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# Vanda Station, Antarctica: a biography of the Anthropocene

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*Abstract:* This article uses the history of New Zealand's Vanda Station in Antarctica as a case study of the inseparability of human history and environmental change in the age of the Anthropocene. Vanda Station was built in the late 1960s to promote New Zealand's sovereignty claims to Antarctica and to promote scientific research in the predominantly ice-free McMurdo Dry Valleys region. Over the course of the 1970s and 1980s, the levels of the nearby Lake Vanda rose dramatically, and in the early 1990s the decision was taken to close the station. Rather than seeing the closure of Vanda simply as a consequence of the rising lake levels, this article suggests instead that it was the result of a number of interconnected social, political, scientific, and environmental factors. Although the concept of the Anthropocene is not unproblematic, a biographical approach to the history of Vanda Station can add depth and nuance to our understanding of the geological age of humans. In the McMurdo Dry Valleys, the 'birth', 'life' and 'death' of Vanda Station helps to demonstrate how the political status quo maintained itself through a partial adaptation to the new realities of the Anthropocene. This political adaptation, however, relies on maintaining human-nature dichotomies and resisting the full implications of viewing the region as an eco-social system.

*Keywords:* Antarctica, McMurdo Dry Valleys, Anthropocene, New Zealand, United States, Japan, history of science, environmental history, geopolitics, climate change, critical physical geography.

*Notes on the authors:* see end of article.

## Introduction

In the early 1990s, the government of New Zealand took the decision to close and remove Vanda Station, its main scientific research station in the predominantly ice-free McMurdo Dry Valleys region of Antarctica. Although classified as a cold desert as a result of its relative lack of precipitation, this isolated region contains a number of ice-covered lakes fed by summertime meltwater streams from nearby alpine glaciers. The level of the nearby Lake Vanda had risen by around ten metres since Vanda Station first opened in the 1968–1969 season and the lake waters were threatening to inundate the entire site.[1] On the face of it, the closure of Vanda Station after 25 years of operation was a purely technical decision. Scientists could predict with a good degree of confidence the future rate of lake level rise based on climate trends, topography, and knowledge of the glaciers, and environmental planners within the New Zealand Antarctic Programme responded to this information by removing the station and cleaning up the area. A small hut was built on higher ground close to the lake, but this was not intended as a direct replacement and would not be permanently staffed. Today, the site where the original field camp once stood is almost completely submerged by the lake.

The closure of Vanda Station has been presented as a warning parable for the consequences of anthropogenic climate warming on a global scale. Reflecting on the rising levels of Lake Vanda, for example, the environmental historian Tom Griffiths writes:

> Are we pushing the maintenance systems of the Earth too far, in Antarctica and elsewhere? Vanda station, operated by New Zealand since 1968, once stood on high rugged ground overlooking the lake. But the lake has been rising about a metre a year for 30 years, and the station was destined to be flooded. It was dismantled in the early summer of 1992. When water flows in Antarctica, the world now watches with concern.[2]

Although the extent of the lake level rise was not quite the 30 metres implied by Griffiths, his wider concerns are very much in keeping with recent scholarship on the Anthropocene, the proposed geological epoch in which humanity has been an agent of massive global change.[3] In this context, the predominantly ice-free environment of the McMurdo Dry Valleys offers a haunting premonition of what an ice-free Antarctica might look like, and the rising lake levels might be seen as a foreshadowing of rapidly rising sea levels throughout the world.

[1] Hawes *et al.* (2013); Castendyk *et al.* (2016).
[2] Griffiths (2007: 325–326).
[3] See, for example, McNeill & Engelke (2016); Bonneuil & Fressoz (2017); Stine & Kress (2017).

While rising lake levels certainly contributed to the closure of Vanda Station, the story is not a straightforward case study of the consequences of recent anthropogenic climate warming. From a scientific perspective, although rising lake levels are certainly linked to a changing climate, in this part of Antarctica it is difficult to attribute direct causation to recent anthropogenic warming.[4] From a more human-focused perspective, political and cultural factors also contributed to the closure of Vanda Station. Since 1923, New Zealand has claimed ownership of the McMurdo Dry Valleys as part of its wider sovereignty claim to the Ross Dependency.[5] The 1959 Antarctic Treaty suspended political claims to the continent, but did little in practice to stop claimant countries promoting existing claims.[6] In the McMurdo Dry Valleys, New Zealand's claims to sovereignty are not recognised by either the United States or Japan, the other two countries that have had the most active presence in the region.[7] In a strategy that might be labelled an assertion of 'environmental authority', Vanda Station was constructed with the goal of demonstrating New Zealand's Antarctic claims through the performance of science and the production of useful knowledge.[8] For several years following its opening in the late 1960s, Vanda Station served this purpose, and New Zealand was able to demonstrate its commitment to scientific internationalism by inviting scientists from the United States, Japan and other countries to stay at the station and use its facilities.

By the mid–1980s, however, Vanda's effectiveness in supporting New Zealand's political position in Antarctica was becoming less clear. In terms of scientific productivity, there were fewer New Zealand publications on the McMurdo Dry Valleys in the 1980s than in the 1970s.[9] Rather than having a strong scientific reputation, the station had become better known for its hospitality, its hard-drinking culture, and for naked swims in Lake Vanda. 'Vanda's important contribution to Antarctic science', writes the New Zealand Antarctic historian David Harrowfield, 'was greatly overshadowed by the more light-hearted antics of its sometime occupants, which became the folklore of the station.'[10] At a time when the racial and gender politics of Antarctic science were starting to change,[11] Vanda had become a bastion of a particular form of

[4] Bomblies *et al.* (2001); Doran *et al.* (2002).
[5] Precis of Memorandum on British Policy in the Antarctic, EA 11 11 (Item Reference 27): Imperial Conference 1926, New Zealand National Archives (Wellington). For a useful summary of New Zealand Antarctic policy see Templeton (2000; 2018).
[6] Dodds (2019).
[7] Joyner (1997).
[8] Howkins (2017).
[9] Results of Bibliometric analysis conducted on McMurdo Dry Valley publications. Results available upon request.
[10] Harrowfield (1999: 3).
[11] Seag (2017).

**Figure 1.** Vanda Station in early 1980s. Copyright Haruta Murayama.

'traditional' Antarctic culture. Female scientists in particular did not always feel comfortable visiting the station, and by discouraging talented scientists, the culture of Vanda in some ways became an obstacle to doing state of the art science.

Rather than seeing the environmental causes of the closure of Vanda as being distinct from the cultural and political causes, a central argument of this article is that they were in fact very closely connected. The rising lake levels helped to highlight the value of environmental knowledge within a political system that already privileged science; the emphasis on science shone a spotlight on the problematic aspects of the culture of Vanda Station that were impeding the scientific – and hence political – value of the station. In other parts of the McMurdo Dry Valleys, policy makers and environmental managers have responded to the rise of lake levels by moving field camps further from the shoreline, and a similar decision could have been taken at Vanda Station.[12] However, rather than moving the station and attempting a radical change to its culture, it was easier to close Vanda and start again. The small camp that took the place of Vanda was not intended as a direct replacement and would not be

[12] This has been done by the US Antarctic Program at its Lake Bonney and Lake Fryxell Camps.

permanently occupied, even during the summer research season. Seen in this context, the rising lake levels provided a convenient justification for the closure of Vanda Station, as the political status quo sought to adapt to the implications of the changing environment.

## A biography of the Anthropocene

In making an argument for the interconnectedness of the environmental, cultural, and political aspects of Vanda's history, this article adopts a biographical approach and argues that the history of Vanda Station can be viewed as a 'biography of the Anthropocene'.[13] On a global scale, many proponents of the Anthropocene argue that humans are not only having a massive environmental impact, but also that these environmental impacts have major consequences for human life on the planet.[14] A biographical approach to the history of Vanda Station helps to focus attention on these eco-social interactions at a much smaller scale and to explore what they have meant for the people and environments involved.

The Anthropocene is a fiercely debated concept, and many significant objections have been raised from different academic perspectives. Scientifically, at the time of writing the Anthropocene remains an entirely unofficial geological age. There seems to be a good degree of support for making a formal declaration that the Earth has shifted from the Holocene epoch to the Anthropocene epoch among members of the Anthropocene Working Group of the Quaternary Sub-commission of the International Commission on Stratigraphy, the scientific body tasked with making an initial recommendation for the establishment of a new geological epoch.[15] But a proposal from this working group would only be the start of a broader approval process, which would need to culminate in a favourable vote by the executive committee of the International Union of Geological Sciences. Despite near universal recognition of the massive extent of anthropogenic environmental changes, many scientific questions remain. There is a long-running debate, for example, about when this proposed epoch began, and evidence is still being gathered to demonstrate a global anthropogenic signal in rock stratigraphy.

[13] For other examples of biographical approaches to environmental history see, for example, Coates (1996); Cioc (2006); Cohn (2017); Corton (2018).
[14] See, for example, McNeill & Engelke (2016).
[15] Subramanian (2019)

In the social sciences and the humanities, the concept of the Anthropocene has been extensively discussed, but also extensively criticised. Scholars have highlighted the hubris of a term that gives humans geological agency on a planetary scale, and have attacked proponents of a 'good Anthropocene' who see it as giving them license to continue efforts to geoengineer the world out of the problems we cause.[16] Other scholars have pointed to the unfairness of lumping all of humanity together as geological agents, when in reality it has been a small minority of the global population who have caused almost all of the problems and reaped almost all of the rewards.[17] Others see the term Anthropocene as hiding the true causes of the massive environmental changes the world is currently experiencing and prefer terms such as Capitalocene, Plantationocene, or Anthropo-obScene.[18] A number of scholars have pointed out that there are many problems associated with the planetary scale at which much of the analysis of the Anthropocene takes place.[19] Not only can this easily seem quite abstract, but it also privileges certain forms of knowledge over others, and the views of certain people over others, with significant political implications.

Despite the problems associated with the concept of the Anthropocene, it remains a useful way of thinking about the inseparability of human history and environmental change. Framing the history of Vanda Station as a biography of the Anthropocene draws upon insights from a variety of academic fields that examine the intersection of humans and non-human nature.[20] There are clear resonances, for example, with post-human approaches to the environmental humanities, which give some degree of agency to non-human nature.[21] In seeking to combine the human history of Vanda Station with a close understanding of its changing biophysical environment, this article engages in particular with the emerging field of critical physical geography. Critical physical geographers argue that Anthropocene environments are as much the products of social forces and histories as they are of biophysical processes: 'structural power relations incorporate and draw on the materiality of nature, creating inextricably eco-social systems'.[22] In this approach, histories of science and environmental change cannot be abstracted from political and cultural histories, but require symmetrical analyses that refuse to collapse the social into the material (and vice versa).[23]

[16] Lecain (2015)
[17] Merchant (2020)
[18] See Haraway (2015); Swyngedouw & Ernstson (2018)
[19] Heise (2008)
[20] See, for example, Emmett & Nye (2017); Martens (1999); Cox (2014); Sinclair *et al.* (2015); Robbins, (2004); Sismondo (2010); Lave *et al.* (2018).
[21] Bennett (2010)
[22] Lave *et al.* (2018:5).
[23] King & Tadaki (2018).

While stopping short of attributing anthropomorphic characteristics to Vanda Station, a biographical approach informed by critical physical geography highlights the difficulty of delineating where the human ends and the non-human begins. The closure of Vanda Station, for example, was obviously not a 'death' in a biological sense, but the grief and loss felt by many of the people who had worked there was real, and its removal led to tangible environmental changes. The materiality of Vanda Station and the surrounding environment was shaped by both the political context and by the race, class and gender relations that characterised life at the station, at the same time as the environmental conditions fundamentally influenced the culture that developed there. The 'othering' of Japanese and female scientists, for example, mirrored an approach that saw the material environment of the McMurdo Dry Valleys as an object of study and conquest by white, male scientists and support staff. Change occurred not by challenging the subject-object dichotomy in the way the environment was to be viewed and studied, but by selectively allowing new groups such as female scientists and support staff into the club, while continuing to exclude others such as Japanese scientists.

As a case study from a continent that is often seen as being at the front line of climate warming and rising global sea levels, a biography of Vanda Station offers a particularly relevant example of the human-nature geo-assemblages that characterise the geological age of humans.[24] Even one of the most remote locations in the world can be viewed as an eco-social system. Embedded in the history of Vanda Station are competing visions of Antarctica, and the tension between a particular, national vision of the continent based on a local manifestation of culture, and a universal, international vision of the continent based on commonly accepted understandings of what constitutes legitimate Antarctic science. This contest was not straightforward: over the course of the history of Vanda Station, for example, the New Zealand Antarctic Programme found itself on both sides of this contest, sometimes at the same time. Somewhat paradoxically, given that it generally sees anthropogenic change as a bad thing, the scientific vision draws much of its strength from its engagement with material changes such as the rising levels of Lake Vanda. The political status quo has proved remarkably resilient by adapting itself to the new conditions of the Anthropocene. But this political resilience relies on maintaining a separation between culture and nature and not following through with all the implications of the Anthropocene in relation to the blurring of categories.

A biography of Vanda Station also helps to demonstrate that histories of the Anthropocene require both generality and specificity. While it was a prominent station with a well-documented history, many of the broad trends in the history of Vanda

[24] Leane & McGee (2019).

Station can be seen at other Antarctic stations and in other national programmes during the same period, as well as in New Zealand, American, and Japanese society more generally. The political use of scientific research stations, for example, was common across the continent, and many countries have struggled to integrate female scientists and promote racial diversity.[25] Within the McMurdo Dry Valleys themselves, the US field camps had much in common with Vanda, and the New Zealand Antarctic Programme should in no way be singled out for criticism. At the same time, the specificity of Vanda's history is important. This is primarily a New Zealand story, and the history of Vanda reflects that. If Vanda Station had been built as a genuinely international station, as was originally proposed, then its history would almost certainly have been different, and the rising lake levels may not have led to its closure.

## The 'birth' of Vanda Station

Scientific research had begun in the McMurdo Dry Valleys during the so-called 'heroic era' of Antarctic exploration in the early 20th century, although this was confined to the single valley that would later be known as Taylor Valley. Britain's Captain Scott visited the ice-free region towards the end of his first Antarctic expedition, and famously wrote: 'It is certainly a valley of the dead; even the great glacier which once pushed through it has withered away'.[26] For reasons unknown, he measured the width of the narrow channel separating the two lobes of Lake Bonney, which would become an important baseline measurement to estimate lake level rise over the next 100 years.[27] Raymond Priestley made a brief visit to the Dry Valleys during Shackleton's *Nimrod* expedition, and the young Australian geologist Griffith Taylor led a scientific party which spent a week exploring the region during Scott's second and ultimately tragic expedition.[28] The history of Taylor's Western Sledge Party is particularly interesting, not least because Taylor would go on to become one of the most prominent environmental determinist thinkers of the first half of the 20th century, and these nascent ideas both shaped and were shaped by the way he understood the Antarctic environment.[29]

Following the end of the 'heroic era' of exploration, activity in Antarctica largely ceased. It would be almost fifty years before scientists next visited the McMurdo Dry Valleys. The International Geophysical Year (IGY) of 1957–58 instigated a massive

[25] Hemmings (2011); Seag (2017).
[26] Scott (2001: 567).
[27] Howkins (2016).
[28] Howkins (2016).
[29] Bashford & Strange (2008); Yusoff (2018)

scientific research programme across the Antarctic continent.[30] The ice-free landscape of the McMurdo Dry Valleys offered a variety of research opportunities, and scientific activity expanded beyond Taylor Valley to the other ice-free valleys of the region, including Wright Valley, where Vanda would be constructed. IGY work in the region was carried out by scientists from New Zealand and the United States, the two countries with logistics hubs at nearby Ross Island.[31] For geologists and geomorphologists, this ice-free landscape was one of a few places on the continent where the bedrock was exposed and where geomorphic features provided clues to previous ice ages. For ecologists, the lakes, streams, and soils of the McMurdo Dry Valleys contained microscopic ecosystems that could be used to understand adaptations to life in an extreme environment. Throughout the IGY, scientific activity was confined to the summer months of October to March, when sunlight was available and when the climate was relatively benign.

Summer research in the McMurdo Dry Valleys continued into the 1960s. During this decade Japanese scientists joined scientists from New Zealand and the United States working in the region. A major motivation for Japanese involvement in Antarctica during the IGY was a reengagement with the global community after the horrors of the second world war.[32] In the McMurdo Dry Valleys, Japan's involvement was driven by the fascinating figure of Tetsuya Torii, a wealthy geochemist who developed a long-standing interest in the region. Torii had got his start in Antarctic research at Japan's Showa Station on the opposite side of the continent, but after being introduced to the McMurdo Dry Valleys on a short trip to Antarctica following the 1961 SCAR meeting in Wellington, Torii realised the tremendous potential for geochemistry research in the predominantly ice-free region. In the 1963–64 and 1964–65 seasons, Torii went to the Dry Valleys as guest of the US Antarctic Programme and worked in and around Don Juan Pond, one of the most saline bodies of water on the planet. It was here that he identified Antarcticite, the first new mineral to be described in Antarctica.[33] Unlike the state-funded United States and New Zealand programmes, Torii's wealth and connections allowed him to raise private funds for much of his work.[34]

From a purely scientific point of view, the construction of a research station on the shores of Lake Vanda in the late 1960s made a lot of sense. The McMurdo Dry Valleys were within helicopter range of the US and New Zealand logistical hubs of McMurdo Station and Scott Base on Ross Island, and could also be reached for much of the year

[30] Launius *et al.* (2010).
[31] Bull & Barwick (2009).
[32] Tonami (2017).
[33] Torii & Ossaka (1965).
[34] https://kyokuchi.or.jp/?page_id=176 (accessed 1 Feb 2021, using Google Translate).

by tracked vehicles across the sea-ice of McMurdo Sound. The growth in the science of limnology provided a clear motivation for building a field camp next to the largest lake in Wright Valley. Lake Vanda was interesting for a number of reasons: unusually, for example, its heat increased with depth.[35] The longest river in Antarctica, the Onyx River, flows into Lake Vanda, and it was relatively close to the scientific curiosity of Don Juan Pond, where Torii and others had been working. The growing scientific activity in the Dry Valleys, and particularly in Wright Valley created an incentive for having an outlying logistical hub. A permanent field camp in the McMurdo Dry Valleys also held out the possibility of extending research into the winter for the first time, which was seen at the time as important for making progress in a number of fields.[36]

The construction of Vanda Station, however, was not the result of purely scientific motivations. In the mid–1960s, the US National Science Foundation put forward unofficial proposals to construct a Dry Valley Station 'under the joint auspices of the United States, New Zealand and Japan'.[37] In January 1966, T.O. Jones at the US Office of Polar Programs sent similar letters to New Zealand and Japan. Unsurprisingly, the justification of the establishment of a new station focused on science, not politics, and in particular on the opportunities for conducting research in the McMurdo Dry Valleys through the winter:

> The primary interest in a wintering over operation in the dry valleys is to observe rates of change in the environment and to determine the underlying causes of these changes. Included in such observations might be measurements of glacier and soil movements, snow accumulation and transfer, lake characteristics, and erosion rates, as well as the collection of routine meteorological and micrometeorological data. These and other measurements would form valuable base lines for the analysis of existing conditions in the dry valley areas. Although the annual changes may be small, it is quite likely that the largest measurable departure from average conditions on the Antarctic Continent occur within these dry valleys.[38]

[35] For a review of the physical limnology research in the McMurdo Dry Valleys see Spigel and Priscu (1998).

[36] R.B. Thompson, Dry Valley Station. Undated Planning Document. CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

[37] R.E. Willett, Ross Dependency Research Committee Visit to Scott Base 10 Dec 1965, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

[38] T.O. Jones to R.B. Thomson, 10 January 1966, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch). Similar correspondence took place with Japan. See for example T.O. Jones to Kiyoshi Sugie, 26 April 1966, Box 94 Antarctic Headquarters, Ministry of Education, Culture, Sports, Science, and Technology – Japan, Exchange Scientists, 1966–1970, Archive of the Japanese National Institute of Polar Research, Tokyo.

In the letter to New Zealand, Jones added 'Because of the work which has been carried out in the ice free valleys by scientists from NZ, we are considering an international cooperative program of work at this small wintering station'[39]. If not quite a fully international endeavour, the American plan still differed considerably from the traditional pattern of building national scientific stations in Antarctica.[40] This was in line with the US policy of furthering its own political interests through promoting international research in Antarctica.[41]

There was some initial support for the US proposal from New Zealand and Japanese scientists. Following a visit to Scott Base that included a flight through Taylor and Wright Valleys, R.E. Willett, for example, recommended that the Ross Dependency Research Committee (RDRC) should 'give most favourable consideration to any such proposal'.[42] Bob Thompson replied to Jones that 'The proposal as a whole is a good one and most interesting, particularly to a number of our people who have spent many summers during the past years in this area.'[43] As a result of lack of funding, however, US officials did not follow through with their plan to initiate the programme in February 1967. This gave time for political objections to be raised by members of the RDRC early in 1967:

> Many members of the RDRC expressed their fears that if New Zealand does not establish a station in the Dry Valleys this coming year, the United States may well do so and in a way which could be detrimental to the area and seriously affect all New Zealand's past, present, and future work in this area. Also a great loss of NZ prestige in Antarctica generally.[44]

In addition to their concerns about American intentions, New Zealanders also worried about Japan. In a letter to Bob Thompson, the head of the New Zealand Antarctic Programme, Mike Prebble, a research student at the Scott Polar Research Institute in Cambridge noted: 'Harry Francis [from the NSF] in a word of warning said be careful of the Japanese. They are liable to hone in on the scientific programme in the Dry Valleys and then it becomes very difficult to move them. Apparently USARP is still

[39] T.O. Jones to R.B. Thomson, 10 January 1966, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).
[40] Hemmings (2011).
[41] Joyner (1997).
[42] R.E. Willett, Ross Dependency Research Committee Visit to Scott Base 10 Dec 1965, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).
[43] R.B. Thompson to T.O. Jones, 17 March 1966, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).
[44] R.B. Thompson, Dry Valley Station [undated, unsigned memo], c.1967, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

being pestered about the dry valley station by the Japs despite the withdrawal of funds for this project.'[45] Wartime suspicion and language was still very much in evidence.

Instead of moving forward as part of an international collaboration, the New Zealand government decided to build its own national station in the McMurdo Dry Valleys. Not only would the initiative highlight New Zealand's scientific credentials and offer a variety of new research opportunities, but it would also offer an opportunity to invite scientists from United States, Japan and other countries to use the station, thereby demonstrating at least some degree of benign scientific internationalism. Rather than being an international station with multiple national flags, Vanda was a New Zealand station with a New Zealand flag. While perhaps not exactly the outcome that US Antarctic policy-makers had initially wanted, they were happy to offer logistical and emergency support to the New Zealand plan, and take advantage of opportunities for collaboration;[46] Japanese scientists were happy to have a base they could use for research.

A site for the new station was identified by Thompson and J. Holmes Miller in the 1966–67 season. Following approval for the project from the RDRC in March 1967,[47] construction of Vanda Station began in the 1967–68 season, but due to financial constraints it would not be completed until the following summer. Most materials were airdropped to the site,[48] while others were transported across the sea-ice of McMurdo Sound, over the Wilson Piedmont Glacier and up Wright Valley (on a track that is still visible from the air alongside the Onyx River, as a consequence of the disturbance of the desert pavement). Two tractor accidents involving crevasses in October 1968 highlighted the difficulty of this work.[49] The station was opened by the Governor-General of New Zealand, Sir Arthur Porritt, on 9 January 1969.

The five-man party that wintered-over at Vanda in 1969 were the first humans to experience the polar night in the McMurdo Dry Valleys. In a reflection of the geopolitical concerns that had led to the construction of Vanda as a national station, the first winter-over party included an American meteorologist, but no Japanese scientists. The original Vanda Station consisted of one living quarters hut and one

[45] M. Prebble to R.B. Thomson, 23 May 1967 [handwritten] CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969.

[46] R.B. Thompson, Dry Valley Station. Undated Planning Document, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

[47] Report on Vanda Station, undated, [*c.* Jan 1968], CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

[48] Report on Vanda Station, undated, [*c.* Jan 1968], CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

[49] B. Lucy to R.B. Thomson, Superintendent, Antarctic Division, 11 Dec 1968, CAHU CH370 Box 13 2/21 Policy and Programmes – Dry Valley Station, 1966–1969, New Zealand National Archives (Christchurch).

laboratory hut. Bill Lucy, the leader of the first over-wintering party was critical of the 'slip shod' work put into the living quarters, and he complained that 'The major fault in the mess construction was the lack of any rubber sealing strips between the panels and this fact alone accounted for most of the icing that occurred during the winter.'[50] A decision was taken not to install a generator so as not to interfere with geomagnetic measurements. Instead, electricity would be obtained from a wind turbine that powered batteries.

From the start, a lack of knowledge of climatic conditions along with logistical challenges hampered the functioning of the over-wintering station. 'Contrary to most prophecies,' wrote Lucy in relation to the decision to rely on wind power for electricity, 'there was very little wind during the winter months and calm periods of up to 3 weeks were not uncommon.'[51] Temperatures dropped steadily during these calms only to rise sharply when the wind eventually arrived. Winter temperatures ranged from a few degrees below freezing during wind periods to approximately –57 °C during a prolonged calm spell.' This necessitated a September re-supply of fuel and a new generator from Scott Base. Despite problems, the first winter at Vanda was broadly considered a success by those involved, and the New Zealand government could take credit for showing that it was possible to occupy this harsh region during the difficult winter conditions. 'If we have not found the answers to all the problems encountered,' wrote Lucy, 'we have, at least, found most of the problems.'[52]

## The 'life' of Vanda Station

The second winter at Vanda did not go as well as the first. A number of medical items were freeze broken over the course of 1969 and a number of 'do not freeze' drugs had frozen.[53] On top of this, Vanda's wintering parties did not include a trained doctor. A fatal helicopter accident that happened nearby in November 1969 caused a great deal of concern, and there was worry about the lack of adequate heating and cramped conditions. Citing these concerns, and several others, the original members of the

[50] B. Lucy, Winter 1969 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).
[51] B. Lucy, Winter 1969 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).
[52] B. Lucy, Winter 1969 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).
[53] D. Lowe, Summer Season 1969/70 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).

1970 overwintering party refused to stay at Vanda.[54] Instead of abandoning plans for a second over-winter, the New Zealand government hastily assembled a second team from its staff at Scott Base. The second season encountered many more difficulties and achieved fewer successes than the first season. Somewhat ironically – given the installation of a new generator to replace the wind turbine – 1970 proved a much windier winter than 1969 making travel around the valleys more difficult.[55]

Following the challenges of the 1970 winter, Vanda switched for the next three years to being a summer-only station. The costs of over-wintering were high and the scientific benefits less than anticipated. In 1974, an international big science project known as the Dry Valley Drilling Project coincided with the New Zealand Government's decision to reopen Vanda Station for a winter season, in part so that a bore hole in Lake Vanda could be monitored year-round.[56] But once again, the practical challenges of living through the winter darkness in the McMurdo Dry Valleys proved to be significant. A major problem of this winter season was the failure of the cold storage in the (relatively) warm month of February, meaning that much of the food supplied for the winter thawed and became rotten.[57] These difficulties led to an impromptu late winter evacuation of the over-wintering party back to Scott Base. This would be the final attempt to maintain Vanda as a year-round station: despite occasional suggestions to try another winter from this point onwards, it would only be occupied during the austral summer, with station personnel usually arriving in late October and leaving in late February.

The difficulties faced by the early residents of Vanda, especially the members of the over-winter parties, help to explain why the station developed such a distinctive culture and quickly became for many the emblematic field camp of the McMurdo Dry Valleys. While summer conditions could sometimes be quite pleasant, cold temperatures and raging winds were never far away. Although certainly not as uncomfortable as camps in the 'deep field' interior of the continent, life at Vanda was not without its discomforts and dangers. The residents who made a success of living at Vanda tended to respond to the harsh environment through outward demonstrations of bravado and hardiness.

[54] D. Lowe, Summer Season 1969/70 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).
[55] H.P. Lowe, Winter 1970 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).
[56] A.M. Bromley, Winter 1974 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).
[57] A.M. Bromley, Winter 1974 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

One of the most famous rituals of Vanda Station was the Royal Lake Vanda Swim Club. Early in the life of the station, residents began to skinny dip in the melted margins of the ice-covered lake.[58] Over time, the activity became ritualised as the Vanda Swim Club with an elaborate set of rules, which included '1) No togs allowed' '4) Complete immersion must be achieved' and '10) A fig leaf may be worn, but must be a genuine fig leaf, and must be naturally green without artificial aid.'[59] Participants received a shot of Drambuie liqueur and a freshly made scone as reward for braving the icy waters of the lake. By the late 1970s joining the Lake Vanda Swim Club had become one of the principal highlights of a visit to the McMurdo Dry Valleys. 'Initially I had regarded the swim club as a bit of a joke,' wrote G.H. Lewis, the station leader in 1979–80, 'but soon realized that it plays an important part in morale and international relations. All our visitors and VIPs thought the swim club was marvellous'.[60] A description from the Vanda Station leader's report of 1988 captured something of the spirit of the Swim Club:

> 1988 ended with a splash in a big way with three of the personnel going down to the lake, cracking the ice and going into the water together. Minor injuries were sustained by two of the swimmers but weren't noticed until later. This was probably due to the temperatures of the water, BUT the fact that three bottles of Drambuie had been disposed of might also have had some bearing on this.[61]

Given the harsh environmental conditions and the element of danger this implied, it is perhaps unsurprising that Vanda's traditions bore considerable similarity to those of the military. The macho bravado of these local rituals might be seen as replicating the broader-scale geopolitics of 'conquering nature' across Antarctica.[62]

While the traditions of Vanda Station certainly created a sense of hierarchy (swimmers vs. non-swimmers, for example[63]), the overall consequence was to foster a

[58] There is a mention of the Vanda Swim Club in the 1975/76 leader's report, but by that stage it was already clearly established. H.P. Lowe, H.P., Summer Season 1975/76 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

[59] CAYP CH805 2803 Box 168, Antarctica social club records – The Royal Vanda Swimming Club Log Book, 1979–1994. New Zealand National Archives, Christchurch. Rule numbers have been crossed out and changed over time. These are the original numbers.

[60] G.H. Lewis, Summer Season 1979/80 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

[61] R.D. Corlett, R.D., Summer Season 1988/89 – Vanda Leader Reports, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch).

[62] Howkins (2016).

[63] R.D. Corlett, R.D., Summer Season 1988/89 – Vanda Leader Reports, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch). The station leader at one point referred to 'five swimmers and two wimps'.

broadly egalitarian ethos that reflected something of the way New Zealand's national culture was frequently imagined.[64] 'All of Vanda staff and duties are interchangeable,' wrote the station leader Harold Lowe in the 1975–76 season, 'therefore, clothing and equipment issue should be the same for everyone. Everyone does everything.'[65]. Traditional notions of social class based on economics and social background were certainly not absent from the history of Vanda Station – leaders were picked for their character and background – but these class differences tended to be flattened by the station's egalitarian ethos. Frequent 'DV' (Distinguished Visitor) visits to Vanda Station from Scott Base and McMurdo Station also served to flatten hierarchies by introducing residents of Vanda to celebrities, politicians and high-ranking military officers in a situation where residents were the ones with local knowledge and a sense of familiarity.

As well as challenging traditional social hierarchies based on class, the culture of Vanda Station also challenged scientific hierarchies. It was not uncommon, for example, for complaints to be made that having a good time got in the way of doing science. The station leader in the 1979–80 season, for example, complained that a helicopter 'jolly flight' for personnel from Scott Base was being given priority over the need to service remote meteorological screens. When this led to an additional flight being made he added 'I feel this extravagant move illustrates the way in which the so called "jolly" syndrome has got out of control in the last few years.'[66] The leader the following season wrote that 'the resources of Vanda appear to be squandered in that only two programmes were centred on the Station,' adding, 'I am sure a more profitable use of the Station facilities for scientific investigations is both possible and desirable'.[67] Such complaints do not mean that no science was done at Vanda, or that programme officers had no influence. But it does mean that the scientists who thrived in this system tended to be the ones who adapted to and enjoyed this culture. Reputation at Vanda was determined less by scientific productivity and more by past experience, practical skills and the ability to fit in with the culture of the station.

Another characteristic of the culture of Vanda Station was epitomised by a rivalry between two groups known as the 'Asgard Rangers' and the 'Vanda Vandals'. The Asgard Rangers were the glaciologists and hydrologists who roamed the valleys surveying glaciers and measuring streams. The Vanda Vandals were those whose work

[64] See, for example, King (1999).

[65] H.P. Lowe, H.P., Summer Season 1975/76 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

[66] G.H. Lewis, Summer Season 1979/80 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

[67] P. Johnstone, Summer Season 1980/81 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

kept them around Vanda Station. These two groupings formed the basis of an ongoing rivalry based around practical jokes and good-humoured banter. 'A good sense of humour,' reported one station leader, 'is so important at a place like Vanda that it has almost become one of our programmes this year (not to be taken seriously).'[68] The Viking helmet symbol of the Asgard Rangers, for example, was painted onto the roof of Vanda Station, to mark a conquest of rival territory. While such antics might appear quite juvenile to outsiders, they functioned as another response to living in a difficult environment. The existence of the Asgard Rangers and the Vanda Vandals also highlights the close overlaps of work and leisure, which not only characterised the culture of Vanda Station but also Antarctic research more generally.

Like in much of Antarctica, during the early years of Vanda Station, environmental protection received relatively little attention. Greywater (and worse) was simply poured onto the ground, wheeled vehicles were driven across the fragile soils, and on one occasion in the early 1980s the surface of Lake Vanda was set on fire to burn fuel spilled by a failed airdrop.[69] These somewhat lax attitudes towards good environmental practice reflected the norms of the times, and retrospective criticism is largely unfair, especially since it was fairly common for station leaders to express concern about environmental negligence. But it is not difficult to make connections between a lack of environmental awareness and the broader 'conquest of nature' mentality that reflected the culture of Vanda Station.

As planned, Vanda Station hosted a number of international exchange scientists. The summer season of 1970–71, for example, saw visits of varying lengths by scientists from Japan, Russia, the United States, and Germany.[70] Japanese scientists would be the most frequent foreign visitors, and their presence added an explicit racial dimension and complicated the initial whiteness of the station. The opening of Vanda saw the Japanese programme in the region shift from relying primarily on US support to relying primarily on New Zealand support. The Japanese scientists got along well with their New Zealand hosts, evidenced by the sharing of national cuisines and beverages during holiday celebrations, which were often high-points for the year ('We are now experts in chopsticks, thanks to Dr. Torii' wrote one station leader in his

[68] G.H. Lewis, Summer Season 1979/80 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).

[69] J. Alexander, Summer Season 1984/85 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch). For a retrospective analysis, see for example, D.S. Sheppard to M. MacFarlane, 5 August 1993 , CAYP CH805 2802 Box 4 18/3 Vanda Station: Vanda Station Removal, 1992–1994, New Zealand National Archives (Christchurch).

[70] P.F. Dyer, Summer Season 1970/71 – Vanda Leader Report, CAYP CH805 2802 Box 33 13/3/1 Reports: Leader: Vanda Station, 1969–1973, New Zealand National Archives (Christchurch).

annual report[71]). Led by Tetsuya Torii, the Japanese clearly enjoyed being at Vanda Station and sharing in certain elements of its culture.

With memories of the Second World War still fresh, however, there were also instances of racial prejudice. A letter from a New Zealand camp manager, dated April 1984, for example, noted:

> The Japanese party in particular put a great deal of pressure on us. Individually they were very nice people, but at 0655 on the dot, 5 red jacketed nippons all in a line coming for breakfast and then sitting politely behind the table waiting for it to appear was not my favourite view… Doc Torii in particular seemed to radiate the opinion that Vanda Station ran entirely for his benefit.[72]

More generally, for much of the time they spent at the station there was relatively little day-to-day interaction between New Zealand and Japanese personnel, and in the early years in particular, the Japanese tended to remain physically distant in their own campsite. The Japanese scientists faced a number of difficulties working in a predominantly English-language environment.[73] Dry Valley place names, for example, were almost exclusively English, and the Japanese researchers don't seem to have made any attempt to provide Japanese names. When Torii made his discovery of Antarcticite in 1965, he originally wanted to call the new mineral Don Juanite, after the name of the site, but he was dissuaded by the US Geological Survey, owing to its womanising connotations of which he was likely unaware.[74] Taken together with their own preferences, the attitudes encountered by the Japanese scientists and the challenges they faced likely served as obstacles to the levels of scientific collaboration that might have been expected to develop through sustained research over such an extended period of time.

While the presence of Japanese scientists at Vanda Station serves as the most obvious focal point for observing the role of race in the history of the McMurdo Dry Valleys, racial factors were not limited to relations among the different national programmes. In both the New Zealand and the US Antarctic programmes, minorities were conspicuous by their absence (as they were in the Japanese programme). Almost all the New Zealand scientists and support staff were of *Pākehā* (white settler) heritage; very few, if any came from Māori or Polynesian backgrounds. The role of the military – which was something of a racially integrated institution – meant that there was a little more diversity in the US programme. But even at the American field camps

[71] G.H. Lewis, Summer Season 1979/80 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).
[72] 'Bunty to Garth, Norm, and Bob', 27 April 1984. CAYP CH805 2802 Box 41 13/2/2 Reports: Scientific Vanda, Dec 1968-June 1990. New Zealand National Archives (Christchurch).
[73] B. Doughty, Summer Season 1978/79 – Vanda Leader Report, CAYP CH805 2802 Box 34 13/3/1 Reports: Leader, Vanda Station, 1973–1985, New Zealand National Archives (Christchurch).
[74] Harrowfield (1999: 45).

almost none of the scientists or the people working in the Dry Valleys came from minority backgrounds. With the notable exception of the Japanese scientists staying at the station, Vanda remained a predominantly white space throughout its existence.

In addition to the racial tensions highlighted by the presence of Japanese scientists, Vanda Station was also the site of tensions around gender. Like virtually everywhere else in Antarctica up to the early 1990s, men dominated the history of Vanda Station. None of the over-wintering parties included women, Vanda never had a female station leader, and women were always in the minority at the station during summers. It would not be until the 1986–87 season that Joanne Cowan became the first female station worker.[75] In the relative absence of women, the culture of Vanda Station developed in a way that was at the same time hyper-masculine and curiously boyish, and for many of its residents this culture appears to have been a big part of the attraction of working there. From close to the beginning of its existence, however, Vanda's masculine world was threatened by efforts to increase female participation in Antarctic activities. Both the US programme and the New Zealand programme made increasing efforts to integrate female scientists and support staff during the 1970s and 1980s, and an increasing number of women lived, worked, and visited the station during the summer months.[76]

While men often liked to think that they were in control of 'allowing' women to play more of a role in Antarctic science, the reality was very much a bottom-up process. The integration of women into Dry Valleys research might be seen as a series of ongoing efforts by individuals and small groups to make women working in the Dry Valleys a reality. Difficulties and obstacles were very much part of this story, and the experiences were not universally positive. The challenges of sustaining a scientific career in Antarctica with pressures of family were experienced by both men and women, but social expectations often made these more difficult for women. There were pin up calendars in the labs, crude and sexualised humour, and a culture characterised by acts of physical prowess and endurance, and by hard drinking. Some women seem to have relished the challenge of proving themselves in a 'man's world', and for them (like many of the men), such a working environment was part of the attraction of Vanda Station. For others, however, it was an added hurdle to overcome to allow for the science to be done. During the 1969–1970 season, for example, Lois Jones led the first US female scientific team to work in Antarctica to the Dry Valleys, where they spent Christmas at Vanda Station. Jones had recently completed a PhD at Ohio State University on the geochemistry of the McMurdo Dry Valleys using samples collected

[75] Harrowfield (1999: 36). There had been a woman (Christina Troup) on the Asgard Rangers 1980/81.
[76] Seag (2017).

for her by male colleagues. She was only allowed to work in the region on the condition that it was an all-female team and although her results were reported in a number of respected scientific journals, Jones would never return to work in Antarctica.[77]

The hostile environment facing female scientists at Vanda Station was exemplified by the Lake Vanda Swim Club. According to rule number five of the club, not only did participants have to swim naked in the lake, but they also had to consent to having their photos taken while doing so. Rule seven added 'all photographs are property of photographer and may be published at his (or her) discretion' and rule eleven gave residents of Vanda permission to 'leer, peer, peep, spy, photograph, make advances, rude suggestions or invitations and compliments as seen fit'.[78] The perceived need to prove oneself in this way was experienced by women and men alike, and not all men enjoyed participating in the Vanda Swim Club. But comments in the Vanda Station leader's reports hint at the pressure that women in particular were put under to take their clothes off and be photographed going for a swim. After noting that a member of the US VXE–6 helicopter squadron had become the first female swimmer of 1988 ('duly witnessed by all the staff at Vanda. Photographic proof is available on request'), the Vanda Station leader's report lamented that 'NZ girls slow starters'.[79] The same report summarised the swim numbers for December: 'The swimming club is going well with 54 brave people entering the water but only two of these being females of the opposite sex!!! And to make matters worse they were both Americans, maybe our base staff are too shy!!! Come on girls we would like to see more of you, in the water.' Even members of visiting New Zealand Youth Groups were encouraged to take a swim: one of the comments in the logbook was 'child pornography,' while another swimmer was keen to point out that she was 18 years old.[80]

The pressures faced by female researchers were not only an important part of the social history of Vanda Station, but also had an impact on the history of science. Regardless of the place of their research or their scientific discipline, many female scientists building their careers during the 1970s and 1980s in the United States, New Zealand, Japan and elsewhere, were subject to prejudice and discrimination. But the pressures facing female scientists at Vanda Station were particularly intense. These

[77] For a recent celebration of Lois Jones' work in Antarctica, see https://byrd.osu.edu/symposia/celebrate-women/videos (accessed 1 February 2021). Also see https://www.thearcticinstitute.org/women-polar-research-brief-history/ (accessed 1 February 2021).

[78] CAYP CH805 2803 Box 168. Antarctica social club records – The Royal Vanda Swimming Club Log Book, 1979–1994. New Zealand National Archives, Christchurch. Rule numbers have been crossed out and changed over time. These are the original numbers.

[79] R.D. Corlett, Summer Season 1988/89 – Vanda Leader Report, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch).

[80] CAYP CH805 2803 Box 168. Antarctica social club records – The Royal Vanda Swimming Club Log Book, 1979–1994. New Zealand National Archives (Christchurch).

pressures put up an additional barrier to the integration of female scientists and support staff. While it certainly reflected broader trends in science, it is perhaps no coincidence that the number of women working in the McMurdo Dry Valleys would increase dramatically from the mid–1990s onwards, following the closure of Vanda Station and the prohibition of swimming in the lakes.

## The 'death' of Vanda Station

For the residents of Vanda Station who returned in consecutive years, it was not difficult to observe the rising levels of Lake Vanda. As they broke lake ice for drinking water and to go for a swim, it was obvious that the edge of the lake was moving progressively closer to the station. By the mid–1980s, the annual station leader reports were beginning to express concern. Reporting on the 1985–86 season Peter Foster, the station leader, wrote:

> From 1970 to 1986 the lake has risen 5.2m. The new Dunlite tower and the freezer at the 91m level which at present is 3.83m above the lake while the new lab is 6.83m above the lake. As rises of over 2m have been recorded, Vanda would have to be shifted about the time water reaches the freezer. Since 1981 the average lake rise has been 0.52 m/year and possibly increasing. Should the current rate of rise continue then the lake would reach the freezer and Dunlite tower base in 1993 which is only seven years away. Unless the Antarctic climate starts cooling in the near future then flooding is inevitable.[81]

Lake level measurements at the station quantified the anecdotal observations of the residents. In closed basin lakes like Lake Vanda, no outflow exists and levels are the simple difference between streamflow and precipitation directly to the lake minus water lost to evaporation or, in the case of Lake Vanda, through sublimation (ice evaporation) from its ice cover. Notably, the soil surrounding the lake including the lake bottom is underlain by permafrost – soil perennially below freezing precluding any subsurface losses to groundwater. The rising lake level clearly showed that stream input from the Onyx River, the only significant water supply to the lake, was greater than losses to sublimation. Based on the measurements of streamflow, the sublimation losses estimated from lake level rise and the knowledge of how lake volume increases with lake level elevation (determined by early survey work prior to station construction), it was easy to predict the rate of future lake level rise, assuming constant conditions. It was clear the station had to be moved.

[81] P. Foster, Summer Season 1985/86 – Vanda Leader Report, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch).

As the level of Lake Vanda continued to rise through the 1980s, the scientific productivity of scientists working from Vanda Station began to decline. Some good science continued to be done in the McMurdo Dry Valleys at this time. An important international conference on Dry Valleys science, for example, was hosted by Mike Selby at the University of Waikato in May 1985, which functioned to showcase New Zealand scientific research.[82] Around this time, there were some calls for another winter season to be tried at Vanda Station. But these calls went unanswered, and, in general, the 1980s was not a strong decade for New Zealand Dry Valleys science. Although a somewhat crude measure, the number of New Zealand publications on the McMurdo Dry Valleys fell decade by decade from the 1970s to the 1990s, before rising again in the 2000s after Vanda had closed.[83]

If never quite a liability to New Zealand's sovereignty claims, the early sense of scientific optimism and prestige generated by Vanda Station had significantly dissipated by the mid–1980s. It was becoming less clear whether Vanda was fulfilling its original goal of promoting New Zealand's Antarctic sovereignty through the performance of Antarctic science. Other factors accompanied this loss of scientific prestige and no single cause resulted in the decision to close Vanda Station. The priorities of Antarctic science were changing, and fields that had been cutting edge in the late 1960s were no longer cutting edge in the late 1980s, in part because most of the work had been done and questions had been answered (for example by the Dry Valley Drilling Project).[84] Discussions over a Mineral Protocol for Antarctica were raising questions about environmental protection across the continent, and good 'stewardship' was becoming closely connected to the politics of sovereignty.[85] Under these circumstances, it was no longer clear that maintaining a central research station in a place like the McMurdo Dry Valleys was the best approach to protecting the environment and supporting New Zealand sovereignty. At the same time, funding for Antarctic science was tight and Vanda Station was expensive to run. With New Zealand's main logistical hub of Scott Base on Ross Island performing the presence and administration required to demonstrate effective occupation under international law, the return on investment of a costly station in the McMurdo Dry Valleys was uncertain.

On a visit to Tokyo in 1986, Bob Thompson informed Tetsuya Torii that New Zealand would no longer provide logistical support for Japanese researchers at Vanda

[82] R.B. Thompson to M. Selby, 9 April 1985, CAYP CH805 2802 Box 46, 14/4/4 Meetings and Conferences: 1985 Dry Valley Conference – RDRC, 1984–86, New Zealand National Archives (Christchurch).
[83] Data obtained from bibliometric analysis and available on request.
[84] Barker (1977).
[85] Antonello (2019).

Station.[86] Without this support, Japanese research became unsustainable, and the decision brought an abrupt end to over 20 years of Japanese Dry Valleys science. The 1986–87 season was the final year of Japanese research at Vanda, and the station report hints a slightly strained relationship, despite one last memorable Christmas party: 'I am confident that Vanda played its part in the life of the Ross Dependency for the season and flew the PR flag regardless of any political clouds that may have been lurking on or just beyond the horizon'.[87] The fact that there was virtually no continued Japanese research in the McMurdo Dry Valleys after this season, including no international collaborative efforts, highlights the tight-knit and isolated character of the Japanese research group.

Following the end of support for the Japanese presence at the station, Vanda continued for several years as a New Zealand-only summer station. But there was a growing sense that the end was near. With the waters of Lake Vanda threatening to inundate the site, there was a real danger that 25-years of accumulated environmental contamination around the station would find its way into the lake, with potentially damaging consequences for future limnological research. A decision was taken to remove the station and replace it with two smaller huts on the opposite side of the lake. Under some pressure from Greenpeace and from the terms of the newly signed Environmental Protocol to the Antarctic Treaty, the removal of Vanda Station was accompanied by a substantial environmental clean-up operation of the contaminated site.[88]

The clean-up operation served as a public confession of the environmental damage Vanda Station had caused, but also offered New Zealand an opportunity to demonstrate its commitment to good environmental management. The soil scientists Ian Campbell and Graham Claridge conducted an environmental survey of Vanda Station during the 1992–93 season and reported their findings to Gillian Wratt, the Director of the New Zealand Antarctic Programme.[89] Soil samples from around Vanda Station were analysed by D.S. Sheppard from the Nuclear Sciences Group.[90] The results indicated 'measurable contamination relative to the baseline samples, of heavy metals including silver, total carbon, nitrate, and phosphate.' A particular focus of concern

[86] Y. Yoshida, Chronological List of Activities of Fieldwork in McMurdo Dry Valleys by Japanese Parties, obtained at Archive of the Japanese National Institute of Polar Research, Tokyo.
[87] C. Lynch, Summer Season 1986/87 – Vanda Leader Report, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch).
[88] M. Bourke, Summer Season 1990/91 – Vanda Leader Report, CAYP CH805 2802 Box 34 Reports: Leader, Vanda Station, 1985–1991, New Zealand National Archives (Christchurch).
[89] I.B. Campbell to G.S. Wratt, Jan 16 1993, CAYP CH805 2802 Box 41 13/2/2 Reports: Scientific Vanda, Dec 1968-June 1990, New Zealand National Archives (Christchurch).
[90] D.S. Sheppard to M. MacFarlane, 5 August 1993 , CAYP CH805 2802 Box 4 18/3 Vanda Station: Vanda Station Removal, 1992–1994, New Zealand National Archives (Christchurch).

was 'Greywater Gulley' where wastewaters had been tipped: '…it must be concluded that the contaminants in the soils at this site are being leached into the lake waters, and are accessible to the algae, as attested to by the bloom.' The fact that work on clean-up began during the 1993–94 season before the circulation of an Initial Environmental Evaluation caused some unease among environmentalists, but with the removal of the remaining Vanda Station structures in the 1994–95 season, a difficult project was successfully completed.

The removal of Vanda Station in the 1994–95 season coincided with the relocation of two small huts from other parts of the Dry Valleys (Lake Fryxell and Lake Miers) to a site on the opposite side of Lake Vanda. The construction of this new structure again caused concerns among environmentalists that work was being done before environmental assessments had been completed, but this was not too serious an issue.[91] Importantly, the new huts were not intended as a direct replacement for Vanda Station. They would not be permanently staffed meaning that there would be no replication of the culture of the original station. The closure of Vanda coincided not only with the signing of the Environmental Protocol to the Antarctic Treaty in 1991, but also with transformation of the New Zealand Antarctic Programme into Antarctica New Zealand and a new, lighter touch approach being taken to scientific research in the Dry Valleys. Rather than working from fixed camps, in recent years New Zealand scientists have tended to rely instead on temporary campsites that are thought to have less of an environmental impact. There would be a small increase in the number of New Zealand Dry Valley publications in the first decade of the 2000s and much of this research was closely connected to environmental protection and management. In much the same way that the establishment of Vanda Station had the goal of promoting New Zealand sovereignty through science, the removal of the station and the increased emphasis on environmental protection this precipitated can be viewed as an effort to promote New Zealand sovereignty through sound environmental practice.[92]

## Conclusion: adapting to the Anthropocene

For anyone who visited the McMurdo Dry Valleys during the 1970s and 1980s, Vanda Station is likely to evoke powerful memories. The station gained something of a legendary status, not so much for the science that was done there, but for its culture. Constructed and run by the New Zealand Antarctic Programme, Vanda Station was

[91] A. Hemmings to L. Sparrer, 15 Nov 1994, CAYP CH805 2802 Box 4 18/3 Vanda Station: Vanda Station Removal, 1992–1994, New Zealand National Archives (Christchurch).
[92] Taylor *et al.* (2016).

quite obviously a 'Kiwi' facility. In reference to the rustic cabins owned by many New Zealanders, Vanda Station was often thought of as the 'bach' (pronounced 'batch') of Scott Base: a place to escape to for rest and recreation. But Vanda Station was also an international space: scientists and helicopter pilots from the United States were frequent visitors, Japanese geochemists used the station as their base for much of its life, and it was a popular stopping point for 'Distinguished Visitor' tours of the Dry Valleys. While most Antarctic field camps and research stations have their own distinct identities, in relation to its relatively small size and relatively short existence, Vanda arguably made a disproportionate contribution to developing a distinctive and influential Antarctic culture. Over the life of Vanda Station, however, this culture became an impediment to the conduct of high-profile scientific research. By the time of its closure in the early–1990s, it was no longer clear that the station was fulfilling its original purpose of promoting New Zealand's Antarctic sovereignty claim through facilitating scientific research. In this context, rising lake levels offered a neat justification for closing the station and starting again, yet there was nothing inevitable or pre-determined about this decision.

A biographical approach to the history of Vanda Station helps to highlight the interconnectedness of its scientific, political, cultural and environmental histories. Vanda Station can be studied as an eco-social system that both shaped and was shaped by the material environment of the McMurdo Dry Valleys. Building on a recognition of this interconnectedness, a biographical approach also helps to put the history of Vanda Station into the broader context of the Anthropocene epoch. The 'birth', 'life' and 'death' of Vanda Station were all shaped fundamentally by the cultural and material conditions that on a global scale are coming to be recognised as 'the age of humans'. Framing the history of this New Zealand Antarctic Station as *a* biography of the Anthropocene can make an important contribution to understanding these wider trends. It becomes possible to see how the political status quo in the McMurdo Dry Valleys has been maintained through a partial adaptation to the new realities of a human-influenced biophysical world. The closure of Vanda Station represented an implicit acknowledgement on the part of the New Zealand government that its nationalistic and hyper masculine approach to asserting Antarctic sovereignty was no longer viable. In the face of rising lake levels, it became politically expedient to close the station and focus on integrating sound environmental management into their performance of science.

In line with some of the more critical humanities literature on the Anthropocene,[93] a biography of Vanda Station reveals that the history of the 'age of humans' is rarely as straightforward as it may appear. The rising lake levels certainly played an important

[93] See, for example, Lecain (2015).

role in the closure of Vanda Station, but the encroaching water was not the only cause. Rather than approaching the study of the Anthropocene as a renewed form of environmental determinism, where humanity will inevitably suffer, the history of Vanda Station presented in this article suggests that more complex eco-social interactions lie just beneath the surface of the dominant narrative (and now the water of Lake Vanda). Environmental historians and other scholars might argue with strong justification that human history has always been inseparable from the history of the environment. But in an age where even a supposedly 'pristine' environment like the McMurdo Dry Valleys has been deeply impacted by human actions, this interconnectedness is arguably more profound, more reciprocal and more pervasive than ever.[94]

While the implications of the Anthropocene are difficult to comprehend at a global scale, smaller scale microhistories can help make sense of our current age. The blurring of nature and culture revealed by a biography of Vanda Station makes it difficult to sustain the idea of 'the environment' as something 'out there' to be investigated as an object of study. Seen in this way, the current climate emergency cannot just be treated as an external threat to the well-being of humanity, but something much deeper that affects what we do and who we are. The totalising vision of the Anthropocene promoted by science creates a comprehensive framing for the way the world is understood that goes beyond science into geopolitics, race and gender relations, and class structures. Even the way we tell stories and think about history is being shaped by the eco-social relations of the Anthropocene. On one level, a biography of Vanda Station might just be one relatively small part of the history of an uncharacteristic region of a peripheral continent. But on another level, it is a story that has much to tell us about the challenges facing humanity in the 21st century.

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[94] Howkins (2014).

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