to reach the public through reading rooms and libraries.

When tracing the circulation of similar glacier knowledge in reverse, the record of Southern Alps study glaciers also made their way beyond national borders to be read before prestigious international science societies. For example, Haast’s publication Notes on the

⁹⁰ James Secord, ‘Knowledge in Transit’, *Isis*, 95.4 (2004), 654-572, <<https://doi.org/10.1086/430657>> [accessed 25 March 2025] (p. 667).

⁹¹ Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 58.

⁹² Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 92-93.

⁹³ Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 93.

⁹⁴ Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 93.

⁹⁵ Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*, p. 93.

Mountains and Glaciers of the Canterbury Province contributed to international glacier knowledge that in the Southern Alps:

No link is missing to show us that the formation of these magnificent Alpine lakes is due to the former extension of the present glaciers, which now form the feeders of these lakes, and we can follow the former lateral moraines to the altitude, where, in the glacial period, an [sic] uniform sheet of ice covered these mountain masses...⁹⁶

In contrast, James Hector's encounter with glaciers in his expedition of the West Coast at roughly the same time, similarly recorded in the *Proceedings of the Royal Geographical Society*, spoke much less about glaciers than Haast.⁹⁷ Although Hector mentioned glaciers in passing, as opposed to Haast's more detailed size and altitude accounts, the formal report did record some of the botany, zoology and geological details that Hector observed along the boundary of Otago and Canterbury.⁹⁸ The reason for the disparity between the two articles, I believe, was because Haast's article was published in the Royal Geographical Society's *Transactions*, whereas Hector's was recorded in the *Proceedings*. In short, the summary of Hector's paper was done through the hands of another individual as opposed to Haast's paper that was written by his own hand.

In Aotearoa, a similar approach to sharing scientific knowledge emerged through a network of learned peers, utilizing annual summaries and journal publications. Consequently, the establishment of the New Zealand Institute in 1867 added credibility to the intellectual papers and studies that were being produced in the colony. According to Ruth Barton, the New Zealand Institute would have given the readers of their *Transactions* "the impression that the natural sciences dominated" in New Zealand.⁹⁹ In contrast, the "fragmentary *Proceedings*", responsible for recording the minutes of local meetings, would have conveyed the "impression of more varied, less straightforwardly scientific, activity" that emerged from New Zealand.¹⁰⁰ As such, where the scientific papers regarding glaciers ended up being published was vital to making New Zealand's scientific glacier history visible to both the nineteenth century scientific elite and later, the wider public.

⁹⁶ Julius von Haast, 'Notes on the Mountains and Glaciers of the Canterbury Province, New Zealand', *The Journal of the Royal Geographical Society of London*, 34 (1864), 87–96, <<https://doi.org/10.2307/1798467>> (p. 92).

⁹⁷ James Hector and James McKerrow, 'Expedition to the West Coast of Middle Island, New Zealand (Otago Province): Survey of the Lake Districts of the Province of Otago', *Proceedings of the Royal Geographical Society of London*, 8.2 (1863), 46–50, <<https://doi.org/10.2307/1799456>>;

⁹⁸ Hector and McKerrow, p. 47–49.

⁹⁹ Ruth Barton, "'Not Merely a Scientific Society": The New Zealand Institute and Its Affiliates c.1868–1900', *Journal of the Royal Society of New Zealand*, 47.1 (2017), 33–40, <<https://doi.org/10.1080/03036758.2016.1207680>> (p. 33).

¹⁰⁰ Barton, p. 33.

More generally, the initial reason the New Zealand Institute was established in 1867 was in accordance with the *New Zealand Institute Act* that was voted into government earlier that same year. At the time, the New Zealand government stated it would hold a board of directors responsible for establishing an “Institute for the advancement of Science and Art in New Zealand.”¹⁰¹ In addition to being charged with building a public national museum, library and laboratory, the institute was tasked with carrying out lectures and the cultivation of “various branches and departments of art, science, literature and philosophy.”¹⁰² James Hector was appointed as the manager of the New Zealand Institute and had the secondary task of distributing the *Transactions and Proceedings* to the society’s active members.¹⁰³ As the beginnings of a network where national knowledge was exchanged, the journal united the advent of Aotearoa science, art, geology, history and literature into a cohesive whole.

At the time, Hector collected selected scientific papers from the academic fields of geology, chemistry, botany and zoology that was written specifically by New Zealand settlers during the nineteenth century.¹⁰⁴ The majority of the works Hector collated were already distilled from papers and lectures that had been presented to other New Zealand science societies.¹⁰⁵ Hector’s own article that discussed the link between glacier moraine drifts and gold in Otago, for example, was created from a series of lectures he delivered at the Colonial Museum in 1869.¹⁰⁶ Arthur Dobson, on the other hand, conducted a survey expedition that found traces of glaciation in Nelson. His article in the fourth volume of the *Transactions of the New Zealand Institute* was derived from a paper he read before the Nelson Association for the Promotion of Science and Industry in 1871.¹⁰⁷ These papers represented a vital link to how glacier knowledge was formalized, printed, and made more accessible to other scientists in New Zealand.

Theories about local glaciers from eminent nineteenth century New Zealand scientists James Hector, Julius von Haast, Joseph Hooker (1817-1911), James McKerrow (1834-1919), Arthur Dobson (1841-1934) and Frederick Hutton (1836-1905), were often conveyed in the

¹⁰¹ *New Zealand Institute Act*, 1867, No. 36, Preamble.

¹⁰² *New Zealand Institute Act*, Preamble; Flemming, p. 17.

¹⁰³ Flemming, p. 17.

¹⁰⁴ Jean Fleming and Jeremy Star, ‘The Emergence of Science Communication in Aotearoa New Zealand’, *Journal of Science Communication*, 16.3 (2017), pp. 1 – 19 <<https://doi.org/10.22323/2.16030202>>, (p. 5); Barton, p. 34.

¹⁰⁵ Other scientific societies included the New Zealand Geological Survey, the Colonial Museum, the Wellington Photophysical Society, Philosophical Institute of Canterbury and Literary and the Scientific Institution of Nelson to name a few. See: Alexander H. McLintock, ‘Science – History and Organisation in New Zealand’, in *Te Ara - the Encyclopaedia of New Zealand* (originally published in 1966) <<https://teara.govt.nz/en/1966/science-history-and-organisation-in-new-zealand>> [accessed 4 May 2025]; Barton, p. 35.

¹⁰⁶ James Hector, ‘On Mining in New Zealand’, *Transactions and Proceedings of the Royal Society of New Zealand*, 2(1869), 361-384, (p. 372).

¹⁰⁷ Arthur Dobson, ‘On the Traces of Ancient Glaciers in Nelson Province’, *Transactions and Proceedings of the Royal Society of New Zealand*, 4(1871), 336-341.

National Institute's *Transactions and Proceedings*. Arthur Dobson, for example, insisted that the Nelson mountain range reflected similar evidence of past glaciation that Haast found in the Southern Alps.¹⁰⁸ Travers, on the other hand, claimed that the Pleistocene era of glaciation was much older than Hector and Haast argued in their earlier papers.¹⁰⁹ This shows that the local cycle of debate was constantly in flux and circulated from idea to proof to debate and back again.

The reason the communication of science knowledge existed in New Zealand, according to Jean Fleming and others, was because scientists “reported their findings both to the NZ Government and back ‘home’.”¹¹⁰ A viewpoint that is emphasised by Ruth Barton stating that the “cultural practices of scientific publishing and scientific societies in Australia and London, and perhaps in Paris” laid the foundation for the New Zealand Institute’s own methods and practices.¹¹¹ By considering Tony Ballantyne’s work on settler communities in Aotearoa, Barton writes that “although New Zealand’s colonial communities were small...they were internationally networked” and “better informed about international than national events.”¹¹² Among the exchange of books and scientific journals, newspapers also included glacier knowledge that was shared between like-minded peers such as Hochstetter and Haast.¹¹³

The knowledge of Aotearoa glaciers that Victorian scientists created, similarly, navigated international borders through members of the New Zealand Institute. Louis Agassiz himself, then professor of zoology and geology at Harvard College in Boston, was awarded membership to the New Zealand Institute in 1874. In his congratulatory letter to James Hector in 1871 that was read before the Wellington Institute of Philosophy (an affiliate of the New Zealand Institute), he praised his copy of the *Transactions* as “more instructive, and better put together, than the proceedings of most learned societies of a long standing.”¹¹⁴ Agassiz even pointed out that there was no brighter indication of progress in a “modern civilization” than the collation and publication of a country’s scientific progress.¹¹⁵ The advancement of glacier knowledge reflected in the pages of the *Transactions and Proceeding of the New Zealand Institute* during the mid-nineteenth century,

¹⁰⁸ Arthur Dobson, ‘Art. LXII—on the Traces of Ancient Glaciers in Nelson Province.’, *Transactions and Proceedings of the Royal Society of New Zealand*, 4 (1871), 336-341.

¹⁰⁹ William Thomas Locke Travers, ‘Art. LXVIII. —Notes on Dr. Haast’s supposed Pleistocene Glaciation of New Zealand’, *Transactions and Proceedings of the Royal Society of New Zealand*, 7 (1874), 409-440.

¹¹⁰ Jean Flemming and others, ‘Aotearoa New Zealand: Participatory science and bicultural knowledge communication’, in *Communicating Science: A Global Perspective*, ed. by Toss Gascoigne and others (Canberra, ANU Press, 2020), pp. 71-102 (p. 74), JSTOR Autoholdings Books <<https://www.jstor.org/stable/j.ctv1bvntz>> [accessed 9 August 2024].

¹¹¹ Barton, p. 34.

¹¹² Tony Ballantyne, *Webs of Empire: Locating New Zealand’s Colonial Past* (Vancouver: UBC Press, 2014), in Barton, p. 37.

¹¹³ Nolden, *The Letters of Ferdinand von Hochstetter to Julius von Haast*.

¹¹⁴ Wellington Philosophical Institute, ‘Letter from Professor Agassiz’, *Transactions and Proceedings of the New Zealand Institute*, 4 (1871), 377-378, (p.377).

¹¹⁵ Wellington Philosophical Institute, p. 377.

therefore, circulated among the larger European network of scientific knowledge. The study of Aotearoa glaciers was constantly in communication with various forms of knowledge and ideals that trickled down from Europe before being refined by newer ideas and research.

Conclusion

This chapter highlights that the creation of New Zealand glacier knowledge was heavily influenced by the ideas and theories that circulated and evolved from mainstream glacier science ideas that originated from Europe. Although this is a standard practice in the evolution of imperial science, in New Zealand, the scientific theories of glacier motion by Horace-Bénédict de Saussure, Jean de Charpentier, Louis Agassiz and James David Forbes were deemed necessary enough to be featured in one of the first local publications about glaciers. Furthermore, in 1856, Charles Darwin used the evidence of erratics in the Southern Alps that Charles Mantel shared with him in London to prove that past glaciation evidence existed in the Southern Hemisphere.

The mainstream intellectual knowledge about glaciers in New Zealand further evolved from circulating new ideas and research through personal and professional networks of communication that pioneer scientists cultivated with their national and international peers. The circulation of big debates on Agassiz's theory of glaciation and Lyell's drift theory was similarly reflected in the letters exchanged between Julius von Haast, Ferdinand Hochstetter and James Hector. Their own debate closely mirrored the one unfolding in the Northern Hemisphere. The reason for this parallel was that individual scholars and scientific communities in the newly established New Zealand colony were better connected to international networks of information exchange than national ones.

However, the institute of study found in Wellington in 1867, with the passing of the *New Zealand Institute Act*, was a more nationally networked platform where local glacier knowledge and formal papers could be studied, subsumed and argued between local scholars. As the example of the *Transactions and Proceedings of the National Institute* shows, knowledge of New Zealand glaciers also travelled abroad through international members of the institute. Furthermore, some New Zealand scholars like Julius von Haast had their work disseminated overseas in international scientific journals.

Equating science as the sole viewpoint of knowledge that was exchanged about glaciers in New Zealand during the nineteenth century is too singular, however. My next chapter explores the way specialised glacier knowledge was converted and communicated through more accessible publication to the wider New Zealand public.

Chapter 3:

Glaciers, Travel and Romanticism in New Zealand Print

A considerable part of Aotearoa’s nineteenth-century glacier knowledge can be found in the well-documented newspaper articles, books, journals and magazines that settlers, explorers, scientists and tourists penned about their interaction with the environmental phenomenon. Much like the philosophical ideals of the Enlightenment influenced scientists to rationalise nature, the aesthetic appreciation of nature that emerged from the Romantic era also inspired the way individuals wrote about and imagined New Zealand glaciers. By definition, Romanticism is a philosophical movement that emerged during the late 18th and 19th centuries in Europe and prevailed through the expression of emotion, passion and individuality rather than scientific order.¹ According to Ferdinand Braudel and later affirmed by James Beattie, Romanticism was more a ‘mood’ than a philosophical movement that saw nature through a combination of calculated intelligence and “warm, troubled, emotion.”² Another notable idea that emerged from Romanticism was the public perception of the ‘sublime’— a pervasive cultural construct William Cronon defined as humans “being reminded of one’s own mortality” by encountering stark places of nature.³

The two main ways glacier knowledge was generated before being disseminated to the public during the nineteenth century were through travel writing and the publication of newspapers, periodicals and gazettes. Travel writing is a multipurpose genre that includes work from “settler narratives, anthropological essays, accounts of exploring territories unmapped by Europeans, scientific notebooks and the conclusions [*their writers*] produced.”⁴ The genre’s ultimate purpose is to generate knowledge about the traveller’s “encounters with people, built

¹ *Oxford English Dictionary* (Oxford: Oxford University Press, 2024),

<<https://doi.org/10.1093/OED/6490478251>> [accessed 28 October 2024] s.v. Romantic, 7, adj.

² Incorporated in Beattie’s definition is Ferdinand Braudel’s interpretation of Romanticism. Braudel claims the Romantic era “coloured people’s minds and feelings over a long, troubled difficult period” after Europe’s economic recession from 1817 to 1852. See: Ferdinand Braudel, *A History of Civilizations* (New York, Penguin Books, 1993) p. 25, 26; James Beattie, ‘Fashioning a Future Part II: Romanticism and Conservation in the European Colonisation of Otago, 1840–60’, *International Review of Environmental History*, 7.2 (2021), 97–124, <<https://ezproxy.waikato.ac.nz/login?url=https://www.proquest.com/scholarly-journals/fashioning-future-part-ii-romanticism/docview/2615451889/se-2?accountid=17287>> [accessed 29 October 2024] (p. 99).

³ William Cronon, ‘The Trouble with Wilderness: Or, Getting Back to the Wrong Nature’, in *Out Of The Woods: Essays in Environmental History*, ed. by Char Miller and Hal Rothman (Pittsburgh: University of Pittsburgh Press, 1997), pp. 28–50 (p. 31, 32, 35), JSTOR <<https://doi.org/10.2307/j.ctt7zw9qw.8>> [accessed 12 June 2024].

⁴ Andrea Kaston Tange, ‘Chapter 41: Travel Writing’, in *The Routledge Companion to Victorian Literature*, ed. by Dennis Denisoff and Talia Schaffer (Oxfordshire: Taylor & Francis Group, 2019), pp. 473–484 (p. 473), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5975415>> [accessed 12 March 2025].

environments, and landscapes that the author formulates as “foreign,”” and allow their readers to devour another individual’s “discoveries, adventures, perils, curiosities, and encounters.”⁵ This way of writing is often represented in the articles, reports and lectures recorded in Aotearoa’s nineteenth century popular print.

The purpose of this chapter is to unravel the way nineteenth-century authors, reporters and diarists expressed Romantic ideas about New Zealand glaciers through a more accessible form of writing. I argue, in parallel to Mark Carey, that glaciers and the glaciated landscape exemplified aspects of the ‘sublime’ in Aotearoa and that glaciers became part of “a new view of the natural world in which Nature could be great though horrible, scary though appealing, repulsive though enticing.”⁶ In other words, the more accessible public knowledge of glaciers in New Zealand newspapers, books and gazettes echoed the same sense of eeriness and awe that situated the frozen environment as part of the Romantic sublime.

I also maintain that that the way glaciers and the high alps of Te Waipounamu were viewed by Europeans during the nineteenth century carries a parallel to Mike Boyes and Susan Mackenzie’s concept that mountain tourism in the 1800s evoked a sense of “wildness and beauty” to foreign visitors.⁷ In addition to promoting the alpine environment, sublime encounters with glaciers and the natural beauty of the South Island can be considered a way New Zealand was put “on show” for the rest of the world.⁸ Lydia Wevers, similarly, argued that writing, during the late-eighteenth and early-nineteenth centuries in New Zealand delineated geographies of power between Indigenous and non-Indigenous people.⁹ The study of printed material that travellers, scientists and reporters generated about glaciers is, therefore, vital to linking glacier knowledge to a more multilayered narrative.

This chapter is split into two sections, each focusing on a different genre of writing that was used when circulating glacier knowledge to the wider New Zealand public. The first examines the way glaciers were observed in nineteenth century colonial newspaper, local gazette and magazine articles written by adventuring tourists, mountaineers, travellers and scientists. By

⁵ Tange, p. 475, 481.

⁶ Mark Carey, ‘The History of Ice: How Glaciers Became an Endangered Species’, *Environmental History*, 12.4 (2007), 487-527 <<https://www.jstor.org/stable/25473130>> [accessed 10 March 2024] (p. 503).

⁷ Mike Boyes and Susan Houge Mackenzie, ‘Concepts of the wilderness experience and adventure mountaineering tourism’, *Mountaineering Tourism*, ed. by Ghazali Musa, James Higham and Anna Thompson- Carr (London: Routledge, 205), pp. 66 – 84 (p. 69), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3569264>> [accessed 4 September 2024].

⁸ Lydia Wevers, *Country of Writing: Travel Writing and New Zealand 1809-1900* (Auckland: Auckland University Press, 2002) p. 2, 3.

⁹ Double citation: J.R Jackson, *What to Observe, Or The Traveller’s Remembrancer*, ed. by Dr. Norton Shaw [3rd Edition] (London: Houlston and Wright, 1861), p. vii, in Lydia Wevers, *Country of Writing: Travel Writing and New Zealand 1809-1900* (Auckland: Auckland University Press, 2002) p. 2, 3.

embellishing glacier knowledge with elements of the sublime, the authors of the easier distributed publications would have simultaneously attracted more interest to New Zealand's natural environment and made the more complex scientific argument regarding glaciers more accessible to readers outside the network of the learned elite.

The second half of the chapter considers the way glaciers were written about by the more notable travellers and scientists such as William Spotswood Green, Julius von Haast and Malcolm Ross. Their personal publications, in the form of well-researched monographs, united a dualistic Romantic and Enlightenment viewpoint that combined elements of scientific research and their personal reflections about glaciers. Accordingly, New Zealand's frozen environment became seen as an engaging subject often painted in great detail through verbose and analytical description. The complex genres that made up travel writing, therefore, reflected glaciers as part of New Zealand's nineteenth century sublime landscape.

3.1 Glaciers in Nineteenth Century New Zealand Press

Newspapers, magazines and gazettes established in Aotearoa during European colonisation played a multitude of roles in disseminating selected information to the public. The content of newspapers largely determined the type of glacier knowledge that circulated inside and outside Te Waipounamu's settler community. According to Tony Ballantyne, print media helped shape important networks of exchange that reached beyond national borders. The establishment of newspapers in Aotearoa also connected the growing colony to "global systems of information exchange."¹⁰ Ian Grant similarly argues that "short of personal conversations, posters and handbills, the sole method of providing a community with news and information" was through the colonial press.¹¹ Newspapers often recorded local discoveries, shipping logs and general intelligence on the state of New Zealand. Newspapers also reflected "developments within the Empire" back to Europe.¹²

According to Reginald Tye, the circulation of New Zealand newspapers during the early nineteenth century was somewhat limited. He stated that "given the composition of immigration and an inherent class structure," the cost of publication and newspaper copy price often made them

¹⁰ Tony Ballantyne, *Webs of Empire: Locating New Zealand's Colonial Past* (Vancouver: UBC Press, 2012) p. 42, ProQuest eBook Central
<<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3412915>> [accessed 12 June 2024].

¹¹ Ian Grant, *Lasting Impressions: The Story of New Zealand's Newspapers, 1840-1920* (Masterton: Fraser Books, 2018), p. ix.

¹² Ballantyne, p. 42.

“out of reach of the labouring class.”¹³ Grant, on the other hand, argued that the way news was collected for new articles often involved stark competition between rival publications. Acting editors and journalists, he stated, took part in rowboat races across colonial harbours to be the first to gather overseas newspapers from arriving ships.¹⁴ From there, the winners would race back to shore to publish the international news.¹⁵ Inversely, the system also included newspapers published in New Zealand circulating beyond national borders in the same manner. Publishers would give New Zealand newspapers to ship captains and instruct them to exchange their haul for other international papers at their next “port-of-call.”¹⁶

Before telegraph lines were established in New Zealand in the early 1860s, newspapers were one of the main ways news was transmitted among the public (bar letter exchanges).¹⁷ Tye also argued that the “improved communication by road and rail, less class-oriented subject matter, greater leisure, ready access to more sophisticated printing presses, a corps of entrepreneurial journalists, daily publication, reduction in price, postal concessions, and a rise in news agency” contributed to a boom in newspaper publication and readership in Aotearoa.¹⁸ Chief among those was the rise in literate readership where statistics placed literacy from 63% in 1858 to a considerable 89% in 1886.¹⁹ The circulation of glacier knowledge contained in newspapers, therefore, would have reached a wider readership because of more stable community infrastructures, working roads, printing presses, post offices, railways and ordered shipping.

An example of the accelerated speed of communication from Europe to New Zealand that came into effect in 1869, was the opening of the Suez Canal. Usually, a single trip from Europe to Australia and subsequently New Zealand, took up to three months. However, by cutting through the Mediterranean Sea, the travel time could be reduced to four weeks.²⁰ Steam-powered, ocean-

¹³ Reginald Tye, ‘New Zealand’, in *Periodicals of Queen Victoria’s Empire: An Exploration*, ed. by Don Vann and Rosemary van Arsdel (Toronto: University of Toronto Press, 1996), pp. 203-240 (p. 203), JSTOR <<https://www.jstor.org/stable/10.3138/9781442678361.8>> [accessed 12 March 2025].

¹⁴ Grant, p. x.

¹⁵ Grant, p. x.

¹⁶ Grant, p. 6.

¹⁷ The first telegraph line in Aotearoa was laid between Lyttelton Harbour and Christchurch that same year and would soon see Port Chalmers and Dunedin linked just a few weeks later. It would only be several years later, however, that the connection between the North and South Islands would be established in 1866 by laying a cable across Cook’s Strait. See: Ron Palenski, *The Making of New Zealanders* (Auckland: Auckland University Press, 2012), p. 18-19, p. 21, 22, ProQuest eBook Central <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=1531099>> [accessed 2 November 2024]; A. C Wilson, ‘Telecommunications - Early telegraphy and telegrams’, in *Te Ara - the Encyclopaedia of New Zealand*, <<https://teara.govt.nz/en/telecommunications/page-1>> [27 October 2024]; Grant, p. 6.

¹⁸ Tye, p. 211.

¹⁹ Tye, p. 212.

²⁰ Tamson Pietsch, *Empire of Scholars: Universities, Networks and the British Academic World, 1850-1939* (Manchester University Press, 2013), p. 29, ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=4083627>> [accessed 20 June 2024].

going, vessels also shortened the amount of time international ships spent at sea.²¹ Therefore, when it came to interprovincial travel in New Zealand during the 1870s, the introduction of steamships that travelled from the North Island to the South Island meant faster travel from port to port rather than lengthy inland travel that was completed on foot, by horse or canoe.²²

Aotearoa's nineteenth century newspapers contain an abundance of written reports, articles and recorded lectures regarding glaciers found in Kā Tiritiri o te Moana. The earliest traceable mention of a glacier in New Zealand can be found in a copy of the *Mary Louisa's* 1859 shipping log that was reported in the *Lyttelton Times*. Her crew carefully observed Ka Roimata o Hine Hukatere, a then 'nameless' glacier that was spotted thirty miles from shore. They wrote:

We saw what appeared to be a long streak of mist running from between the two peaks which form the summit of the mountains. Upon a nearer approach, we concluded it must be a glacier. At noon, abreast of Mount Cook, close in shore, we could see distinctly that it was an immense field of ice, entirely filling up the valley formed by the spurs of the twin peaks, and running far down into the low land.²³

The reason Ka Roimata o Hine Hukatere's existence was reported at that time, according to Lynley Hargreaves, was because the *Mary Louisa's* expedition in search of viable land for more sheep runs in Te Tai Poutini/West Coast came up empty-handed.²⁴ The discovery of a pristine glacier visible miles from shore seemed far more interesting news than simply reporting the schooner's failed expedition to locate usable land for animal husbandry. With the article situated among shipping news, questions about the debate of constructing a railway from Lyttelton to Christchurch and a list of unclaimed letters, the report Ka Roimata o Hine Hukatere was still only minor page three news. Over the next two years, there is a silence regarding New Zealand glaciers.

However, the topic seemed to gain more prominence when Julius von Haast was appointed as Canterbury's Provincial Geologist during the 1860s. A slightly more visible instance of glacier knowledge found in local news is Dr Julius von Haast's 1861 lecture regarding his explorations in the Southern Alps. According to Bruce Hevly, another element of studying glaciers during the nineteenth century was heroism. He writes that "elements of direct action, lonely commitment, and

²¹ Pietsch, p. 29.

²² André Brett, 'Floods and Railways in Nineteenth Century New Zealand', *New Zealand Journal of History*, 53.2 (2019), 5-31, <<https://muse.jhu.edu/article/883339/pdf>> [accessed 13 October 2024] (p. 5).

²³ 'Local Intelligence', *Lyttelton Times*, 6 July 1859, p. 4.

²⁴ As note on the side: Though both Hargreaves and Trevor Chinn argued the *Lyttelton Times* article was the first publication of a New Zealand glacier, I would like to note that the article was not the first publication in New Zealand about glaciers (as evidence of the 1850 article published in the *New Zealand Evangelist* dealing with glacier theories has shown). See: Lynley Hargreaves, *Vanishing Ice: Stories of New Zealand's glaciers* (Nelson: Putton & Burton, 2022) p. 25; Trevor Chinn, 'Glaciers of New Zealand', in *Satellite Image Atlas of Glaciers of the World*, ed. by Richard S. Williams and Jane G. Ferrigno (Denver: U.S Geological Survey, 1988) USGS <<https://pubs.usgs.gov/pp/p1386h/nzealand/nzealand.html#observation>> [accessed 26 October 2024].

manly risk” shaped the way glacier motion was debated.²⁵ Furthermore, although nineteenth century field sciences often represented “a shift away from the romantic or impressionistic elements of natural history,” prominent glacier scientists such as Tyndall and Forbes did not observe such a “neat division between science and romanticism.”²⁶ Rather, they combined elements of the two opposing ways of thought. Haast, himself, created a similar parallel by merging both aesthetic Romanticism and the rigorous study of glaciers in the antipodes.

The report of Haast’s lecture that was given at the Christchurch Mechanics Institute and Lyttelton Town Hall in 1861, for example, contained elements of both rigorous scientific study and Romantic description.²⁷ When ascending the Havelock valley, Haast extolled that “peak above peak and pinnacle above pinnacle are seen covered with snow, above which again tower, rugged brown rocks in the boldest and most fantastic forms.”²⁸ Furthermore, Haast also declared numerous alpine peaks pierced the bright blue sky with glimmering “molten silver” glaciers.²⁹ By openly reenumerating that “it was not without a feeling of awe that I stood thus in the lonely wilderness gazing in admiration at one of the most beautiful phenomena of nature,” Haast perfectly reflected Carey and Cronon’s definition of what nineteenth century romanticists conveyed when observing harsh, isolated, landscapes.³⁰ Haast’s lecture, when published, would have introduced the public to the idea that glaciers were both a reflection of awe-inspiring nature and subject to scientific study.

The other turning point that generated public interest in Southern Alps glaciers the promotion of leisure travel in the mountains during the 1860s and 1870s. According to Lee Davidson, tourism in the nineteenth century provided an opportunity to sell the idea of New Zealand as an attractive place with “mountain scenery” that could be “envisaged as a key drawcard for prospective visitors.”³¹ She further argues that various forms of promotional material “emphasising Romantic and sublime qualities, and the sense of accessible adventure” was part of enticing travellers to explore New Zealand mountains.³² The *Otago Witness*, for example,

²⁵ Bruce Hevly, ‘The Heroic Science of Glacier Motion’, *Osiris*, 11(1996), 66-88
<<https://www.jstor.org/stable/301927>> [accessed 2 July 2024] (p. 66).

²⁶ Havly, p. 84.

²⁷ Considering I analysed the Enlightenment era and Haast’s scientific discoveries in Chapters 1 & 2, I will only be focusing on the Romantic elements of his writing in this case. ‘A Lecture’, *Lyttelton Times*, 12 October 1861, p. 5; Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005), p. 51.

²⁸ ‘Lecture’, *Lyttelton Times*, 23 October 1861, p. 4.

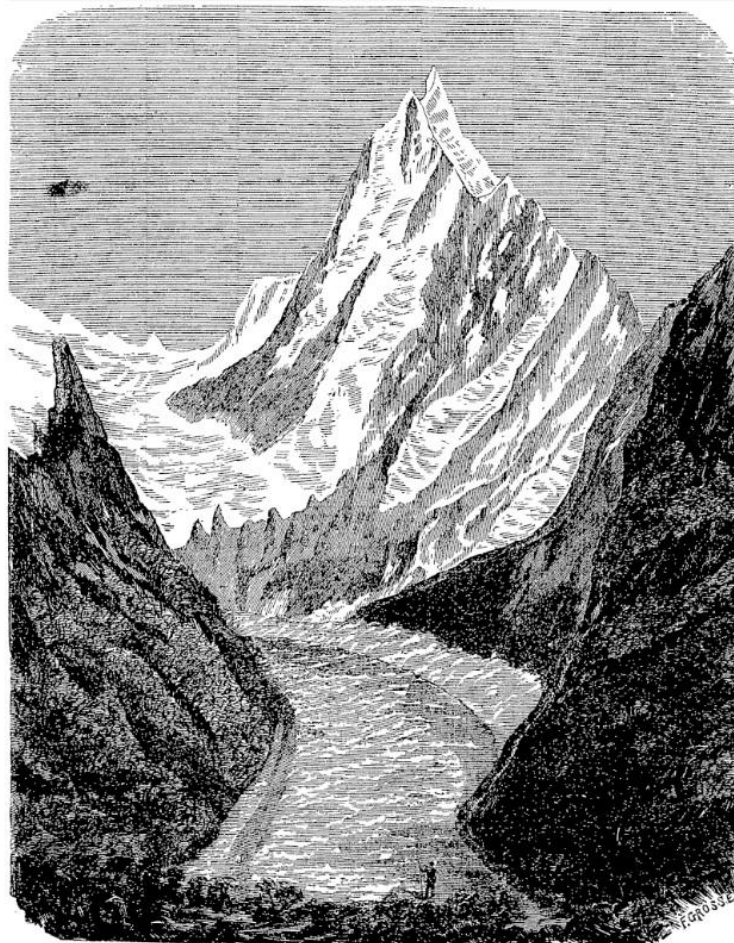
²⁹ ‘Lecture’, *Lyttelton Times*, p. 4.

³⁰ For the sake of the argument, I will repeat Carey and Cronon’s argument reviewed in the Chapter introduction. Carey labelled glaciers as examples of the ‘sublime’, a mood or lens through which Nature can be both terrifying and awe-inspiring. A view Cronon expressed allowed the ‘wilderness’ to be seen as a place where traveller’s scientist’s and explorers were confronted with their own mortality. ‘Lecture’, *Lyttelton Times*, p. 4. Carey, p. 503; Cronon, p. 35.

³¹ Lee Davidson, ‘Seeing Differently: Understanding Pakeha Constructions of Mountain Landscapes in Aotearoa’, *Public History Review*, 29 (2022), 96 - 113 <<https://doi.org/10.5130/phrj.v29i0.8199>> (p. 102).

³² Davidson, p. 102.

published an illustrated front page report about the Hooker Glacier with emphasis on its sublime appearance in 1864. By featuring the natural draw that a towering, snow-capped, mountain and stupendous ice field represented to the public, Frederic Grosse's woodblock illustration created a sense of awe around the glacier's imposing size.³³



THE HOOKER GLACIER, MOUNT COOK, NEW ZEALAND.

Fig. 4: Frederic Grosse (1828-1894), *The Hooker Glacier, Mount Cook, New Zealand*, engraving/newspaper illustration, 1864, from *The Otago Witness*, 20 August 1864. Copyright Expired

The article that accompanied the illustration extolled the vividness of the scenery, stating that “clothed with snow” the summit of the mountain “stretches in a vast field at the head of the glacier, which, like a solid river, fills up the ravine and is destined ultimately to effect wonderful

³³ Note: the figure in the lower right corner of the illustration, showing the smallness of man, was common in sublime paintings during the Romantic era. Evidence of which, I will be analysing further in Chapter 4 of this thesis. As an aside, Frederic Grosse was an Australian engraver and vigneron from Prussia that lived in Melbourne from 1854 to 1868 and created many woodblock prints for illustrated periodicals. See: Peter Dowling, 'Grosse, Frederick (1828–1894)', *Australian Dictionary of Biography*, <<https://adb.anu.edu.au/biography/grosse-frederick-12955/text23415>> [accessed 2 April 2025]; Frederick Grosse, *The Hooker Glacier, Mount Cook, New Zealand*, newspaper illustration, from *The Otago Witness*, 20 August 1864, p.1; 'The Hooker Glacier', *Otago Witness*, 20 August 1864, p. 1.

changes in the physical structure of the district.”³⁴ By referencing the way the glacier will undoubtedly change the landscape, the article includes a subtle nod to Agassiz’s recently accepted theory of glaciation. Further suggesting travel to the glacier, the article also claims “those who for the sake of health or relaxation seek change of scene will find objects of surpassing interest in these Alpine ranges.”³⁵ The woodblock print, accompanied with an enticing, sublime, description of the Hooker Glacier would have introduced readers of the newspaper to the idea that glaciers were an undeniable part of the Southern Alps’ landscape and a point of interest to observe when travelling through the mountain on foot or by horse.

Beyond reports on scientific lectures, papers and survey expeditions in the Southern Alps, newspaper articles also reviewed the occasional travel book, mountaineering triumph or important travel narrative. For example, a review in the *Otago Witness* of *Spangles and Sawdust* contained a detailed excerpt of a circus performer encountering a glacier near Martin’s Bay. The author, Robert Whitworth, wrote the following:

On both sides of us were lofty ranges, shooting up their peaks into- the sky, and covered with masses of ice that might have been there for centuries. As we lay wrapped up in our blankets at night, we can hear the echo of the voices of these dead giants, as from their hoary scalps the avalanche fell, thousands of tons, it might be, of ice, and drifted snow, and rocks, and mighty trees, crashing into the low-lying valleys with what, to us, was a dull, solemn, solitary boom.³⁶

The excerpt also claimed that “when the moon rose, and came sailing across the dark firmament” the storyteller’s soul was “filled with thoughts of the sublime.”³⁷ With such an account linking New Zealand glaciers to the idea of the sublime, other newspaper articles regarding travel close to the natural phenomenon contained repeated accounts of glaciers as grand landscapes of ice defined by the strange duality of fear and awe. Governor George Bowen’s visit to Mount Cook’s glaciers in 1873 created a similar parallel.

Although, Bowen’s account was more scientifically descriptive than romantic in prose, his article compared the surface of the Hooker glacier to “a country which had been violently tossed by earthquake forces” and caused the icefield to expel large rocks and debris in the form of avalanches.³⁸ Regardless of the matter-of-fact description he adopted to observe his surroundings,

³⁴ ‘The Hooker Glacier’, *Otago Witness*, 20 August 1864, p. 1.

³⁵ ‘The Hooker Glacier’, *Otago Witness*, p. 1.

³⁶ ‘Review’, *Otago Witness*, 7 September 1872, p. 4.

³⁷ ‘Review’, *Otago Witness*, p. 4.

³⁸ George Bowen, Governor to New Zealand from 1867 to 1873, played a vital role in eliminating the threat of a full-scale conflict during the New Zealand war. Instead, he worked to reconcile the conflict with the Māori King. The trip he took in 1873 took place a month before he would take over as Governor in Victoria. See: W. P. N. Tyler, ‘Bowen, George Ferguson’, *Te Ara - the Encyclopaedia of New Zealand*, <<https://teara.govt.nz/en/biographies/1b27/bowen-george-ferguson>> [accessed 2 April 2025]; ‘The Governor’s Visit to Mount Cook Glaciers’, *The Press*, 4 February 1873, p. 3.

Bowen also admired the “sublime scenes as long as daylight lasted.”³⁹ Record of the Governor’s trip to the glaciers circulated across four of the South Island’s most important newspapers: the *Press*, *Otago Daily Times*, *Otago Witness* and *Timaru Herald*.⁴⁰ Bowen’s recollection, at the time, reflected the interest and encounter an important figure in the New Zealand Government had with glaciers. His personal account elevated the idea that glaciers were subjects to observe and reflect on when travelling for leisure.

From the 1870s onward, newspapers and illustrated gazettes began to report heroic tales of mountaineers conquering the South Island’s rugged alpine peaks and subsequent glaciers. The purpose of dangerous alpine excursions, according to Malcolm Ross in 1887, was to “glory in the physical regeneration which is the product of our exertions” and “exult over the grandeur of the scenes that are brought before our eyes.”⁴¹ The philosophy of mountain climbing, Ross argued, was to toil because toil begat strength, not only through muscular energy but by engaging with the mind.⁴² At the time, Ross (a respected New Zealand mountaineer in the nineteenth century) reflected what Steven Vine called “Kantian” philosophy— or the “idealist sublime.”⁴³ As part of Romantic era thought, Kantian philosophy promoted “thought over thing, subject over object, mind over matter, interiority over exteriority and self over nature.”⁴⁴ It was a philosophy that would become visible in the 1880s and 1890s media record of glaciers in Aotearoa.⁴⁵

At roughly the same time, articles promoting travel to the Southern Alps glaciers circulated in the *New Zealand Graphic* and *New Zealand Tablet*.⁴⁶ The *New Zealand Graphic*, for example, advertised the Hermitage Hotel, a cob building on Mount Cook erected in 1884, that the manager used to guide travellers onto the ice.⁴⁷ The *New Zealand Graphic* similarly extolled the view of Lake Wakatipu as “glaciers on these mountains...sparkle like diadems under the mid-summer sun.”⁴⁸ Milford Sound, correspondingly, was recorded as being surrounded by “precipices of ice and snow” that rose “one above the other until clouds stop further vision and we can only see in

³⁹ ‘The Governor’s Visit to Mount Cook Glaciers’, *The Press*, p. 3.

⁴⁰ Grant, p. 120, 159.

⁴¹ Malcolm Ross, ‘Among the Glaciers’, *Otago Witness*, 29 April 1887, p. 14.

⁴² Ross, *Otago Witness*, p. 14.

⁴³ Steven Vine, *Reinventing the Sublime: Post-Romantic Literature and Theory* (Liverpool: Liverpool University Press, 2014), p. 1, JSTOR <<https://doi.org/10.2307/j.ctv3029scx>> [accessed 3 November 2024].

⁴⁴ Vine, p. 1.

⁴⁵ Media, in this case, referring to reports found in the different means of mass communication like newspapers, journals, gazettes and magazines. See: OED, s.v. media, n2.

⁴⁶ The *New Zealand Graphic*, as its name suggests is an illustrated weekly publication that was pioneered by Henry Brett’s engraving technology and published from 1890. Grant, p. 145.

⁴⁷ Hargreaves, p. 88.

⁴⁸ ‘Lake Wakatipu no 8: Health and Pleasure Resorts of New Zealand’, *New Zealand Graphic*, 3 February 1894, p. 100.

spirit the everlasting glacier that, many thousand feet above us, forms the summit of the mighty Pembroke.”⁴⁹ Newspapers, gazettes and magazines further promoted tourism in the mountains by providing detailed accounts of professional mountaineers enjoying successful trips across the Southern Alps and glaciers.

The establishment of the New Zealand Alpine Club by Malcolm Ross and George Mannering in 1891, for example, played a vital role in bringing awareness of glaciers to the New Zealand public. As celebrated national mountaineers and explorers, the two crafted the *New Zealand Alpine Journal*— a biannual publication concerned with reporting the achievements of the local mountaineering society.⁵⁰ Davidson also pointed out that New Zealand’s mountaineering society consisted of “avid mountain publicists” that often dabbled in photography, book writing and pamphlet creation to “encourage the wider public to view the mountains as spaces for recreation and scenic appreciation.”⁵¹ The personal reflections of New Zealand mountaineers, however, did not just appear in local print but long-established international journals dedicated to alpine explorations.

Some of New Zealand’s recorded encounters with glaciers also circulated beyond national borders. For example, Arthur P. Harper recorded the trip he and Charles Douglas made across Kā Roimata o Hine Hukatere/ the Franz Josef Glaciers for the London Alpine Club.⁵² George Mannering and Malcolm Ross also featured several articles in the club’s *Alpine Journal* well into the early 1900s. The most important of these was a comprehensive record of the New Zealand Alpine Club’s expeditions from 1892 to 1893.⁵³ Mannering, when attempting to cross the Godley Glacier in 1892, made specific note of the sub-alpine scrubs, veronicas, celmisia, and spaniards that thrived on glacier moraines.⁵⁴ His close observation of the landscape, extolling both a sense of

⁴⁹ ‘Lake Wakatipu no 8: Health and Pleasure Resorts of New Zealand’, *New Zealand Graphic*, p. 100; ‘Milford Sound no 13: Health and Pleasure Resorts of New Zealand’, *New Zealand Graphic*, p. 268.

⁵⁰ Margaret Johnston, ‘Case Study 1: Early development of mountain recreation in New Zealand and the place of risk’, *Mountaineering Tourism*, ed. by Ghazali Musa, James Higham and Anna Thompson-Carr (London: Routledge, 2015), pp. 55 – 58, ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=3569264>> [accessed 4 September 2024].

⁵¹ Davidson, p. 103.

⁵² Arthur P. Harper, ‘The Western Glaciers of New Zealand’, *The Alpine Journal*, 17 (1895), 316-328 <https://www.alpinejournal.org.uk/Contents/Contents_1895_files/AJ%201895%20Vol%2017%20316-328%20Harper%20New%20Zealand.pdf> [accessed 3 November 2024].

⁵³ George Mannering, ‘New Zealand Climbing 1892 and 1893’, *The Alpine Journal*, 17 (1895), 153-165 <https://www.alpinejournal.org.uk/Contents/Contents_1894_files/AJ%201894%20Vol%2017%20153-165%20Mannering%20New%20Zealand.pdf> [accessed 11 November 2024]; Malcolm Ross, ‘The First Crossing of Mount Cook’, *The Alpine Journal*, 23 (1906), 124-140 <https://www.alpinejournal.org.uk/Contents/Contents_1906_files/AJ%201906%20Vol%2023%20124-140%20Ross%20Mt%20Cook.pdf> [accessed 11 November 2024].

⁵⁴ George Mannering, ‘The Godley Glacier and Sealy Pass, New Zealand’, *The Alpine Journal*, 24 (1908), 64-79 <https://www.alpinejournal.org.uk/Contents/Contents_1908_files/AJ%201908%20Vol%2024%2064-79%20Mannering%20Godley%20Glacier.pdf> [accessed 11 November 2024].

human triumph in conquering glaciers and expressing the beauty the environment evokes was dotted with ideas of the sublime.

Overall, New Zealand glaciers, as expressed in public newspapers and other popular print, were situated as simultaneously part of the sublime, objects of study and part of the environment that could be personally reflected on when both studied, observed and explored. Mixed in with the awe-inspiring size and beauty of New Zealand's glaciers that the media extolled, there was also a lingering sense of terror and dread that individuals observing the phenomenon openly expressed. By embellishing glacier knowledge with elements of the sublime and scientific study, the way glaciers were reflected in newspapers, gazettes and journals created a more attractive and enticing perception of the environment to the public. As such, glacier knowledge would have become more accessible readers outside the network of the learned elite. What is not yet reflected, is the way personal self-reflections of travel and tourism further developed New Zealand's glacier history in the nineteenth century— a topic that will be evaluated in the upcoming section.

3.2 Mountaineering and Travel Writing

In the nineteenth century travel writing promoted, accumulated and disseminated glacier knowledge to the wider New Zealand public. The genre, according to Lydia Wevers, fell into a broad category “composed of many different kinds of writing” that was transmitted to the public by “bookish travellers.”⁵⁵ The books that travellers wrote at the time, she argues, formulated a constant projection of the author's personal thoughts and self-reflections on the surrounding landscape.⁵⁶ This section will, therefore, analyse the way glaciers were conceived, recorded and reflected on the authors Julius von Haast, Reverend William Spotswood Green and Malcolm Ross that used travel and exploration as a medium to express their interaction with glaciers.

In 1895, when George Mannering compiled a list of New Zealand's mountaineering achievements during 1892-1893, he also created a record of books about the Southern Alps that was available at the time. Claiming that the catalogue contained all the current “book knowledge” about the New Zealand mountains and Southern Alps, Mannering mentioned Sir Julius von Haast's geological monograph of Canterbury, Reverend William Spotswood Green's trip in *The High Alps of New Zealand* and Malcolm Ross' *Aorangi: Or the Heart of the Southern Alps* as valuable sources of information for international readers to satisfy their curiosity about New Zealand's mountain environment.⁵⁷ Also included in his list are other alpine books such as Frederick Hutton's

⁵⁵ Wevers, p. 1.

⁵⁶ Wevers, p. 1.

⁵⁷ Mannering, ‘New Zealand Climbing, 1892 and 1893’, p. 165.

report on the *Geology & Goldfields of Otago* and Robert Lendlmayer von Lendenfeld's *Australische Reise* (Australian Trip).⁵⁸

According to Lydia Wevers, travel writing during the nineteenth century was one of the most “powerful tools for naturalising novelty and difference” in a country.⁵⁹ It is a genre that played an important part in storing, circulating, recycling and reaffirming “Western formulations of knowledge about New Zealand.”⁶⁰ By including glaciers among the landscapes that was naturalised by Europeans, Hargreaves argues that Haast was part of the “rapturous promotion of the mountains and glaciers of Aotearoa.”⁶¹ She states that it was Haast that inspired other travellers to see the exploration of glaciers and alpine travel as “enterprises worthy of glory.”⁶² His geological monograph, *Geology of the Provinces of Canterbury and Westland*, would be at the heart of how glaciers were promoted to other travellers hoping to follow in his footsteps across the Southern Alps.

Haast's near five-hundred-page compendium of the Southern Alps became available for purchase in 1879 for £1.7s in full leather binding.⁶³ Encompassing his personal reflections about glaciers from not only the culmination of Haast's first-person field notes, the book also contained the formal reports the geologist was tasked with completing by the Canterbury Provincial Council.⁶⁴ As both a carefully collated scientific report and scenic collation of Haast's geological expeditions, *Geology of the Provinces of Canterbury and Westland* presented a vivid example of what genres of prose could be considered part of ‘travel writing’. Despite falling into the genre of a scientific monograph, for example, the *Geology of the Provinces of Canterbury and Westland* can also be read as a reflection of travel writing.

Reviewed by the *Lyttelton Times* in 1879, Haast's *Geology of the Provinces of Canterbury and Westland* was acknowledged as discovering “stupendous ice cascades, *Mers de Glace*, avalanches and ordinary glaciers” in the Southern Alps.⁶⁵ By presenting his readers with “a very full account, both scientifically and economically, of the chief physical features and of the nature of

⁵⁸ As note, Hutton and Lendlmayer's work will not be discussed in this chapter because of the word restrictions and lack of access to their primary sources. Mannering, ‘New Zealand Climbing, 1892 and 1893’, p. 165.

⁵⁹ Wevers, p. 11.

⁶⁰ Wevers, p. 11.

⁶¹ Hargreaves, p. 87-88.

⁶² Hargreaves, p. 87-88.

⁶³ In the year 2017, £ 1.7s was worth approximately £ 85.35. See: ‘Currency Converter: 1270-2017’, *The National Archives* (2025) <<https://www.nationalarchives.gov.uk/currency-converter>> [accessed 3 March 2025]; Julius von Haast, *Geology of the Provinces of Canterbury and Westland, New Zealand: a report comprising the results of official explorations* (Christchurch: Times Office, p. 1879); Stephen Budden, ‘Prospectus – Geology of the Provinces of Canterbury and Westland, New Zealand’, *Lyttelton Times*, 23 July 1879, p.1.

⁶⁴ Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005) p. 24.

⁶⁵ ‘Review’, *Lyttelton Times*, 25 August 1879, p. 5.

the rocks and minerals of the [*Canterbury*] Province,” Haast’s monograph was given considerable standing in the list George Mannering created of New Zealand mountaineering books.⁶⁶ For example, Haast claimed that the first part of *Geology of the Provinces of Canterbury and Westland* was written in “popular form” so readers could acquaint themselves with “the peculiarly grand features of the Southern Alps.”⁶⁷ Therefore, the contents of his exploration were rewritten for a public audience that may not be as well acquainted with glaciers and the frozen environment in Canterbury.

Victorian science writing in the nineteenth century according to Andrea Kaston Tange however “was often designed to appeal to an audience that included intelligent lay readers” and the best examples of it were “highly literary prose” that combined a “travelogue with field notes to produce texts that rendered the natural world as engaging a spectacle as world cultures were in more traditional travel narratives.”⁶⁸ Haast created a similar composition when writing his compendium, stating that he wanted his readers to “participate in the difficulties, dangers, and joys of an explorer’s life.”⁶⁹ Therefore, contained in his writing, was reference to glaciers as part of the Southern Alps’ sublime landscape.

When Haast wrote of the Southern Alps, he claimed that they, “in all their sublime grandeur”, were crowned by “the noble form of Mount Cook” towering prominently above the grand mountain range.⁷⁰ By exploring Lake Takapō, Haast also wrote that “the view from the shores of the lake is grand in the extreme” and “bounded by lofty mountains on both sides.”⁷¹ By creating a magnificent backdrop where the Godley River entered the lake, he writes that the beauty of the glacier environment could be found in Lake Tekapo’s grand surroundings where:

Snowfields with glaciers of the second order descended...now covering the flanks of the wild serrated peaks on both sides, from which... high and picturesque waterfalls issued, often hanging on the rocky precipices like so many ribbons of floating silver, before they plunged into their dark gorges.⁷²

Haast further claimed that the milky white water of Lake Takapō, “even when its surface was quite unruffled by any breeze,” was a direct result of snowmelt running down from the surrounding glaciers.⁷³ In this example, Haast used descriptions of the sublime to create a more accessible form of writing about the natural environment. He used both rationality and imagination

⁶⁶ ‘Review’, Lyttelton Times, p. 5.

⁶⁷ Haast, p. iv.

⁶⁸ Tange, p. 481.

⁶⁹ Haast, p. iv.

⁷⁰ Haast, p. 4.

⁷¹ Haast, p. 19.

⁷² Note: Quote converted into past tense to match the leading sentence. Haast, p. 20.

⁷³ Haast, p. 19.

to pen his contemplations to his audience, a method Steven Vine argued was part of the Romantic movement during the nineteenth century.⁷⁴

Emily Brady, similarly, argued that subjects of the romantic aesthetic in the natural environment became “grounded in a much more intimate conception of the relationship between humans and nature.”⁷⁵ That, at the same time, created “a much greater respect for natural phenomena.”⁷⁶ She further considered that romantic beauty was “exemplified by the solitary traveller exploring her or his expressive freedom through experiences of living close to the land.”⁷⁷ Haast’s monograph of the Southern Alps represents a good of example of expressing his experience close to glaciers in the natural environment. His writing, as well as the photographs that were taken by Sealy and the Burton Brothers and included in the monograph, would later inspire Reverend William Spotswood Green to travel to New Zealand in 1882 and ascend Mount Cook.⁷⁸

The book Green subsequently published in 1883 was written from the viewpoint of a member of the English Alpine Club. Considering the members of the English Alpine Club made it their mission to explore and conquer yet to be climbed mountain peaks during the nineteenth century, Green’s *High Alps of New Zealand* represented a good example of the more accessible travel narratives regarding New Zealand glaciers that was published for national and international readers. The *High Alps of New Zealand*, featured in the *Star* in 1884, was available for purchase through a Mr. A. Simpson for 7s 6d.⁷⁹ As an Irish naturalist, William Spotswood Green’s trip to New Zealand supported by the Royal Irish Academy. His book, therefore, emerged from extending the paper of his exploration of Mount Cook in the *London Alpine Journal* and the *Transactions of the Royal Irish Academy*.⁸⁰ When Green presented the same paper before the Royal Geographical Society in 1886, his work was compelling enough to elect him as a fellow member of the RGS.⁸¹

Green made several comparisons in his book between the Southern Alps in New Zealand and the Alps of Switzerland. As is typical of nineteenth century travel writing, *The High Alps of New Zealand* displays an “overriding consciousness of the comparison between home and abroad,”

⁷⁴ Vine, p. 4.

⁷⁵ Emily Brady, *Aesthetics of the Natural Environment* (Edinburgh: Edinburgh University Press, 2008), p. 45, JSTOR <<https://www.jstor.org/stable/10.3366/j.ctvxcrq5h>> [accessed 7 November 2024].

⁷⁶ Brady, p. 45.

⁷⁷ Brady, p. 45.

⁷⁸ Davidson, p. 103.

⁷⁹ **Note:** Price – 7s 6d translates to seven shillings and six pence. The modern equivalent, as of 2017, would be £24.82 according to the National Archives in Britain. ‘Anglo-Colonial Summary’, *Star (Christchurch)*, 12 February 1884, p. 3; ‘New Books Per Mail’, *Lyttelton Times*, 26 February 1884, p.4; Currency Converter: 1270-2017; William Spotswood Green, *The High Alps of New Zealand: Or A trip to the glaciers of the Antipodes with and ascent of Mount Cook* (London: MacMillan and Co, 1883).

⁸⁰ Christopher Moriarty, ‘Green, William Spotswood’, in *Dictionary of Irish Biography – Royal Irish Academy* <<https://doi.org/10.3318/dib.003605.v1>> [accessed 26 October 2024].

⁸¹ Moriarty.

of the “self” and “other.”⁸² Green wrote that New Zealand was to Australia what “Switzerland is to England.”⁸³ He considered that the South Island would be a substantial draw for Australian mountaineers looking to explore frozen alpine peaks. He further compared Mount Cook that “rose pile upon pile” with “its glittering peak crowning all,” to the Dom, a peak in the Pennine Alps, that Green first saw when approaching the Rhone valley during a trip he took several years earlier.⁸⁴

Furthermore, Green would compare the Tasman Glacier to the Aletsch in Switzerland.⁸⁵ He even pointed out the smallest differences that existed in the similar landscapes. The valley of the Tasman Glacier, he stated, like the Zermatt valley, contained a flat landscape created by the stark powers of erosion and the low altitude of the New Zealand rivers.⁸⁶ Green even explicitly mentioned that “the ravine shaped glens of Switzerland are not to be found, so far as my experience goes, in the Southern Alps.”⁸⁷

The Irish mountaineer would later dedicate almost the entirety of Chapter X in *The High Alps of New Zealand* to the journey he took across the Tasman Glacier. With the two professional Swiss guides, Ulrich Kaufman and Emil Boss, who accompanied him from the start of his journey, Green wrote that after climbing over large angular rocks and crossing a “surface stream roaring along through a deep cleft in the [Tasman] glacier,” they finally mounted “the rough white ice of the glacier.”⁸⁸ When it came to reflecting on the glacier itself, Green moved away from his usual comparisons between New Zealand and Switzerland. Instead, he would write that “no words at my command can express our feelings when we stood for the first time in the midst of that glorious panorama.”⁸⁹ The reason for this, as Green stated, was because “the present scene so completely asserted its own grandeur that... it surpassed anything we had ever seen.”⁹⁰

For the readers of *The High Alps of New Zealand*, Green’s inability to make a suitable comparison to another formerly observed scene would only emphasize the sense of awe he experienced on the Tasman Glacier. Green even directly expressed the sublime qualities of the alpine landscape, stating that among “the grand outlines of the precipices and peaks,” there existed a “richness of the sub-tropical verdure, amidst which white glaciers glisten in the deep ravines; in

⁸² Wevers, p. 4.

⁸³ Green, p. 52.

⁸⁴ Note: [the mountain] added for clarity in what Green was referring to in his quote. The Dom, as mentioned by Green, had a peak of 4546 m and hosted the Ried and Fee glaciers. See: ‘Dom (mountain)’, *Wikipedia* (2024) <[https://en.wikipedia.org/wiki/Dom_\(mountain\)](https://en.wikipedia.org/wiki/Dom_(mountain))> [accessed 14 October 2024]; Green, p. 134.

⁸⁵ Green, p. 134.

⁸⁶ Green, p. 134.

⁸⁷ Green, p. 134.

⁸⁸ Green, p. 166.

⁸⁹ Green, p. 166.

⁹⁰ Green, p. 166.

the countless waterfalls and cascades which never fail...⁹¹ According to Lee Davidson, it was William Spotswood Green's attempted ascent of Mount Cook that encouraged New Zealand mountaineers to found a national Alpine Club.⁹² It was also Green who inspired the "beginnings of an intriguing relationship between mountain recreation, tourism development and its publicity in New Zealand."⁹³

Although Green's attempted ascent eventually ended in failure because of a storm, his journey led to a "brief flourishing of pioneer climbing focused on Mount Cook and Lake Whakatipu" area.⁹⁴ Green's trip would also lead to the creation of infrastructure for mountain tourism in the Southern Alps.⁹⁵ As well as being responsible for the 'discovery' of the Linda Glacier route up Mount Cook, Green's recreational expedition resulted in the establishment of the first Hermitage, more climbing huts, better travel routes and guiding services across the Southern Alps from the mid-1880s onward.⁹⁶ A *Lyttelton Times* review of *The High Alps of New Zealand*, similarly praised the mountaineer for telling a "thrilling story of Alpine adventure" where "an original Alpine exploration in regions of exceptional difficulties, and of unsurpassed variety of magnificence" was brilliantly achieved.⁹⁷ The way he collated his narrative was so detailed and compelling that Malcolm Ross would publish *Aorangi: Or the Heart of the Southern Alps*, a short sixty-four page travel companion in 1892, by retracing the same route Green travelled across the Tasman Glacier and Mount Cook.⁹⁸

Ross's *Aorangi: Or the Heart of the Southern Alps*, however was written in a slightly different format than Haast and Green's publications. The little travel compendium was compiled at the request of the New Zealand Government and was created to contain invaluable information on how aspiring mountaineers could make it to the peak of Aorangi.⁹⁹ By tracing both earlier and current routes available by lake and land, Ross iterated the way former explorers and future travellers could attempt to ascend and explore the area around Mount Cook safely. Ross even

⁹¹ Green, p. 70.

⁹² Lee Davidson, 'Publicising Peaks: Early Promotion of Mountain Tourism', *Selling the Dream: The Art of Early New Zealand Tourism*, ed. by Peter Alsop, Gary Steward and Dave Bamford (China: Midas Printing International, 2012), p. 56.

⁹³ Davidson, 2012, p. 56.

⁹⁴ Davidson, 2012, p. 56; Hargreaves, p. 86.

⁹⁵ Davidson, 2012, p. 56.

⁹⁶ The word 'discover' here is scare quoted for the reason that it is not known if Māori travelled the route beforehand and also, as is mentioned by Wevers: Mary Louse Pratt refers to Europeans using a "monarch of all I survey scene," to highlight 'discoveries' that traveller 'won' for their country. It is also better explained as "moments the explorer, who has found his way with the help and knowledge of the local people, proceeds to discover what is already known." See: Hargreaves, p. 86, Wevers, p. 41. Davidson, 2012, p. 56.

⁹⁷ 'Review: The High Alps of New Zealand', *Lyttelton Times*, 15 March 1884, p. 3.

⁹⁸ Malcolm Ross, *Aorangi: Or The Heart of the Southern Alps, New Zealand*, (Wellington: George Didsbury Government Printer, 1892).

⁹⁹ Ross, p. i [Preface].

described vivid scenes from his own exploration of the Tasman Glacier, writing that “the gleaming ice - slopes and dark precipices of Aorangi,” stood before the Ball Glacier.”¹⁰⁰ The Hochstetter Ice-fall, consequently, poured its “beautifully-coloured cascade of broken ice, in spires and cubes and pinnacles” on the Tasman Glacier’s extensive ice vault.¹⁰¹ His words, not only designed to capture the sublime imaginings of his readers, was also enhanced by illustrations and lithographs created by Laurence William Wilson (1860-1904) and Dan Ross (1849-1919).

Aorangi: Or the Heart of the Southern Alps embodies what Kate Flint refers to as a “fascination with the act of seeing” that was attributed to Victorians of the nineteenth century.¹⁰² She further argues that in writing, “by replacing an emphasis on narrative with lyrical language,” it is the responsibility of the reader to not repeat verbal interpretations of what they see, but “succumb” to the mood, atmosphere and affect the writer and artist hope to create instead.¹⁰³ By adopting an “aesthetic approach that tends toward the immersive and the attentive,” Flint also affirmed that readers were able to “counter the speed and distractions of modern life” by observing their natural surroundings.¹⁰⁴

When Malcolm Ross recounted his exploration of the Tasman Glacier from the starting point of the Hermitage, a place he called a “well-conducted hostelry, prettily situated within a few minutes' walk of the largest glaciers in the Southern Alps”, the glaciated environment he conveyed to his audience was as vivid as a painting.¹⁰⁵ He writes:

Before tea I ascended the moraine, and made a sketch of Mount Cook, which towered up behind our camp, with its ice-seamed sides glittering in the sunlight, like a wall of frosted silver, through which at intervals the black rocks broke, making the white ice more beautiful by contrast.¹⁰⁶

By measuring his expedition across the Tasman Glacier against the earlier one that William Spotswood Green completed five years earlier, Ross also boasted that his small party of two (including himself) took one day to complete when the former journey took Green five.¹⁰⁷ This sense of triumph over another’s past accomplishment and evocative description of the surroundings

¹⁰⁰ Ross, p. 19.

¹⁰¹ Ross, p. 19.

¹⁰² Of the *Aorangi: Or the Heart of the Southern Alps* chapter that was dedicated to the Tasman Glaciers, one ink sketch by Wilson and two lithographs by D. Ross were included on p. 18, 21 and 23. Kate Flint, ‘Chapter 16: Visual Culture’, in *The Routledge Companion to Victorian Literature*, ed. by Dennis Denisoff and Talia Schaffer (Oxfordshire: Taylor & Francis Group, 2019), pp. 182-194 (p. 188), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5975415>> [accessed 12 March 2025].

¹⁰³ Flint, p. 188.

¹⁰⁴ Flint, p. 188.

¹⁰⁵ Ross, p. 5.

¹⁰⁶ Ross, p. 17.

¹⁰⁷ Ross, p. 12.

evoked a style of writing Mary Louise Pratt refers to as “the monarch of all I survey.”¹⁰⁸ She explains that it was a style where Victorians “opted for a brand of verbal painting whose highest calling was to produce for the home audience the peak moments at which geographical “discoveries” were “won” for England.”¹⁰⁹ Ross’ expedition of the Tasman Glacier can be similarly seen as instilling a sense of national pride for New Zealanders who hoped to conquer the harsh landscape of the Southern Alps.

At its core, *Aorangi: Or The Heart of the Southern Alps* is a guide for tourists with a series of recommendations for travel, climbing routes and the promotion of the New Zealand Government’s new infrastructure that made it easier for expeditions across the Mueller, Hooker and Tasman Glacier.¹¹⁰ In reference to the past mountaineering triumphs in the Southern Alps, Ross also summarised Green’s entire expedition from the camp the Irish naturalist set up and the failed route he took up the slopes of Mount Aorangi. When comparing *Aorangi: Or the Heart of the Southern Alps* to Haast’s *Geology of the Provinces of Canterbury and Westland* and Green’s *The High Alps of New Zealand*, Ross’s publication is more matter of fact. The main difference is that Ross transversed the Southern Alps’ glacier for personal pleasure as opposed to Haast’s more scientific study and Green’s primary goal of reaching the ‘unexplored’ peak of Mount Cook.

The common thread that links these three publications is the way glaciers were aesthetically interpreted and expressed through more popular prose for a public audience. By seeing glaciers in a sublime context, journalists, mountaineers, authors and even scientists expressed verbose descriptions to promote, accumulate and disseminate information about New Zealand’s frozen environment. The popular prose about encountering glaciers through travel in New Zealand during the nineteenth century, similarly, highlighted the emotionally evocative relationship that existed between humans and nature. As a result, the way glaciers were represented in the genre of travel writing had an intended readership of the scientific elite, the recreational and lay readers of the time, and Victorian “armchair travellers” who “did not undertake journeys themselves” but preferred to read about them instead.¹¹¹

¹⁰⁸ Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation* (London: Routledge, 2008) p. 197, Taylor & Francis eBooks <<https://doi.org/10.4324/9780203932933>> [accessed 6 November 2023].

¹⁰⁹ Pratt, p. 197.

¹¹⁰ In regards to tourist promotion: Ross, p. 22-23.

¹¹¹ Tange, p. 476.

Conclusion:

The aim of this chapter was to evaluate the way some nineteenth-century authors, newspapers reporters and diarists expressed knowledge and interactions with New Zealand glaciers through more accessible forms of writing. By analysing glaciers through the Romantic concept of the sublime and the profound self-reflections some authors used to write about the natural environment, it can be concluded that both book publications and newspapers in Aotearoa reflected glaciers through a lens of fearful awe and blissful terror. This sublime way of writing about glaciers was presented through popular print and travelogues as distant, unexplored, regions that was reflected on by scientists like Haast and visions of ice conquered by the heroic mountaineers William Spotswood Green and Malcolm Ross.

The constant evolution of faster communication methods, the type of subject matter being shared and an increased media presence of the later nineteenth century also contributed to how knowledge of was shared and presented to the public. There was a distinct change in the way glaciers were first expressed in newspapers during the mid-1860s to the late-1880s. The earlier half of the century focused on reporting about glacier through the actions and observations of the scientific elite. The latter half of the century, on the other hand, catered to a wider audience of “intelligent lay readers” that came from the higher literacy rate of the public and the wider geographical reach of newspapers and New Zealand printed text.¹¹²

By simultaneously combining elements of the scientific and personal reflections about the natural phenomenon, glaciers were seen as an engaging subject often painted in detail for both explorers and readers through verbose description. Travel writing, furthermore, reflected the aesthetic convention of how glaciers were part of the sublime beauty of nature. Malcolm Ross’ *Aorangi: Or the Heart of the Southern Alps*, for example, was written with the intent to guide future travellers and armchair readers to experience the glaciers in New Zealand for themselves.

In turn, the way these glaciers were written about in Aotearoa defined the way the public was encouraged to view and understand the natural phenomenon. One of James Beattie’s most important definitions of Romanticism in New Zealand was how the philosophical ‘mood’ shaped everything from the “fashion, art, writing and intellectual life to the way Europeans regarded non-Europeans and environments.”¹¹³ Therefore, the way glaciers were understood by the public in New Zealand during the nineteenth century was not only through the text analysed in this chapter, but the art, cartography and photography to be discussed in the next chapter.

¹¹² Tange, p. 481.

¹¹³ Beattie, p. 99.

Chapter 4

Visual Histories of Te Waipounamu's Glacier Landscapes

The public consumption of visual sources from nineteenth century newspaper etchings, maps, scientific journals and travel books in New Zealand helped reinforce the philosophical ideas about nature from the Enlightenment and Romantic eras. Michelle Facos argues, for example, that the new awareness of nature that emerged during the above eras emphasised not only “empirical observation and rational analyses” but the idealisation of nature and the public’s “urge to understand it.”¹ Therefore, the dissemination of topographic, artistic and photographic imagery of New Zealand’s glaciers intersected with Victorian views on visual culture. The purpose of this chapter is to understand the depth of the philosophical ideas that existed in New Zealand’s visualisations of glaciers and how they were generated and circulated to the public.

The study of natural history, as defined by Jarrod Hore, is a subject that “defined hard divisions between science and art” during the nineteenth century and “inspired networks of artists, naturalists, and natural historians to tie...a diverse range of local natures back to those that defined British and European worlds.”² William Spotswood Green compared his expedition in the Southern Alps to the views and scientific information he observed in Switzerland, the visual representation of New Zealand glaciers is related to the artistic depictions of nature that trickled down from Europe. Visual sources, as result, played an equally important role in conveying information about glaciers to a wider national and international audience.

According to Marie-Stéphanie Delamaire and Will Slauter, a defining feature of the nineteenth century was how “science, technology, and industry produced new visual media” and helped transform “processes of creation” and the conditions for viewing objects, landscapes and the environment.³ The invention of lithograph printing, for example, emerged through new

¹ Michelle Facos, *An Introduction to Nineteenth Century Art* (New York: Routledge, 2011), pp. 110 - 139 (p. 110), Taylor & Francis Group
<<https://www.taylorfrancis.com/chapters/mono/10.4324/9780203833070-6/shifting-focus-art-natural-world-michelle-facos?context=ubx&refId=3ef03317-addb-494a-b74b-d4b3bbf4ca4e>> [accessed 9 April 2025].

² Jarrod Hore, *Visions of Nature: How Landscape Photography Shaped Settler Colonialism* (Oakland: University of California Press, 2022) p. 144, EBSCOhost
<<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip.sso&db=nlebk&AN=3186437&authType=shib&site=ehost-live>> [accessed 22 November 2024].

³ Marie-Stéphanie Delamaire and Will Slauter, ‘Law, Culture, and Industry: Toward a History of Intellectual Property for Visual Works in the Long Nineteenth Century’, in *Circulation and Control: Artistic Culture and Intellectual Property in the Nineteenth Century*, ed. by Marie-Stéphanie Delamaire and Will Slauter (Cambridge, UK: Open Book Publishers, 2021) pp. 1-36 (p. 5), ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=6789406>> [accessed 29 November 2024].

scientific developments in chemistry during the late eighteenth century.⁴ The purpose of the lithograph was to create “new visual experiences of the world” that portrayed “people, events, landscapes, and natural or scientific phenomena.”⁵ With a printing process that relied on the principal that oil and water did not mix, lithographers affixed oil-based images on limestone slabs with gum arabic before transferring the image to paper with ink and a flatbed press.⁶

Another defining feature of lithography was that as long as the image on the stone was maintained without wear, it could produce an abundance of copies without deterioration to the print. It was a feature that allowed for not only easier image production, but the transformation of the press industry by minimizing the cost previous engraving and etching methods incurred.⁷ When it comes to the visual representation of glaciers in Aotearoa, lithographs played a vital role in the distribution of map-making, art and photographs that were consumed by the general public.

The focus of this chapter, therefore, interrogates the three main ways glaciers were represented visually in Aotearoa during the nineteenth century. Section 4.1 looks at four of the twelve watercolours that Julius von Haast commissioned John Gully to paint from a series of field sketches he completed on his 1861-1863 Southern Alps expeditions. Section 4.2 analyses two types of personal and scientific maps that were used to study New Zealand glaciers in 1884 and 1905. Section 4.3, lastly, considers how photography and specific photography studios helped promote New Zealand glaciers to travelling scientists, tourists and mountaineers determined to climb the Southern Alps.

Overall, I argue that, as the Romantic and sublime shaped the way glaciers and the glacier environment were written about during the nineteenth century, the visual representation of the natural phenomenon too had its roots in the way Europeans interpreted and produced ideas about the environment. The circulation of these knowledges in Aotearoa, therefore, was very much visible in the way glaciers were promoted, defined and represented to the public through nineteenth century visual sources. The significance of this generation of glacier knowledge further proves that New Zealand glacier history was constantly shaped by the creations, transformation and dissemination of both local and international knowledges about the cryosphere. Furthermore, the dissemination of glacier images further highlights that New Zealand’s nineteenth century cryo-history was multilayered.

⁴ The lithograph was developed by German Playwright Alios Senefelder in 1796 and would be used, initially, for musical scores and maps at the time. Delamaire and Slauter, p. 6.

⁵ Delamaire and Slauter, p. 6.

⁶ Delamaire and Slauter, p. 6

⁷ Delamaire and Slauter, p. 6

4.1 Haast's Field Sketches and Gully's Watercolours

When considering Aotearoa-specific landscape painting during the nineteenth century, New Zealand art historian Francis Pound notes that the “artistic conventions” of the time determined the way nature was seen and understood by the public.⁸ He further extrapolates that the main genres of landscape painting in New Zealand, the topographic, ideal, picturesque and sublime, were imported conventions that originated from Europe.⁹ John Gully's sublime watercolours of the Southern Alps glaciers, commissioned by Julius von Haast in 1862, can be considered as part of valuable artistic studies of nineteenth century landscape paintings in Aotearoa.

John Gully was an Englishman born in 1819 in Bath and despite apprenticing under the landscape painter William James Muller in his formative years, he was forced to join his father's ironmongery business as a clerk in 1845 before immigrating to New Plymouth with his wife.¹⁰ In 1858, he advertised his skill as a painter capable of capturing colonial ‘views’ “for the purpose of transmitting them” overseas.¹¹ It was only after Gully relocated to Nelson after being invalided from the Taranaki War in the 1860s that Julius von Haast commissioned the British artist to render twelve watercolours from the sketches the latter compiled from his explorations in the Southern Alps.¹² The paintings expressed not only the vivid scenes that Haast observed during his groundbreaking expeditions across Kā Tiritiri o te Moana, but also a fairly accurate rendition of Aotearoa's nineteenth century glacier environment.

Before analysing the landscapes Gully created of the Macaulay, Godley and Tasman glaciers in more detail, it is imperative that we look at the genre of sublime painting in Europe that Gully would have drawn inspiration from before arriving in New Zealand. According to Michelle Facos, the sublime, in the form of nineteenth century painting, should “stimulate a strong emotional response” and prompt viewers to contemplate deep “metaphysical reflections” about the

⁸ Francis Pound, *Frames on the Land: Early Landscape Painting in New Zealand* (Auckland: William Collins Publisher's Ltd, 1983), p. 11.

⁹ For reference: **Topographic** landscapes, as the name suggests, were painted including empirical inscriptions like longitude and latitude, the viewpoint, snowline ect, and remained as accurate to nature as possible. **Ideal** landscapes were biblical in nature, often imaginary and aimed at perfecting beauty. The **Picturesque**, on the other hand, was meant to capture “objects and scenes which reminded their spectator of painting.” The **Sublime**, as I have previously debated, was a style that used natural spectacles to symbolise humanity's “smallness in in the vast face of nature”. See: Pound, p. 11, 13, 19, 25.

¹⁰ Pound, p. 25.

¹¹ John Gully, ‘Landscape Painting’, *Taranaki Herald*, 6 February 1858, p. 1.

¹² George Hook and Andrew Lorrey, ‘Depiction and Description: Insights into Southern Alps Glaciers Conveyed by John Gully's Paintings and Julius Haast's Paper at the Royal Geographical Society’, *The Journal of New Zealand Studies*, 38 (2024), 66-91 <<https://doi.org/10.26686/jnzs.iNS38.9581>> (p. 66); Pound, p. 52.

subject of the paintings they observed.¹³ By expressing to grandness of nature and humanity's smallness as a result of the vast scenery, Sublime paintings should also express "fear and exhilaration in the face of instability."¹⁴ One of the foremost examples of a sublime glacier painting can be found in John Brett's 1856 *The Glacier of Rosenlauri*.¹⁵ As shown below, the landscape in oil depicts a frozen vista spread out before the misty Bernese Alps.



Fig. 5: John Brett, *The Glacier of Rosenlauri*, 1856, oil on canvas, 445 x 419 mm, Tate Modern, London, UK. Copyright: Permission Obtained: 06/12/2024

¹³ Facos, p. 110.

¹⁴ Facos, p. 110.

¹⁵ See: John Brett, *The Glacier of Rosenlauri*, 1856, oil on canvas, 445 x 419 mm, Tate Modern [currently on loan Huntington Library, Art Collections and Botanical Gardens (San Marino, USA)], London, UK <<https://www.tate.org.uk/art/research-publications/the-sublime/john-brett-glacier-of-rosenlauri-r1105548>> [accessed 2 December 2024].

Art historian Kenneth Bendiner argues that the painting is part of the sublime genre because of its realistic and factual observation of the natural environment.¹⁶ By openly shunning right angles, expressing solidity and massiveness in the ruggedness of the landscape and containing a sudden and stark transition in the ice, Brett's glacier landscape is inextricably linked to what Edmund Burke defined as a sublime landscape.¹⁷ The ice-excavated landscape, series of boulders and eroded stones can directly be related to the mechanics of how glaciers moved. Bendiner even states that Brett's landscape in oil asks of the viewer "how did these widely differing stones, from places of widely differing geological formation, arrive together at this lofty zone?"¹⁸ *The Glacier of Rosenlauri* combines elements of science to exemplify "the mid-nineteenth century's search for realism, objectivity, materialist truth, rational understanding, and detailed documentation."¹⁹

John Gully's twelve watercolours of the Southern Alps, similarly, included references to both sublime landscapes and scientific fact to interpret the glaciers Haast commissioned Gully to portray. Haast would even send the completed watercolours, along with a topographical map of the Southern Alps and extensive notes on Canterbury and Westland's geography to Roderick Murchison (the President of the Royal Geographical society) in 1864.²⁰ Haast's hope was that the images would "best enable the members, to gain an insight into the wild mountain masses, with their snowfields, glaciers and lakes."²¹ The intended audience of Gully's paintings were the scientific elite and members of a learned society. They represented the accuracy and detail of New Zealand's glacier landscape to viewers of the paintings.

However, Gully did not specifically accompany Haast on his expedition to the Southern Alps himself. Nevertheless, he managed to capture the topographical features of the Southern Alps accurately enough that Haast even praised Gully's work by stating that the artists "well and faithfully rendered what I sent him to copy."²² According to Hook, the greatest challenge for

¹⁶ Kenneth Bendiner, 'John Brett's "The Glacier of Rosenlauri"', *Art Journal*, 44.3 (1984), 241–48, <<https://doi.org/10.2307/776824>> (p. 241).

¹⁷ **Note:** Pound summarised Burke's definition of what should be include in sublime landscapes: vast, rugged and negligent, shuns right angles, perpendicular, obscurity, darkness and gloom, sudden transitions, solid and massive, terror and founded in pain. Edmund Burke, *Philosophical Inquiry into the Origin of our Idea of the Sublime and Beautiful* (New York: Harper & Brothers, 1844), p. 152-153; Pound, p. 19.

¹⁸ The answer to the question can be traced to Agassiz' theory of glaciation that gained momentum during the mid-nineteenth century. Bendiner, p. 241.

¹⁹ Bendiner, p. 243.

²⁰ Janet Paul, 'Twelve Watercolours of Glaciers in the Province of Canterbury: An Account of the collaboration between Julius von Haast & John Gully in the 1860s', *Art New Zealand*, 8 (1977), 56-59, <<https://art-newzealand.com/8-glaciers/>> (p. 56); Hook and Lorrey, p. 66.

²¹ Julius Haast, "Notes Accompanying a Map of the Province of Canterbury" (Royal Geographical Society Manuscript Archive, 1862), p.1, cited in Hook and Lorrey, p. 66.

²² It should be noted that Gully had never seen or visited a glacier before he took on Haast's commission and had to rely on the geologist's sketches, written and verbal descriptions to complete his work. Hook and Lorrey, p. 68. For citation in quoted text, see: Julius Haast, "Notes Accompanying a Map of the

landscape artists in the nineteenth century was balancing both the artistic and scientific truth in their paintings.²³ He further extrapolates that landscape painting sought to unify “subjective aesthetic responses with scientific insights.”²⁴ Gully’s glacier paintings expressed a similar approach to his commissions although they were painted in a studio with only Haast’s field sketches and notes to guide his composition.

Gully’s Macaulay Glacier (Fig. 6), for example, depicts the Murchison glacier névé where alpine snow accumulated and was compressed into ice over many centuries.²⁵ The painting originated from a sketch Haast made “north of where the flow of the Macaulay River changes from south-southeast to south-southwest” in 1862.²⁶ Unlike Brett’s depiction of the Rosenloui, painted specifically to express the grinding action and power of glaciers, Gully’s landscape expresses a grand view of the Macaulay that draws attention to the braided river expelled from a distinct blue ice cave at the centre of the glacier. The vast moraines on parallel side of the river bed also indicate the sheer scope of the Macaulay reached during its past glaciation.



Fig. 6: John Gully, *Macaulay Glacier*, 4375 feet, 1862, watercolour, 285 x 460 mm, [Ref: C-096-007], Alexander Turnbull Library, Wellington. [/records/23191264](#) Copyright: Permission Obtained 05/12/2024.

Province of Canterbury” (Royal Geographical Society Manuscript Archive, 1862), p.1, 26, 30, 32, 33, in Hook and Lorrey, p. 68, 70.

²³ George Hook, ‘Brushes with Infidelity: Truth to Nature in Three Composite Landscapes by Eugene von Guérard’, *Art History*, 40.5 (2017), 1026–53 <<https://doi.org/10.1111/1467-8365.12286>> (p. 1028).

²⁴ Hook, p. 1028.

²⁵ **Note:** The Macaulay Glacier was later renamed the Murchison Glacier. John Gully, *Macaulay Glaciers*, 4375 feet, 1862, 285 x 460 mm, Ref: C-096-007, Alexander Turnbull Library, Wellington; Hook and Lorrey, p. 66.

²⁶ For sketch by Haast, copy available (Plate 13) in Colin Burrows’s *Julius Haast in the Southern Alps* after p. 48. Colin Burrows, *Julius Haast in the Southern Alps* (Christchurch: Canterbury University Press, 2005); ‘Catalogue Details: Gully, John, 1819-1888: [Macaulay Glaciers, 4375 feet], *Alexander Turnbull Library* (2024) <<https://tiaki.natlib.govt.nz/#details=ecatalogue.75525>> [accessed 1 December 2024].

Inversely, Gully’s depiction of the Godley Glacier (Fig. 7) contains a much sharper portrayal of a glacier’s scree and jagged ice field.²⁷ Haast’s geological notes of the landscape placed Mount Peterman at the right, “beyond the smooth surface of the Godley Glacier,” and Mount Walseley as the centre peak.²⁸ According to Hook and Lorrey, Gully’s portrayal of the sharp-edged boulders indicated debris “deposited on the surface of the glacier, either by rock avalanches, scree falls or by the grinding of rock walls by the glacier.”²⁹ Their placement suggests an overall impression that the Godley Glacier created a stark contrast between the light, ice, snow and dark sediment.



Fig. 13: John Gully, *From central moraine of the great Godley Glacier*, 1863, watercolour, 393 x 614 mm, [Ref: D-037-001], Alexander Turnbull Library, Wellington. [/records/23176300](https://records/23176300) Copyright: Permission Obtained 05/12/2024.

So far, Gully’s depictions of the two glaciers included a fairly accurate portrayal of the geological forces behind the size, shape and movement of Aotearoa’s ice. This was because the art produced by amateurs during the nineteenth century in New Zealand, according to Richard Wolfe, tended towards the topographical picturesque.³⁰ Picturesque, in this sense, refers to rendering a landscape in such a way that the image reminds the viewer of a painting.³¹ Some official artists of scientific expeditions allowed their “objective records to be suffused by the prevailing European

²⁷ John Gully, *From central moraine of the great Godley Glacier*, 1863, watercolour, 393 x 614 mm, [Ref: D-037-001], Alexander Turnbull Library, Wellington.

²⁸ ‘Catalogue Details: Gully, John, 1819-1888: [From central moraine of the great Godley Glacier], *Alexander Turnbull Library* (2024) <<https://tiaki.natlib.govt.nz/#details=ecatalogue.451622>> [accessed 1 December 2024].

²⁹ ‘Hook and Lorrey, p. 74.

³⁰ Richard Wolfe, ‘Championing the Landscape: Painters Pay Homage to Nature’s Shrine’, *Art New Zealand*, Issue 186 (2023), <<https://go.gale.com/ps/i.do?p=ITOF&u=waikato&id=GALE%7CA750107165&v=2.1&it=r>> [accessed 4 April 2025] (para 5).

³¹ Pound, p. 11, 12.

taste for the romantic.”³² Although Gully was not part of Haast official expedition of the Southern Alps, his paintings similarly reflected an objective approach to the landscape whilst simultaneously expressing the Romantic aesthetic of nature paintings that circulated from Europe to New Zealand at the time.

Gully’s depiction of the Tasman and Murchison Glacier (Fig. 8), for example, contains a rather precarious balance between science and art.³³ Haast’s original sketch of the Rudolf glacier meeting the Tasman (on the right of Mount de la Beche) shows a much closer rendition of the glaciers meeting than Gully’s painting.³⁴ It becomes quite obvious that Gully moved the main focal point of the painting further away to emphasize the size of the glaciers and their unique point of convergence. Furthermore, an added plateau of snow-covered rock in the foreground of the landscape also creates a sense of height that was previously not visible in Haast’s sketch. The additions add to Gully’s painting a complex narrative that, like the picturesque and sublime, “emerged from an Enlightenment interest in studying the appearance of nature” and affirming its grandeur.³⁵ As an aside, the extra embellishment also highlighted that Gully had not yet visited the site of his landscape paintings.



Fig. 8: John Gully, *The Tasman and Murchison Glaciers, from the Mt Cook Range*, 1862, watercolour, 431 x 610 mm, [Ref: C-096-012], Alexander Turnbull Library, Wellington. [/records/22419488](#) Copyright: Permission Obtained 05/12/2024.

³² Wolfe, para. 3.

³³ Haast’s sketch from 12 April 1862 is available in Burrows’ *Julius von Haast in the Southern Alps* (Plate 17). John Gully, *The Tasman and Murchison Glaciers, from the Mt Cook Range*, 1862, watercolour, 431 x 610 mm, [Ref: C-096-012], Alexander Turnbull Library, Wellington. Burrows.

³⁴ Lynley Hargreaves, *Vanishing Ice: Stories of New Zealand’s glaciers* (Nelson: Putton & Burton, 2022), p. 41; Hook and Lorrey, p. 68.

³⁵ Facos, p. 138.

Sublime landscape paintings, according to Francis Pound, made of use “natural spectacles” like mountains, oceans, snow, glaciers and the sky to “symbolise man’s aspirations to the infinite.”³⁶ Although Gully’s paintings do not hugely “distort the outlines of mountains Haast provided”, the addition of details like pools of water and sharp angular rocks were used to enhance the stark and dangerous impression of New Zealand’s glaciers.³⁷ John Gully’s landscapes however, are an excellent example of the techniques and sublime interpretations of nature that nineteenth century landscape artists may have relied on when painting New Zealand glaciers.

Although, it is currently possible for scholars to look back and cross-examine Gully’s art with the scientific and geological knowledge of glacier landscapes that was developed during the nineteenth century. The glacier knowledge Gully’s paintings exhibited to the public was overwhelmingly limited. The actual circulation of Gully’s paintings outside members of London’s *Royal Geographical Society* during the nineteenth century was nearly non-existent. According to the *Press*, Gully’s glacier paintings were kept in the society’s archives until 1974 before they were sold to the Alexander Turnbull Library at £5000.³⁸ Although there is evidence that some of Gully’s works were printed in Marcus Ward’s *New Zealand Scenery* in 1877, only a later watercolour the artist did of Mount Cook and the Hooker Glacier in 1875 (Fig. 9) was included in the folio.³⁹

In the words of the *Press*, Ward’s folio was “a prime example of Victorian chromolithography at its worst” and did not do Gully’s work justice.⁴⁰ As shown below, Gully’s usually vivid brushstrokes were toned down and the dimness of the Hooker Glacier was overshadowed by the strange hue of the sky. Nevertheless, Ward’s *New Zealand Scenery* was a fairly popular publication in London and Dunedin at the time.⁴¹ Considering Elin Manker’s analysis that the interpretation of images varies and can be investigated as “producers of knowledge,” Gully’s glacier paintings represent a good example of the way some nineteenth century paintings transmitted implicit knowledge about glaciers to their chosen audience.⁴²

³⁶ Pound, p. 19.

³⁷ For the smaller details see: Fig.7 [angular rocks], Fig. 8 [small pools of water] and Fig. 8 [distance]. On Fig. 6 there are small, human shaped figures used next to the braided river to indicate the size of the glacier (although the current resolution of the image in the thesis cannot create enough detail to display it properly). Gully, *From central moraine of the great Godley Glacier; The Tasman and Murchison Glaciers; Macaulay Glacier*; Pound, p. 52.

³⁸ ‘Art and Science Matched’, *The Press*, 16 July 1975, p. 11; Hook and Lorrey, p. 69.

³⁹ John Sydney Gully, *New Zealand’s Romantic Landscape Paintings by John Gully* (Wellington: Millwood Press, 1984) p. 32, 132; Fig 9: John Gully, *Mount Cook with the Hooker Glacier*, 1875, in Marcus Ward, *New Zealand Scenery* (London: Marcus Ward & Co, 1877), Chromolithograph, 383 x 306 mm, [Ref: PUBL-0010-05], Alexander Turnbull Library, Wellington.

⁴⁰ ‘Art and Science Matched’, *The Press*, p. 11

⁴¹ ‘Art and Science Matched’, *The Press*, p. 11.

⁴² Elin Manker, ‘Object Catalogues, Knowledge Photography, Illustrated Price and the Circulation of Knowledges’, in *History of Intellectual Culture: Participatory Knowledge*, ed. by Charlotte Lerg, Johan Östling and Jana Weiß (Berlin: Walter de Gruyter, 2022), pp. 55 – 85 (p. 56), ProQuest

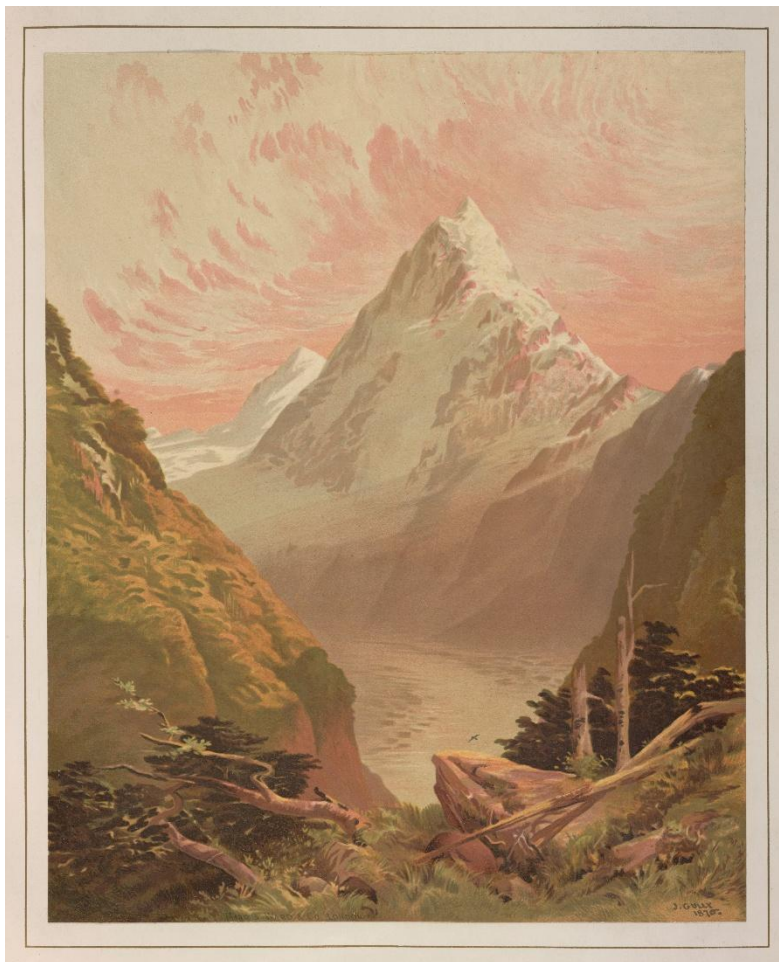


Fig. 9: John Gully, *Mount Cook with the Hooker Glacier*, 1875, in Marcus Ward, *New Zealand Scenery* (London: Marcus Ward & Co, 1877), Chromolithograph, 383 x 306 mm, [Ref: PUBL-0010-05], Alexander Turnbull Library, Wellington. [/records/23233516](#) Copyright: Expired

By observing the way Gully interpreted Haast's sketches of the Southern Alps, it is also important to keep in mind that artists of the time had a tendency to sentimentalise romantic views and found it "necessary to paint what the public would buy."⁴³ Gully's glacier watercolours, therefore, contain not only elements of science but also artistic elements of the sublime and picturesque. Furthermore, Peter Burke's deliberation that the "landscape, trees and fields, rocks and rivers all carry conscious or unconscious associations for viewers," emphasises that Gully's work was constructed with the conscious and unconscious elements of glacier landscapes.

The braided river fed by the Murchison Glacier's meltwater in Gully's *Macaulay Glacier* (Fig. 6) for example, and the crevassed seracs of the Tasman glacier (Fig. 7) are good representations of glacier landscapes captured in sublime paintings. Whereas Gully's addition of a rocky plateau in the foreground of *The Tasman and Murchison Glaciers, from the Mt Cook Range* (Fig. 8) expressed a conscious decision to aggrandise the icefall meeting point of two glaciers. In this sense, Gully's interpretation of Haast's sketches regarding New Zealand Southern Alps

eBook Centra <<https://ebookcentral.proquest.com/lib/waikato/detail.action?docID=7113738>> [accessed 14 April 2025].

⁴³ 'Art and Science Matched', *The Press*, p. 11

glaciers “reveal that a variety of values... have all been projected onto the land.”⁴⁴ Therefore, the images that were prioritised in his paintings emphasize the size and scope of the natural environment, its topographical study and vast, unexplored, planes that had the potential to draw many a scientist, tourist and mountaineer to observe their icy grandeur. Another form of visual culture that expressed the topographical features and accuracy of portraying glaciers to the public was lithographic maps, a more mathematically accurate form of imagining the landscape that is discussed in the next section.

4.2 The Mapping of New Zealand Glaciers

The widespread printing of lithograph maps in New Zealand also incorporated philosophical ideals from Romanticism and the Enlightenment era to visualise glaciers in a specific way. Because Romanticism was “shaped by writers and thinkers driven to reflect on their place in the world,” an extra dimension of philosophical thought was added to the way topographical glacier knowledge was constructed, disseminated and later conveyed to the public.⁴⁵ According to John McCrystal, maps are generally “the means by which geographical knowledge is communicated” and, from the mid-to-late 1800s, attached scientific study, surveys of the land and the locations of potential mining resources to Aotearoa landscapes.⁴⁶ Maps also conveyed that empires “governed, grew, and declined” over time by measuring how land possession fluctuated.⁴⁷

By presenting the material shape and form of the land to those who intend to use it, Giselle Byrnes states that nineteenth century New Zealand surveyors observed the landscape for “material opportunity,” scientific interest and the ability to domesticate foreign environments.⁴⁸ This was done through a panoptic and panoramic gaze, a European ideal that allowed “the observer to read the land from a position of omnipotence.”⁴⁹ Byrnes further argues that “nineteenth-century

⁴⁴ Peter Burke, *Eyewitnessing: The Use of Images as Historical Evidence* (London: Reaktion Books Ltd, 2001) p. 43.

⁴⁵ Hore, p. 141.

⁴⁶ John McCrystal, *Singing the Trail: The Story of Mapping Aotearoa New Zealand* (Allen & Unwin, 2020), p. 11, 13, ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=5972405>> [accessed 10 December 2024].

⁴⁷ Thomas Simpson, ‘Cartography and empire from early modernity to postmodernity’, *The Routledge Handbook of Science and Empire*, ed. by Andrew Gross, (London, Routledge, 2021), pp. 21-34 (p.21), Taylor & Francis <<https://www.taylorfrancis.com/chapters/edit/10.4324/9780429273360-3/cartography-empire-early-modernity-postmodernity-thomas-simpson?context=ubx&refId=134310c8-f905-4164-bb43-5c72e3a9af2a>> [accessed 9 December 2024].

⁴⁸ Giselle Byrnes, *Boundary Markers: Land Surveying and the Colonisation of New Zealand* (Wellington: Bridget Williams Books, 2001), p. 41, 54-55, Bridget Williams New Zealand History Collection <<http://dx.doi.org/10.7810/9781877242908>> [accessed 10 September 2024].

⁴⁹ Byrnes, p. 62.

travellers understood nature as a force to be harnessed, tamed and then controlled.”⁵⁰ Furthermore, she claims that ascending a mountain peak for Europeans was a way to “secure confidence in human strength and to experience a power over those below.”⁵¹ At the same time, travellers would also be reminded of their “human vulnerability against the sublime and ultimately greater powers of nature.”⁵² Glacier maps, as result, fall into a category of knowledge that both promotes and situates the New Zealand landscape through nineteenth century scientific interest, novel travel routes and alpine spaces that were not yet explored.

Nineteenth century glacier maps also had the purpose of recording the “spatial morphology of glacier terrain features.”⁵³ Glacier maps, at the time, were invaluable archives that referenced unique ice and moraine structures during the period of the map’s creation.⁵⁴ Furthermore, the knowledge conveyed about the glaciated environment provided information “about the formation, evolution, and morphology” of glaciers as well as the physically mapping the surrounding areas “visible physical features, such as the delineation of glacial boundaries, crevasse areas, and debris fields” of the natural phenomenon.⁵⁵ Christopher Mayer’s study of glacier map history in 2009, for example, stated that the velocity (or movement of glacier ice) was one of the first scientific approaches to be used when physically mapping the frozen environment. Franz Josef Hugi (1791-1855) was the first geologist in 1827 to deliberately place a boulder on the ice of Unteraargletscher in Switzerland before mapping its movement “over defined time intervals.”⁵⁶ Although his method made it possible to track the movement and direction of glacier ice flow, it was only the later addition of using smaller, coloured, stones and markers that made the data that geologists observed accurate.

⁵⁰ Byrnes, p. 62.

⁵¹ Byrnes, p. 70.

⁵² Byrnes, p. 65, 70.

⁵³ Rakesh Bhambri, and Tobias Bolch, ‘Glacier Mapping: A Review with Special Reference to the Indian Himalayas’, *Progress in Physical Geography*, 33.5 (2009), 672–704, <<https://doi.org/10.1177/0309133309348112>> (p. 672).

⁵⁴ Bhambri, p. 672.

⁵⁵ Andreas Kaab, Lorenz Hurni and Christian Haberling, ‘Cartographic Representation of Glacial Phenomena: Historical and Recent Developments’, *Cartographica*, 38.1/2 (2001), 41–54 (p. 43) <<https://ezproxy.waikato.ac.nz/login?url=https://www.proquest.com/scholarly-journals/cartographic-representation-glacial-phenomena/docview/89065788/se-2?accountid=17287>> [accessed 6 April 2025].

⁵⁶ Christof Mayer, ‘The early history of remote sensing of glaciers’, in *Remote Sensing of Glaciers: Techniques for Topographic, Spatial and Thematic Mapping of Glaciers*, ed. by Petri Pellikka and W. Gareth Rees (London: CRC Press, 2009), pp. 67 – 80 (p. 70), Taylor and Francis Group <<https://www.taylorfrancis.com/chapters/mono/10.1201/b10155-10/early-history-remote-sensing-glaciers-petri-pellikka-gareth-rees?context=ubx&refId=764145c7-d407-4327-be60-03c0148f82b0>> [accessed 12 December 2024]; Garry Clark, ‘A Short History of Scientific Investigations on Glaciers’, *Journal of Glaciology*, 33.1 (1987), 4-24 <<https://doi.org/10.3189/S0022143000215785>> (p. 4).

In the mid-nineteenth century it became commonplace for glaciers to be mapped with a theodolite (tachymetry) and plane-table cartography. A plane-table is a device constructed with a smooth, mounted, surface that was adjustable and used in conjunction with measuring device (theodolite) to capture the topographic lines and elevations of the landscape.⁵⁷ By observing and sketching glaciers from remote viewpoints, Mayer notes that the topographical maps' remarkable accuracy of glaciers in the nineteenth century allowed large-scale contour maps, still in use today, to be developed.⁵⁸

When it comes to the types of glacier maps present in nineteenth century New Zealand, there are two relevant maps that relate to Hugi's method of tracking glacier flow and the accurate rendition of a New Zealand glacier's detailed topographical contours. The first (Fig. 10) is a later example of cartography that used Hugi's method for measuring the movement of coloured stones across the surface of glacier ice. It was drawn in 1905 by the New Zealand Department of Lands Survey and recorded the Mueller Glacier's surface movement over a nine-year long survey.⁵⁹ By precisely recording the placement of numbered stones, the movement of the stones are mapped, by year, in different colours: 1889 (blank), 1890 (blue), 1893 (green), 1895 (yellow) and 1898 (purple).⁶⁰ The survey, compiled by Thomas Noel Broderick (surveyor of the Mackenzie District) cost £242 16s. 6d and had the purpose of "reporting and redetermining the position of the marked stones on the Mueller Glacier and monitoring the glacier terminus as it moved over the past five years."⁶¹ Drawn by Fredrick William Flanagan (1856 – 1934) and later printed for the Department of Lands and Survey by John Mackay (1851-1937), the lithograph visually represented the Mueller Glacier's directional flow between 1889 and 1890. The map acts as a valuable source of geographical, glacial and scientific knowledge that was recorded by and for the use of the government.

⁵⁷ 'Plane Table', *Wikipedia*, 2024

<https://en.wikipedia.org/w/index.php?title=Plane_table&oldid=1232253631> [accessed 12 December 2024]; Mayer, p. 71.

⁵⁸ Kurt Brunner, 'Glacier Mapping in the Alps', *Mountain Research and Development*, 7.4 (1987), 375-385 <<https://www.jstor.org/stable/3673286>> [accessed 7 December 2024] (p. 377). Mayer, p. 71 – 72.

⁵⁹ Department of Lands and Survey, *Diagram showing the positions of the numbered stones on the Mueller Glacier 1889, 1890, 1893, 1895 and 1898*, 1905, Scale [1:7,920], (Ref: 834.47cbsf 1889-1898), Alexander Turnbull Library, Wellington.

⁶⁰ Department of Lands and Survey, *Diagram showing the positions of the numbered stones on the Mueller Glacier 1889, 1890, 1893, 1895 and 1898*, 1905, Scale [1:7,920], (Ref: 834.47cbsf 1889-1898), Alexander Turnbull Library, Wellington.

⁶¹ The amount £242 16s. 6d when converted to pounds in today's terms, is £19,078.64. 'Department of Lands: Surveys (Annual Report)', *Appendix to the Journals of the House of Representatives*, 1905, C—1, Appendix IX, <<https://paperspast.natlib.govt.nz/parliamentary/AJHR1905-I.2.1.4.1/7>> [accessed 12 December 2024] p. 112; 'Department of Lands: Surveys (Annual Report)', *Appendix to the Journals of the House of Representatives*, 1906, Session 2, C—1a, <<https://paperspast.natlib.govt.nz/parliamentary/AJHR1906-II.2.1.4.2>> [accessed 12 December 2024] p. 13, 16-17.

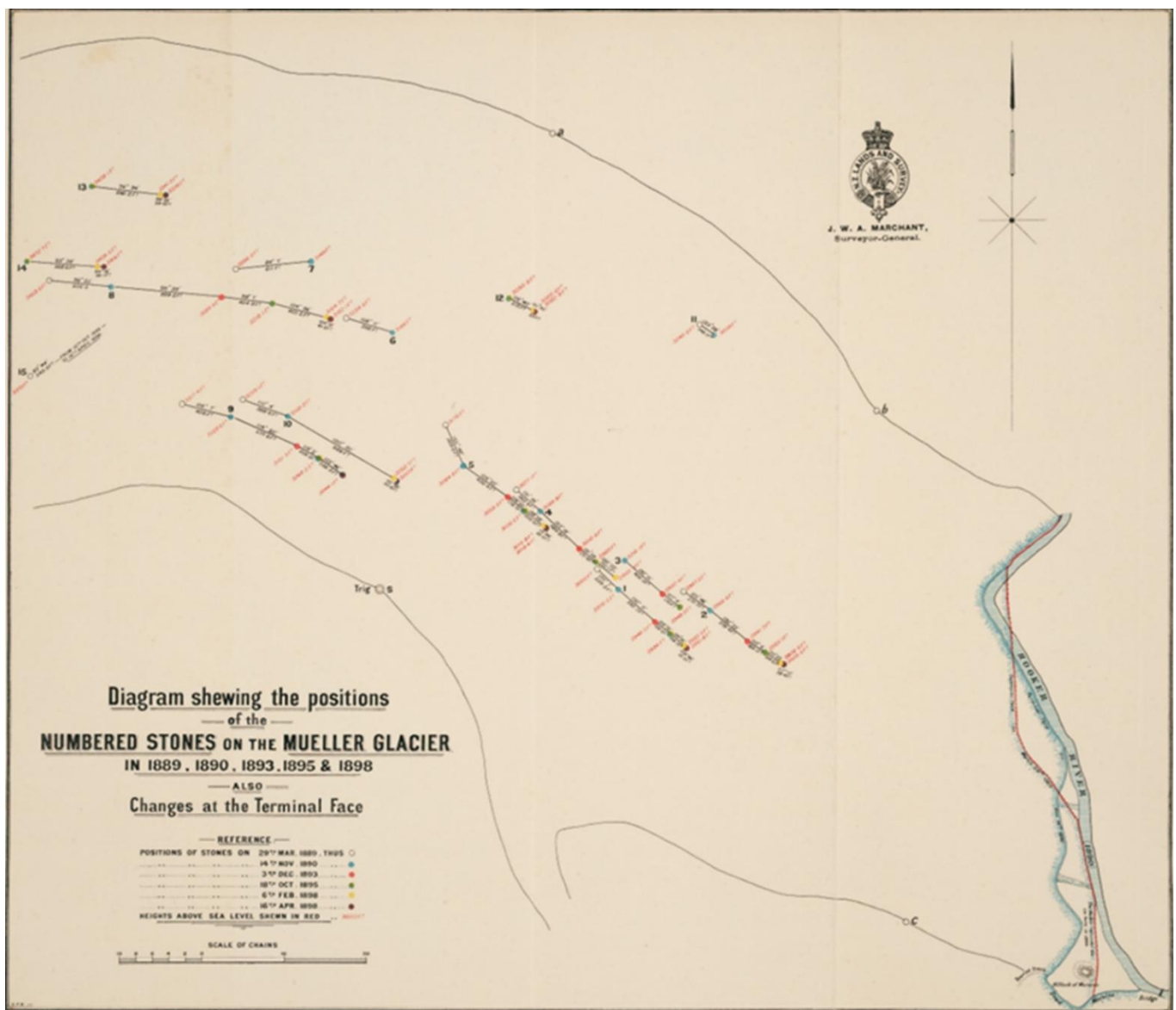


Fig. 10: Department of Lands and Survey, *Diagram showing the positions of the numbered stones on the Mueller Glacier 1889, 1890, 1893, 1895 and 1898, 1905*, Scale [1:7,920], (Ref: 834.47cbsf 1889-1898), Alexander Turnbull Library, Wellington. [/records/38985134](https://records/38985134) Copyright: Permission Obtained 13/12/24.

The second example (Fig. 11), has a somewhat different but equally important role in the visualisation of Aotearoa’s glaciers during the nineteenth century. Presented as a 1:80 000 scale contour map of the Tasman Glacier by Robert von Lendenfeld in 1884, the coloured lithograph was printed by Wurster, Randegger & Cie and published in Dr A. Petermanns *Geographische Mitteilungen* (Geographical Reports).⁶² Furthermore, the route that Lendenfeld, his wife and their porter Harry Dew walked across the Tasman Glacier’s ice in 1883 is embellished in red.

⁶² The printing company, Wurster, Randegger & Cie, was from Switzerland and created a new chromolithograph (coloured lithograph) printing process that was “popular with alpine enthusiasts, the military, and other enterprises that required durable field maps.” The company was renamed “Topographische Anstalt J. Schlumpf in 1890. See: ‘Schlumpf, Jacob’, *Geographicus* (2025) <https://www.geographicus.com/P/ctgy&Category_Code=schlumpfjakob> [accessed 17 April 2025]; Robert Von Lendenfeld, *Karte des Tasman-Gletscher*, 1884, Scale [1: 80 000], Alexander Turnbull Library, Wellington; E. Behm, *Dr A. Petermanns Mitteilungen aus Justus Perthes’ Geographischer Anstalt*, 30 (1884) <<https://babel.hathitrust.org/cgi/pt?id=mdp.39015012301399&seq=7>> [accessed 12 December 2024] (p. x).

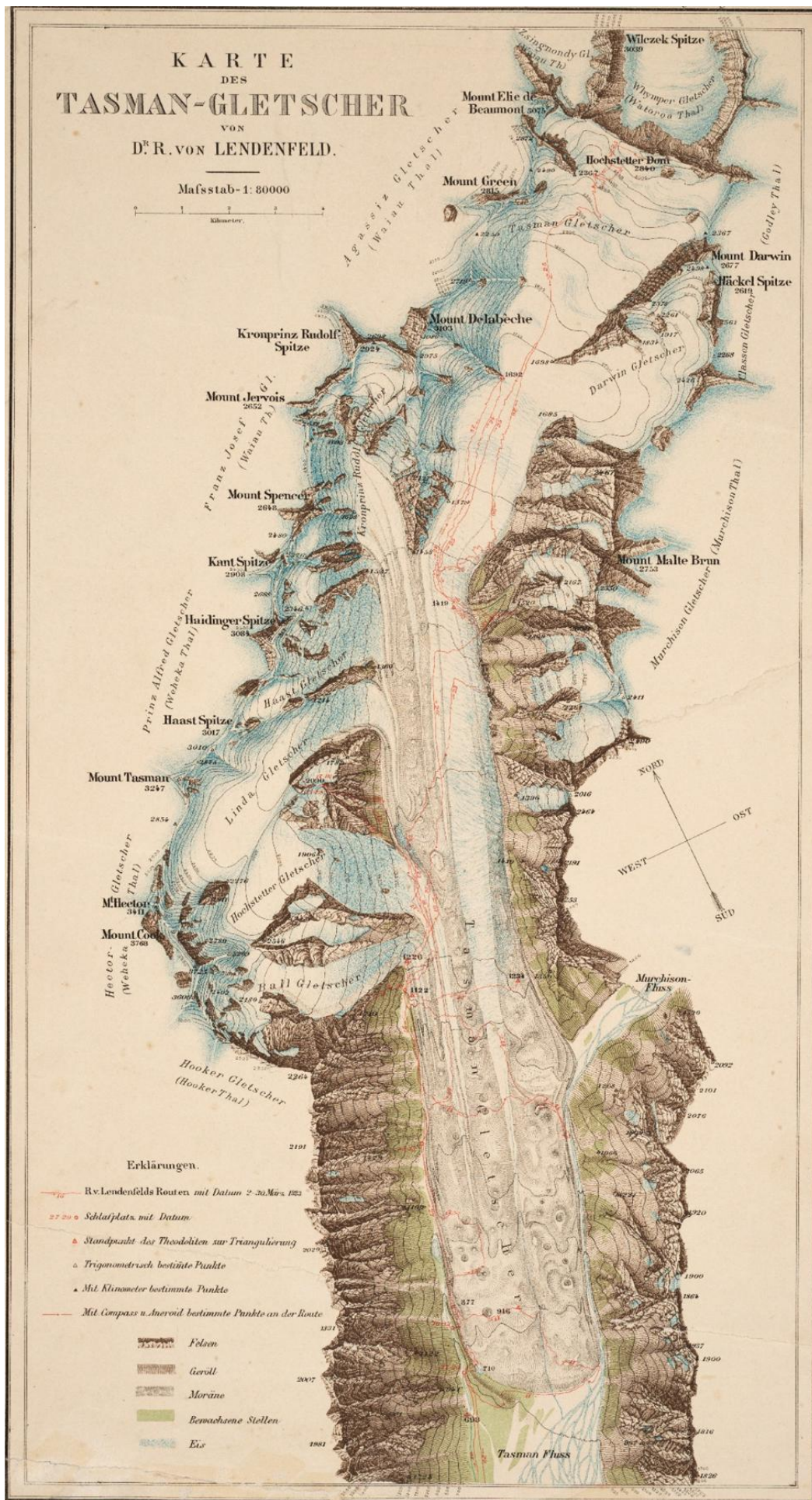


Fig. 11: Robert Von Lendenfeld, *Karte des Tasman-Gletscher*, 1884, Scale [1: 80 000], Alexander Turnbull Library, Wellington. records/39688628 Copyright: Permission Obtained 12/12/2024.

Although the accuracy of Lendenfeld's *Kartes des Tasman-Gletscher* is in question because of a faulty theodolite he carried on his trip, the map still expresses a detailed birds-eye view of the Tasman Glacier.⁶³ The map key also included the points where Lendenfeld perched his theodolite and the mathematical triangulation points he used to calculate the topographical record of the glacier ice and its surrounding landscape. Lendenfeld's German map of the Tasman Glacier captured not only the detail of the glacier's moraines but also the entirety of the glacier's ice field, its rock formations and contour lines in colour.

By charting not only the size of the glacier, but the accompanying Linda, Darwin, Hochstetter and Ball Glaciers, the map can be read as a vehicle that conveys Lendenfeld's first-hand observation of the glacier and its surroundings to those who studied or used the map. One of the most valuable forms of knowledge in the nineteenth century, according to Chathrine Delmas, was the Victorian "craving for statistics and systematic collection of data" and a "preference for first-hand testimonies and information that guaranteed the scientific quality."⁶⁴ Lendenfeld's chromolithograph map that was circulated in Petermann's *Geographische Mitteilungen* journal would have been highly valued for containing detailed data and a first-hand account of transversing the Tasman Glacier.

Both New Zealand maps fall into the category of what Mayer describes as an accurate nineteenth century glacier map. Lendenfeld's map represents the unique ice and moraine structures that was visible in the Tasman Glaciers, provided an accurate rendition of the formations and morphology of the New Zealand glacier and delineated the difference between glacier boundaries and crevasses. Whereas Broderick's survey of ten-year survey of the Mueller Glacier and the movement of its terminus falls into the second type of glacier maps most valued by early glacier cartographers, tracing the velocity (or movement of glacier ice) that was one of the first scientific approaches used to physically map glaciers. However, glacier maps did not exist solely for the use scientific study. They were also an important part of illustrating travelogues and informing possible tourists of how to reach and cross glaciers.

Glacier maps in Aotearoa largely promoted the depth of scientific exploration that took place on the ice whilst simultaneously portraying its romantic scenery to travellers and prospective settlers.⁶⁵ According to Radu Leca, maps were also "examples of knowledge harvested by

⁶³ Hargreaves, p. 86.

⁶⁴ Catherine Delmas, Christine Vandamme, and Donna Spalding Andréolle, *Science and Empire in the Nineteenth Century: A Journey of Imperial Conquest and Scientific Progress* (Oxford: Cambridge Scholars Publishing, 2010), p. 32, ProQuest eBook Central <<http://ebookcentral.proquest.com/lib/waikato/detail.action?docID=1114119>> [accessed 8 April 2025].

⁶⁵ In the case of glaciers however, the landscape itself would have been seen as a hazard to settlement rather than prospective land. Therefore, the connotations of glacier maps was more to do with its scientific

European explorers and compiled into finished products.”⁶⁶ Maps were the completed product of rigorous classification and represented “a faithful depiction of space” that relied on “a scientific turn of mind capable of organizing and structuring” different spaces.⁶⁷ Although not always accurate in mathematical precision as Lendefeld’s broken theodolite shows, their rendering of the landscape was accepted as a true-to-form representation of a specific space. Nineteenth century Glacier maps in Aotearoa tended to blend scientific constructs and literary exploration as “travel-related or travel-derived visual images”.⁶⁸

Another major focus behind the circulation of maps for travel was the nineteenth century desire for “cartographical, natural historical, and ethnographic data” that was scrupulously mapped by region, flora, fauna, and other natural resources.⁶⁹ Even though glaciers were mostly mapped for scientific and travel purposes, it should not be forgotten that maps perpetuated the belief that ‘empty space’ was exploitable to settle and “available for appropriation.”⁷⁰ Maps were, therefore, a tool used to reinscribe European history and views over an environment that Māori already knew. Photographers, similarly, inscribed “all kinds of landmarks with their own forms of knowledge” — an argument that I will examine in the next section.⁷¹

4.3 Glacier Photography in New Zealand

Landscape photography, according to Jarrod Hore, was a form of art where settlers turned “to the wilderness for inspiration” and sought “out depictions of land and its resources for commercial purposes.”⁷² Photography had the purpose of expressing settler attachment to the environment, scientific thinking and “declarations of territoriality.” The duality of landscape photography during the nineteenth century was, therefore, “enacted and reenacted in the transformation and imagination of places visually.”⁷³ In conjunction with landscape art, surveys, lithography and cartography, photography also had the ability to simplify and hasten the creation

study and the possible area of travel that would be available to the public. Lee Davidson, ‘Seeing Differently: Understanding Pakeha Constructions of Mountain Landscapes in Aotearoa’, *Public History Review*, 29 (2022), 96 - 113 <<https://doi.org/10.5130/phrj.v29i0.8199>> (p.98).

⁶⁶ Radu Leca, ‘Maps as Knowledge Vehicles: Insights from the Collections of Leiden University Library’, in *Mapping Asia: Cartographic Encounters Between East and West*, ed. by M Storms, and others (Berlin: Springer Nature, 2019), pp. 147–67 (p. 148), Springer Nature Link <https://doi.org/10.1007/978-3-319-90406-1_9> [accessed 9 March 2025].

⁶⁷ Delmas, Vandamme, Andréolle, p. 26.

⁶⁸ Carl Thompson, ‘Nineteenth-Century Travel Writing’, in *The Cambridge History of Travel Writing*, ed. by Nandini Das and Tim Youngs (Oxford: Cambridge University Press, 2019), pp. 108–24 (p. 109), Cambridge Core <<https://doi.org/10.1017/9781316556740.008>> [accessed 1 April 2025].

⁶⁹ Thompson, p. 116.

⁷⁰ Davidson, p. 100.

⁷¹ Hore, p. 5.

⁷² Hore, p. 5.

⁷³ Hore, p. 6.

and distribution of images.⁷⁴ The wider circulation of these landscape images, at the time, led to the New Zealand's natural environment becoming increasingly recognisable to the readers of newspapers, travelogues, graphic magazines and scientific papers.

As an artistic medium, landscape photography was only pursued by the “most dedicated” photographers.⁷⁵ The reason for this was the considerable size, weight, fragility and complexity of the tools, equipment and tripods that were needed to develop photographs at the time.⁷⁶ Capturing images of New Zealand's icy monoliths would have required great stamina, technical know-how and accuracy to account for limited glass development plates.⁷⁷ When it comes to understanding the importance of glaciers as photographic subjects, another layer of complexity can be drawn from the way the environment was shaped through geological forces. According to Hore, photographs of glaciers were used “to construct and then maintain a configuration of time, beauty, and the environment that attracted naturalists, geologists, photographers, and tourists.”⁷⁸

Some of New Zealand's most well-known photographers like Thomas Pringle (1858-1931), Edward Sealy (1839-1903) and George Moodie (1864-1946), were responsible for capturing and conveying the earliest images of Kā Tiritiri o te Moana glaciers.⁷⁹ Among them, Pringle was the first to capture the now iconic nineteenth century photograph of the Franz Josef Glacier (Fig 12) in 1871.⁸⁰ The sepia-toned image showcases the astounding height of the glacier terminus and the way the ice flowed across the bed of the Waiho River. It is also possible to spot three (tiny) individuals located in the middle-right foreground of the picture with a large erratic boulder situated in front of them. Further investigation reveals that a copy of this photograph was added to Ferdinand von Hochstetter's private collection of New Zealand paintings, drawing and photographs in Basel.⁸¹ The photograph also served as a “basis for illustrations published in Julius von Haast's *Geology of the Provinces of Canterbury and Westland, New Zealand*.”⁸²

⁷⁴ Hore, p. 6.

⁷⁵ Hore, p. 5.

⁷⁶ Shaun Barnett and Chris Maclean, *Tramping: A New Zealand History* (Nelson: Craig Potton Publishing, 2014) p. 54.

⁷⁷ Barnett and Maclean, p. 54.

⁷⁸ Hore, p. 79.

⁷⁹ **Note:** George Moodie was under the employ of the Burton Brothers photographic studio. Though most credit of the photographs would be given to the studio, he worked over a seven-week trip in the Southern Alps where he took over a 176 alpine photographs in 1893. Moodie would later take over the Burton Brothers Studio and rename it Muir & Moodie in 1900. See: Hore, p. 86.

⁸⁰ Thomas Pringle, *Franz Josef Glacier*, circa 1871, Albumen print, 13.5 x 20.5 cm, from Photographs of the Richmond family, their relatives and friends, [Ref: PAColl-7075-06-05], Alexander Turnbull Library, Wellington.

⁸¹ **Note:** Basel is a city in Switzerland where the archives of Hochstetter are kept. Sascha Nolden and Sandy Nolden, *Hochstetter Collection Basel: Part 2 – New Zealand Photographs and Prints* (Auckland: Mente Corde Manu Publishing, 2012), p. 144-146.

⁸² According to Nolden and Nolden, the famous photograph of the Franz Josef Glacier was replicated in Haast's book by the Viennese lithographer Max Jaffé (1845-1939). See: Julius von Haast, *Geology of*



Fig. 12: Thomas Pringle, *Franz Josef Glacier and Waiho River*, circa 1871, Albumen print, 13.5 x 20.5 cm, from Photographs of the Richmond family, their relatives and friends, [Ref: PAColl-7075-06-05], Alexander Turnbull Library, Wellington. [/records/22467433](#) Copyright: Copyright Expired 1981.

Lynley Hargreaves' book, *Vanishing Ice: Stories of New Zealand's Glaciers*, contains a more recent appearance of Pringle's photograph. She used the earliest known photograph taken of the Franz Josef Glacier terminus by Pringle to compare to a more recent one (2013) taken by Petr Hlavacek.⁸³ The purpose of Hargreaves' comparison was to use repeat photography, a method of scientific enquiry that Dani Inkpen defines as "composite images built by juxtaposing older photographs with more recent recreations from the same position."⁸⁴ Since the 1990s the recreation of photographs from the same position at different points in time had been used to convey the visible impact global warming had on fluctuating glacier landscapes.⁸⁵

The initial reason repeat photography was used to capture portraits of ice during the nineteenth century, according to Inkpen, was the belief that repeat images could reveal the way "ice morphed and moved."⁸⁶ The image also allowed the viewer to analyse "whether it did so

the Provinces of Canterbury and Westland, New Zealand: a report comprising the results of official explorations (Christchurch: Times Office, p. 1879) p. 102; Nolden and Nolden, p. 145.

⁸³ Most of the modern photographs, both comparisons and individual scenes, in Hargreaves book was taken by Hlavacek, a New Zealand landscape photographer based on the West Coast that captures the South Island, Southern Alps and West Coast landscape untouched by human presence. See: Petr Hlavacek, 'NZ Icescapes Images: Image Library & Fine Art Prints of New Zealand Landscapes', *NZ Icescapes* (2024) <<https://www.nzicescapes.com/>> [accessed 12 December 2024]; Hargreaves, p. 9.

⁸⁴ Dani Inkpen, 'Of Ice and Men: The Evolving Role of the Camera in Twentieth-Century Glacier Study', *Environmental History*, 27.3 (2022), 547-560 <<https://doi.org/10.1086/719791>> (p. 547).

⁸⁵ Inkpen, p. 547.

⁸⁶ Inkpen, p. 552.

according to cyclical patterns” during a set period of time.⁸⁷ This method would be another way that glaciers and their impact on the environment were studied. By using a faster and more accurate method to observe the flow of ice rather than field sketches and cartography, photography increased the efficiency and purpose of glacier study during the nineteenth century.

Inversely, however, not all early glacier photographs were used for scientific purposes. In 1893, during the intensive seven-week photographic expedition George Moodie took to the Southern Alps under the employ of the Burton Brothers Studio, he managed to capture a candid picture of two climbers cutting steps into the Tasman Glacier’s ice wall (Fig. 13).⁸⁸ The image conveys a party of two (possibly George Mannering and John Dixon) relying on ice axes to cut ascending footholds in the face of the Tasman Glacier.⁸⁹ By using the sharp end of an axe to anchor their position on the glacier wall as they ascended, an additional safety rope was tied to each climber so that they could keep the other tethered should they slip. The significance of this photograph is a documentary record of how nineteenth century mountaineers would have climbed the vertical walls of glacier ice as well as the methods used to keep them safe. It also highlights the physical exertion, inherent skill and dedicated work individuals needed to scale New Zealand glaciers.



Fig. 13: George Moodie, *Men Climbing an ice face on the Tasman Glacier*, 1893, Albumen Print, 13.6 x 19.5 cm, from Photographs of New Zealand scenes (Burton Brothers), [Ref: PAColl-4751-02], Alexander Turnbull Library, Wellington. [/records/22738311](#) Copyright: Copyright Expired 1996

⁸⁷ Inkpen, p. 552.

⁸⁸ George Moodie, *Men Climbing an ice face on the Tasman Glacier*, 1893, Albumen Print, 13.6 x 19.5 cm, from Photographs of New Zealand scenes (Burton Brothers), [Ref: PAColl-4751-02], Alexander Turnbull Library, Wellington. Hore, p. 86.

⁸⁹ 'Catalogue Details: Men Climbing an ice face on the Tasman Glacier, *Alexander Turnbull Library* (2024) <<https://tiaki.natlib.govt.nz/#details=ecatalogue.350334>> [accessed 1 April 2025].

With a brief from the Burton Brothers Studio that asked Moodie to “make a record” of Mount Cook and “the wonders of the adjacent region,” the nineteenth century photographer’s inherent skill and eye for detail added more than 176 alpine photographs of the Southern Alps to their collection.⁹⁰ Having travelled to the Hermitage with three cameras, eight different focal lenses and “every appliance for the production of all sizes of negatives” according to the *Otago Daily Times*, Moodie captured a breathtakingly image (Fig. 13) of Mount De La Beche on the Tasman Glacier in 1893.⁹¹



Fig. 14: George Moodie, *Mount De La Beche from the Tasman Glacier*, 1893, gelatine silver print, 28.8 x 21.2 cm, from Te Papa Online Collection, [Ref: O.000729], Te Papa: Museum of New Zealand, Wellington. Mount De La Beche from the Tasman Glacier No Known Copyright

Pringle’s photograph of the Franz Josef Glacier and future images from similar locations made the Franz Josef more recognizable to the public, Moodie’s photograph of Mount De La Beche, although taken from the opposite side of John Gully’s 1862 landscape painting (Fig. 8), marked one of the Tasman Glacier’s main geographical features just as recognisable. The image of Mount De La Beche, for example, is easily recognisable from either side of the Tasman Glacier. Hore argues that capturing similar images and views through photographs during the nineteenth century enacted “a kind of unknowing transnationalism that made otherwise unconnected images

⁹⁰ ‘Photography in the Higher Alps of New Zealand’, *Otago Daily Times*, 15 April 1893, p. 5.

⁹¹ ‘Photography in the Higher Alps of New Zealand’, *Otago Daily Times*, p. 5; George Moodie, *Mount De La Beche from the Tasman Glacier*, 1893, gelatine silver print, 28.8 x 21.2 cm, from Te Papa Online Collection, [Ref: O.000729], Te Papa: Museum of New Zealand, Wellington.

hauntingly familiar.”⁹² Therefore, the black and white striations visible in the Tasman icefield (ogives) and the detailed undulation of ice crevasses, provided viewers with a unique close up of a glacier that Gully’s watercolour paintings did not previously convey.⁹³ Also, the impression of the two images is recognizable enough to place Mount De La Beche as the centre point of both landscapes.

The photographs Moodie took in 1893 can also be related to conveying a sublime aesthetic of New Zealand’s frozen environment. Photographing glaciers, however, is not an easy task according to Moodie. He personally commented that “scrambling up moraines and over clear ice with such enormous swags, under a broiling sun, does indeed take it out of one.”⁹⁴ However, his comments of the Tasman Glacier noted “some splendid faces of ice in the foreground” where he personally related his observation of the Benmore Range to the sublime.⁹⁵ The images Moodie captured of glaciers in the Southern Alps, congruent to Gully’s paintings, can also be seen as emphasising the grand icefields of glaciers and the smallness of ‘man’ against the face of the Tasman ice wall in Fig. 13.

In the wider view of connecting tourism to the sublime aesthetic in the nineteenth century, it is possible to decipher how images were used to disseminate knowledge and Romantic ideals to the wider public that consumed these images. According to Michelle Facos, interpretation of the sublime “heightened travellers’ sensitivity to the natural world” and previously dreaded landscapes evolved into “sublime experience to enjoy and a physical challenge to savour.”⁹⁶ Settler landscapes were, therefore, “produced through an exchange between image, text, impression, memory, and experience” according to Jarrod Hore.⁹⁷ The way landscapes were narrated in photography, for example, were done with “cartographic techniques...and productively with the existing visual modes of romantic painting.”⁹⁸ This argument highlights the way images of glaciers during the nineteenth century could be used to relate travellers’ heightened sensitivity to glacier landscapes by showcasing encompassing views of grand ice vaults such as the image Moodie took of Mount De La Beche.

Romanticism and ideas of the sublime, however, had “ideological as well as visual elements” and that the idea of landscape photography (where these types of knowledges were combined), was an influential method for photographers to join “scientific, instrumental,

⁹² Hore, p. 5.

⁹³ **Note:** Ogives are distinctive bands of debris inside glacier ice that forms over the centuries. Ogives can also be referred to as Forbes Bands. Hargreaves, p. 50.

⁹⁴ ‘Photography in the Higher Alps of New Zealand, *Otago Daily Times*, p. 5.

⁹⁵ ‘Photography in the Higher Alps of New Zealand, *Otago Daily Times*, p. 5.

⁹⁶ Facos, p. 114.

⁹⁷ Hore, p. 6.

⁹⁸ Hore, p. 6.

sympathetic, and intuitive orientations to nature.”⁹⁹ When it came to the circulation of these ideas and the photographs that helped sculpt them, the printing, replication and dissemination of photographic negatives, glass negatives, lithography and paper copies were relatively numerous. The wider circulation of photographic images, for example, much like advances in the field of chemistry that allowed lithographs to be developed, was influenced by nineteenth century scientific discovery. Delamaire and Slauter wrote that “the first commercially successful photographic process, the daguerreotype, produced a stable unique positive image on a silver-coated copper plate brought out by exposure to light in a camera obscura.”¹⁰⁰ Later, in 1842, William Henry Fox Talbot (1800-1877) would patent the use of negatives that created multiple positive prints of a photograph at any point in time.¹⁰¹ Talbot’s method was most likely used by Pringle and Moodie to develop copies of their photographic plates for publication, their clients and other commercial endeavours.

Photography also transformed the way images were perceived by a wider viewership. With a photograph’s ability to craft an “indexical” relationship with the environment, the new genre of image also brought about “a new framework for the discourse on objectivity and truth” to be expressed in accordance with “visual representation.”¹⁰² In turn, the relationships photographers developed when conveying glacier landscapes was not only found in the images they captured, but also the relationships they crafted with scientists, explorers and mountaineers that helped them reach their destination.

The alpine photography of Sir Joseph James Kinsey (1852-1936) is such an example. According to Geraldine Lummis, Landon Fraser and Joanna Copley, Kinsey’s photographs represented not only landscape views of the Southern Alps, but also “a documentary record of late nineteenth-century climbers, their equipment and the appropriate apparel and behaviour expected of a Victorian gentleman and a Victorian lady climber.”¹⁰³ Although Kinsey was not a professional photographer, in the sense that he did not run a formal studio, he still managed to capture and convey the atmosphere of New Zealand’s Southern Alps and its glacial wonders to a wide audience. His photography was often requested as a visual aid for lectures by visiting academics such as W. Herbert Jones from the Royal Geographical Society in London on a visit to New Zealand in 1894.¹⁰⁴ Other important figures connected to Kinsey can be found in the visitors’ book of his homes in Christchurch and Sumner that hosted a wide collection of alpine enthusiasts like

⁹⁹ Hore, p. 10, p. 145

¹⁰⁰ Delamaire and Slauter, p. 7.

¹⁰¹ Delamaire and Slauter, p. 7.

¹⁰² Delamaire and Slauter, p. 8.

¹⁰³ Geraldine Lummis, Landon Fraser and Joanna Copley, ‘Kinsey’s Southern “Wonderland of Ice and Snow”: New Insights into Early Alpine Photography’, *Records of the Canterbury Museum*, 25 (2021), 211-245 <https://cms.canterburymuseum.com/assets/Fraseretal_vW.pdf?v=1678149252> [accessed 12 November 2024] (p. 211, 212).

¹⁰⁴ Lummis, Fraser and Copley, p. 217.

George Mannering, Arthur P. Harper, Robert Falcon Scott and Ernest Shackleton.¹⁰⁵ Furthermore, Kinsey's photographs were also shared with nineteenth century publications like the *New Zealand Illustrated Magazine*, the *Weekly Press* and various travel books like Blanche Baughan's *Snow Kings of the Southern Alps* and the eleven later travel books she would write between 1908 and 1929.¹⁰⁶

According to Lummis, Fraser and Copley, Kinsey "took pleasure in sharing his images" and "often shared his passion for the mountains with guests by conducting lantern slide shows" for both private and public audiences.¹⁰⁷ With his photographs taken from the perspective of a climber rather than a researcher or photographer who focused solely on views of the landscape, Kinsey conveyed images that were equally important to mountaineers, travellers and scientists alike. He created glacier images that one was likely to come across when exploring New Zealand's natural environment.

The photograph (Fig. 15) that Kinsey captured of a curious Kea (*Nestor notabilis*) pulling at the leather strap of his camera case during the 1890s is a good example of a candid photograph that represents the New Zealand glacier environment.¹⁰⁸ With the blurred image of the Franz Josef Glacier in the background and the Kea perched on a large boulder in the foreground, Kinsey's image can be likened to a spontaneous snap a traveller would be capable of taking themselves if they possessed the equipment to do so. The spontaneity of the snap comes from the fact that the Kea itself is not likely to have been placed there to capture the image and the blurriness of photograph illustrates the instability of the camera. This may have been from the haste in which the photograph was not able to bring the background and foreground into focus.

In Kinsey's own words, he stated that "most people who visit the mountains feel obliged to write a book or newspaper article describing 'terrifying experiences, hair-breath escapes; roaring torrents, crevasses ... horrifying records to establish themselves forevermore as 'alpine heroes.'""¹⁰⁹ His photograph, on the other hand, had a way to both validate those experiences by capturing the vastness of the Franz Josef Glacier in the background as well as softening the sight of grand nature by highlighting the way the fauna interacted with humans who they came into contact with like the Kea.

¹⁰⁵ Lummis, Fraser and Copley, p. 211.

¹⁰⁶ Lummis, Fraser and Copley, p. 218, 219.

¹⁰⁷ Lummis, Fraser and Copley, p. 219.

¹⁰⁸ James Joseph Kinsey, Kea at Work, circa 1890s, Lantern Slide, 82.55 x 82.52 mm, from W. A. Kennedy Collection, [Ref: 1975.203.16077], Canterbury Museum, Christchurch.

¹⁰⁹ Lummis, Frasier and Copley, p. 224.



Fig. 15: James Joseph Kinsey, *Kea at Work*, circa 1890s, Lantern Slide, 82.55 x 82.52 mm, from W. A. Kennedy Collection, [Ref: 1975.203.16077], Canterbury Museum, Christchurch. 203/75 – WAK192 No Known Copyright

Overall, in this section, it can be concluded that glaciers played a part in perpetuating the way the frozen environment was seen as landscapes capable of evoking both awe and the desire to conquer. For example, Moodie's photograph of the Mount De La Beche from the Tasman Glacier illustrated that photography could capture a visual representation of the sublime in glacier landscapes. By capturing the Romantic aesthetic of wide, icy vistas and mountaineers that showcased their heroic ice-cutting skills, glaciers became more than just landscapes to observe through scientific study. Glacier photographs also encouraged recreation to recognizable glacier locations like Pringle's image of the Franz Josef Glacier and Kinsey's later candid photograph of a Kea 'at play' before the terminus of the aforementioned landscape. It was also through the intimate connections that photographers had with publishing their images, sharing them with like-minded peers and evolving printing technology that these images were circulated to the wider public.

Conclusion

Glacier knowledge in nineteenth century New Zealand was created, implicitly and explicitly, through imagining the frozen landscapes through the medium of artistic painting, photography and glacier cartography. The visual representation of glaciers also had its roots in the way Europeans interpreted and produced ideas about the environment. The circulation of New Zealand glacier knowledge can, therefore, be traced through the way glaciers were promoted and defined through certain nineteenth century visual sources.

Gully's recreation of Haast's field sketches, for example, captured both scientifically accurate depictions of the natural phenomenon and nineteenth century landscape conventions of the sublime. They would have been a valuable visual record of ice in the Southern Alps that cameras (at the time) could not accurately capture. Furthermore, Gully's paintings also conveyed proof of Agassiz's theory of glaciation to international audiences from the London's Royal Geographical Society.

The creation of two nineteenth century New Zealand maps, on the other hand, prioritised the dissemination of scientifically measured data and accuracy for travel purposes. The glacier landscape and the slow movement of its ice were meticulously recorded by Thomas Broderick's ten-year survey of the Mueller Glacier. Hugi's method of studying the movement of glaciers that Broderick used was undoubtedly supplemented by the main scientific observation of glaciers at the time. Another example is Lendefeld's detailed rendering of the Tasman Glacier's topography in colour and published in the collection of Germany's geographical society. Lendefeld's map, depending on the audience it reached, also had the possibility of appealing to travellers who might physically follow his route, marked in red, across the Tasman Glacier.

At least three of New Zealand's nineteenth century photographers managed to accurately depict the sublime views of glaciers in the Southern Alps, their awe-inspiring size and a glimpse of the mountaineering etiquette that travellers used when crossing large terrains of ice. The way climbers scaled ice and spontaneous photographs of the wildlife, mixed together with the more formal view of glacier landscapes, created a more encompassing visualisation of the frozen environment. The advancement of camera technology, development of negatives and printing methods further allowed copies of these images to be distributed through a variety of newspapers, magazines, scientific reports and travel books. For example, Blanche Baughan's series of travel books that relied on Kinsey's photographs, Julius von Haast's *Geology of the Provinces of Canterbury and Westland* that made use of Pringle's early image of the Franz Josef Glacier and Kinsey hosting both private and public lantern shows with slides of Southern Alps glaciers that he captured in the late nineteenth and early twentieth century.

It can be concluded that these images represent the way Europeans interpreted New Zealand's glacier landscape through three different visual mediums. Although the evidence used here is limited, there is a lack of visual proof that Māori played a part in shaping the way glaciers were visually conveyed to the wider public. Therefore, regardless of how accurate nineteenth century scientific measurements, maps and photographs of glacier images are, there is an unexplored avenue that can perhaps, in the future, trace a more definitive Māori history regarding the creation and distribution of New Zealand glacier images specifically.

Conclusion

As a cryo-history, this thesis considers that the creation, transformation and dissemination nineteenth century knowledge is crucial to writing a New Zealand-focused glacier history. By analysing how glacier knowledge was transformed through national and international moments of exchange, it becomes possible to branch out from the usual scientific and tourism-focused study of Aotearoa glaciers. This thesis posits that glaciers were not only physical entities defined by European settler thought but ideas shaped by different forms of scientific, cultural and social knowledge systems.

This thesis asks how nineteenth century systems of thought about the frozen environment helped shape the creation, dissemination, and circulation of local glacier knowledges. In answer, the main way glacier history was shaped in New Zealand was through individuals physically encountering the frozen environment, studying it from a scientific perspective, writing about it in popular form and imagining it visually. For example, mātauranga Māori (traditional Māori knowledge) helped shape several encounters that nineteenth-century scientists, surveyors, and travellers had with Kā Tiritiri o te Moana's glacier environment. Secondly, New Zealand scholars like Julius von Haast and James Hector refined their understanding of New Zealand glaciers through personal observation and the transnational exchange of scientific glacier knowledge. Furthermore, a combination of Enlightenment rationalism and Romantic aesthetic influenced the popular glacier narrative that emerged in New Zealand during the nineteenth century. The imagination of journalists, mountaineers, cartographers, artists and photographers reflected the broader cultural trends that circulated from Europe to New Zealand before that knowledge was disseminated to the public.

On closer examination, how Europeans responded to Māori glacier knowledge can be summarised in the three distinct ways. First, some Europeans relied on integrating Māori knowledge in their expeditions to help navigate the hazardous landscape. The second recorded mātauranga Māori for the purpose of collation and later study like James Herries Beattie's interviews with Māori elders regarding ice-related kupu (words). Third, as Julius von Haast demonstrated, Europeans identified their knowledge of the environment as superior to the Māori equivalent. By dismissing the words of a Māori elder that recounted the location of Te Tioripatea pass in the Southern Alps, Haast relied, instead, on his own scientific observation of the landscape to find passage to the West Coast.

These examples show that there was not a singular scientific perspective of how glacier knowledge began its circulation in Aotearoa. Rather, Māori knowledge and expertise of the alpine

landscapes played a vital role in familiarising Europeans with the glaciated environment. Contrastingly, when it comes to the formal study of glaciers in Aotearoa it is difficult to find any mention of Māori influence on the way Europeans thought about that natural phenomenon. Instead, there is a distinct influence of European scientific theories on the way New Zealand geologists observed, debated and transformed knowledge about New Zealand glaciers. Ferdinand von Hochstetter, Julius von Haast and James Hector often cross-referenced and debated the scientific theories that developed in Europe to supplement their own studies of New Zealand glaciers.

Behind the influence European glacier theories had on the study of New Zealand glaciers however, the mainstream intellectual knowledge about glaciers was transformed through circulating new ideas and research about the environment through personal and professional networks of communication that pioneer scientists cultivated with their national and international peers. Travellers, writers, scientists and settlers, for example, were often inspired by the pool of already extant glacier knowledge that was circulated, accumulated and shared in the Northern Hemisphere before it arrived in New Zealand.

The scientific study of glaciers was not the sole way settlers, travellers and tourists came to know and generate knowledge about glaciers during the nineteenth century. Instead, a large part of Aotearoa's developing glacier knowledge can be found in newspaper articles, books, journals and magazines that European settlers penned about their personal observations, encounters and reflections about the frozen environment. Travel writing often equated New Zealand glaciers to the idea of a sublime landscape. For example, glaciers were seen as landscapes that encouraged those who came into contact with them to describe their fearful awe and blissful terror when faced with the sheer scale and beauty. It can be concluded, therefore, that another way glaciers were thought about during the nineteenth century was through the aesthetic lens of observation.

On the other hand, there is a distinct difference in how glaciers were expressed in newspapers during the mid-1860s and late-1880s. The earlier half of the century focused on reporting about glaciers through the actions and observations of the scientific elite. The latter half of the century catered to a wider audience that came from a higher public literacy rate and the geographical reach of New Zealand's nationally and internationally circulating media. Authors often expressed their knowledge of glaciers in verbal paintings to help promote, circulate and disseminate information about New Zealand's glaciated environment. Furthermore, the complex genre of travel writing often combined both scientific fact and emotional reflections to express different types of knowledge to the wider public.

The visual representation of New Zealand glaciers, similarly, reflected the same sublime ideals and scientific fact that is found in nineteenth century travel writing. By examining the way landscape paintings, topographical maps and photographs created and conveyed explicit and

implicit glacier knowledge, it can be concluded that the generation and combination of scientific images and the Romantic sublime played equally important roles when it came to the visual representation of glaciers in New Zealand. John Gully's glacier landscape, for example, was created through a combination of the artist's Romantic interpretation of the landscape and Haast's 1862 field sketches. The paintings expressed not only the vivid scenes that Haast observed during his groundbreaking expeditions across Kā Tiritiri o te Moana, but also a fairly accurate renditions of Aotearoa's nineteenth century glacier environment.

Nineteenth century New Zealand glacier maps, on the other hand, seemed to prioritise the topographical features of glacier landscapes and the physical representation of scientific data. Glacier maps, therefore, fell into several forms of knowledge depending on who and what they were used for. For example, Lendenfeld's detailed contour map of the Tasman Glacier was both a representation of a viable travel route across the glacier's ice field and a scientific record of the surrounding landscape. Thomas Boderick's application of Francis Hugi's method for observing the movement of glacier ice highlighted the priority that was given to the study of glacier mechanics at the time. Visually, these sources depict the size, scope and appearance of New Zealand glaciers from a birds-eye-view that was laid over the landscape.

Landscape photography, similarly, created a visual impression of the scenes that photographers, travellers and scientists prioritised when observing New Zealand's glacier landscapes. New Zealand glacier photographs captured both grand, Romantic views of the environment and proof that alpinists could scale large walls of glacier ice. Candid photographs of glaciers taken by amateur photographers also acted as a catalyst that attracted overseas tourists and travellers to spend their leisure time exploring New Zealand's frozen environment. Whether it be as scientists interested in the natural environment, mountaineers hoping to make their mark on New Zealand's 'unexplored' Southern Alps or accomplishing a feat heroic enough to be recorded in the Newspapers.

Ultimately, the sum of glacier knowledge created and circulated in nineteenth century New Zealand tended to reflect the philosophical ideals and scientific inquiries that emerged from Europe. The creation of glacier knowledge in Aotearoa during the nineteenth century, in turn, strengthened the links between New Zealand and the global nineteenth century science and leisure network. However, there are other ways glacier knowledge was generated in New Zealand that did not focus solely on mapping and studying the Southern Alps' frozen environment like traditional mātauranga. Instead, glaciers were part of an idea shaped by different knowledge systems, cultural perceptions, and historical contingencies.

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