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Notes from the Icehouse



Mixed Methods, Dry Valleys, New Insights

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The McMurdo Dry Valleys are a polar desert and the largest ice-free region of Antarctica. They were discovered in 1903 on the first expedition of British explorer Captain Robert Falcon Scott, who, seeing the bare rock and lack of plants, called the area ‘a valley of the dead’. While Scott and his party pressed on for the South Pole during his second, and ultimately fatal, Antarctic expedition, a team led by Australian geologist Griffith Taylor spent the first week of February 1911 exploring, photographing and surveying the Dry Valleys.¹ No one visited the region thereafter until it became a focus of research during the International Geophysical Year (IGY) in

¹ A. Howkins, ‘Taylor’s valley: what the history of Antarctica’s “Heroic Era” can contribute to contemporary ecological research in the McMurdo Dry Valleys’, *Environment and History* 22 (2016): 3–28. doi:10.3197/096734016X14497391602125.

Figure 1. A typical semi-permanent field camp in the McMurdo Dry Valleys. Photograph by Stephen Chignell.



1957–1958. Since the IGY, scientific activity has continued every austral summer, in addition to three winter stays. Scientists found microbial life in the soils, glaciers, and ice-covered lakes, resulting in a changed perspective, and the valleys came to be seen as a vulnerable ecosystem rather than a ‘dead’ landscape. Many now consider the area a ‘natural laboratory’ for researching fundamental ecological processes. Ecologists and other environmental scientists, working out of field camps (Figure 1), study how nutrients cycle through this system in ways impossible elsewhere with far greater ecological complexity and longer histories of human presence.

How might one write an environmental history of such a place, never permanently inhabited, only relatively recently brought within the compass of human knowledge, and widely regarded as devoid of history and culture? That question initiated a seven-year (and counting!) collaboration between an environmental historian

(Adrian Howkins), a glaciologist (Andrew Fountain) and a mapping specialist (myself).² Recognising that scientists and support staff are the only people to spend significant time in the region, and that the history of science would therefore figure large, we took the approach offered by critical physical geography, a growing field which seeks to study material landscapes, social dynamics and knowledge politics together.³ By mixing methods and embracing iterative analysis, we have been able to adjust our goals, assumptions and methods as new lines of inquiry emerge.

The project began with the creation of a digital photo archive of human activity in the region, which we believed would help scientists to identify earlier research sites, and throw light on the changing interaction between people and the Dry Valleys environment.⁴ However, we soon realised that, by locating historic sites of human occupation, our archive enabled the collection of soil samples that might reveal the long-term effects of different types of human activity on Dry Valleys microorganisms. This led to field surveys at six past and present research camps, where we collected soil samples at former huts, helicopter landing zones and outhouses (Figure 2). We also used repeat photography to help identify changes at each site over time. With the help of our ecologist colleagues, we are now analysing these data to see whether the soils at each camp differ from the surrounding landscape.

Parallel to our fieldwork, we also collected data on scientific activity over time to supplement our digital photo archive. Through

² Adrian and Andrew are the leaders of this project, and I am a graduate research assistant. We have also had many key collaborators and co-authors along the way, including Poppie Gullett, Melissa Brett, Evelin Preciado and Madeline Myers.

³ R. Lave, C. Biermann and S.N. Lane. 2018. 'Introducing critical physical geography', in R. Lave, C. Biermann and S.N. Lane (eds), *The Palgrave Handbook of Critical Physical Geography*, pp. 3–21 (Cham: Springer International, Publishing, 2018). doi:10.1007/978-3-319-71461-5_1.

⁴ A. Howkins, S.M. Chignell, P. Gullett, A.G. Fountain, M. Brett and E. Preciado, 'A digital archive of human activity in the McMurdo Dry Valleys, Antarctica'. *Earth System Science Data* 12 (2020): 1117–1122. doi:10.5194/essd-12-1117-2020.

Figure 2. The Asgaard Hut near Taylor Valley, Antarctica in 1970–71; and environmental historian Adrian Howkins laying out a transect for soil sampling at the site in 2017–18.



Asgaard Hut: 1970-71



Asgaard Hut: 2017-18

Photograph credits: Trevor Chinn (top), *Asgaard Hut* Antarctica NZ, <https://adam.antarcticnz.govt.nz/nodes/view/40100> (accessed 7 Sept. 2022); Poppie Gullett (bottom).

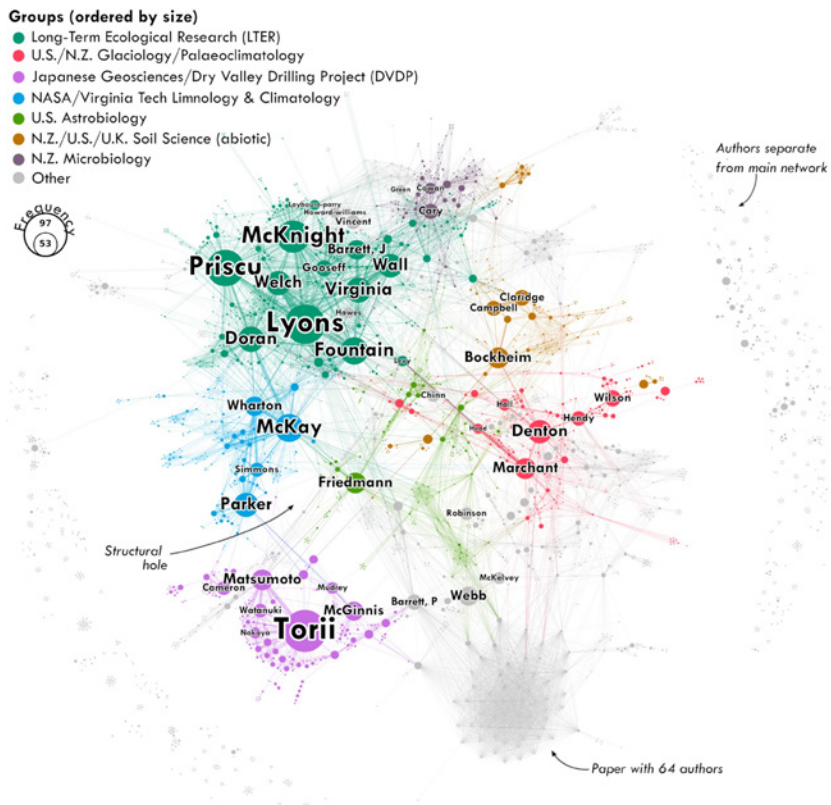
this process, we came across a three-volume paper-bound bibliography published by the New Zealand Antarctic Program of all known Dry Valleys publications between 1978 and 1995. While digitising this bibliography, we realised we could harmonise it with similar data from the Web of Science to conduct a longitudinal bibliometric analysis of Dry Valleys science. Interestingly, there was very little overlap between the two datasets, demonstrating how historical sources can fill in gaps in modern digital databases.

The bibliographic data also led us to social network analysis (Figure 3), which is a suite of techniques for analysing and visualising relational information. None of us had experience with network analysis, but we dived in to create networks based on co-authorship and academic discipline. The results allowed us, together, to identify key actors and research communities and how they changed over time. This macroscopic perspective complemented the microscale archival sources and interviews we had already collected, and helped us to identify additional people to interview, questions to ask and parts of the story to explore. Strikingly, we learned that the most prolific author in the Dry Valleys corpus is Tetsuya Torii, a geochemist who led the Japanese Dry Valley programme from the late 1960s–80s, but whose story we knew little about. This led Adrian and Andrew to visit archives and interview scientists in Japan, which yielded, in turn, a historical paper that delves into the geopolitical, racial and gender aspects surrounding the construction and eventual closure of New Zealand's Vanda Station.⁵

Our bibliographic database of science in the Dry Valleys also allowed us to explore the links between field camp location, research sites and the incidence of publications pertaining to particular locales. By reading each publication and identifying if and where the authors collected field data, we were able to conduct a longitudinal geospatial analysis, and found that research sites have, on average,

⁵ A. Howkins, S. Chignell and A. Fountain, 'Vanda Station, Ant-arctica: a biography of the Anthropocene', *Journal of the British Academy* 9s6 (2021): 61–89. doi:10.5871/jba/009s6.061.

Figure 3. Example of our social network analysis. This is the cumulative co-authorship network of the Dry Valleys, 1907–2016. Each circle (node) represents an individual scientist, and its size reflects the number of publications that scientist authored. Line (tie) thickness represents the number of collaborations between authors. Colours represent different groups identified by a clustering algorithm. CC-BY-4.0.⁶



⁶ This is a reprint of Figure 3 in S.M. Chignell, A. Howkins, P. Gullett and A.G. Fountain, 'Patterns of interdisciplinary collaboration resemble biogeochemical relationships in the McMurdo Dry Valleys, Antarctica: a historical social network analysis of science, 1907–2016', *Polar Research* 41 (2022): 8037. doi:10.33265/polar.v41.8037.

gotten closer to field camps overtime.⁷ Moreover, scientific output does not necessarily correspond to the number of field camps, and constructing a field camp does not always lead to a subsequent increase in research in the local area. Not only does this have implications for national programmes seeking to minimise the impacts of scientific research, it helps to show the contingency of current scientific knowledge in the region, as the establishment and placement of camps is often decided for logistical rather than scientific reasons.

My involvement has already convinced me that the interdisciplinary rubber meets the road when collaborators begin to interpret information and write *together*. It is then that taken-for-granted assumptions and familiar axioms are subject to new scrutiny. Linking distinct and diverse disciplinary perspectives forces one to negotiate and learn in different ways from when collaborating within cognate domains (e.g., historians with human geographers; ecologists with hydrologists). In our case, we embarked on a continuing process of learning each other's disciplinary languages and thought styles, deferring to each other's expertise and finding key areas of conceptual overlap. Intentionally engaging in each other's domains has fostered a spirit of mutual learning.⁸ Andrew has experienced the pleasures and pains of sleuthing through archives and conducting interviews. Adrian now knows the subjectivity of field survey design, the tedium of data entry and the excitement of interpreting the results of quantitative analyses. I have learned how to do bibliometric network analyses and design metadata schema in line with archival standards.

Although differences in disciplinary language and theory have presented hurdles, differences in knowledge communication styles have been a continuing challenge in both writing and publishing our

⁷ S.M. Chignell, M.E. Myers, A. Howkins and A.G. Fountain, 'Research sites get closer to field camps over time: Informing environmental management through a geospatial analysis of science in the McMurdo Dry Valleys, Antarctica', *PLOS ONE* 16 (2021). Public Library of Science: e0257950. doi:10.1371/journal.pone.0257950.

⁸ K.K. Greer, K. Hemsworth, A. Csank and K. Calvert, 'Interdisciplinary research on past environments through the lens of historical-critical physical geographies', *Historical Geography* 46 (2018): 32–47. doi:10.1353/hgo.2018.0024.

work, not least because differences in writing styles reflect differences in thought styles. Broadly speaking, scientists collect and analyse data, draw diagrams and then fill in the text of the manuscript around a pre-existing structure. For many scientists, ‘knowledge’ seems to reside in the empirics, and writing is considered a way to convey an insight that emerged from an ‘analytical’ act (not an interpretive one) that already took place. In history, it seems, the interpretation and resulting insights are understood to emerge *through the act of writing*. The empirics are important, but the interpretive powers of weaving a narrative are recognised and emphasised, resulting in a blurring between what is ‘Results’ and what is ‘Discussion’. This may seem more honest and transparent to historians, but can come across as vague or even misleading to scientists. Although this is a simplistic characterisation, and narrative of course plays a large role in scientific writing, I believe these differences in style can form an obstacle to meaningful collaboration between the ‘two cultures’. In projects such as ours, participants have to do more than decide between narrative and the impassive prose of scientific articles – they have to balance and incorporate each other’s epistemic perspectives. This requires ongoing deliberation and compromise, which is aided by the mutual respect and appreciation we gained for each other as scholars and people over the years in the field, the office – and the pub.

Similar challenges are endemic in the review process, particularly in a publishing landscape that is surprisingly resistant to such work (despite constant calls for it). Deciding on a suitable venue has required considerable deliberation and strategizing. Do we ‘scientise’ one part our work to fit it into a well-respected science journal? Or do we try to slip a smattering of science into a history article? In one earlier version of a manuscript, we attempted to combine the social network analysis, bibliometrics and interviews. Thinking that the field would welcome such work, we submitted to a prominent geographical journal. We received mixed reviews, one highly supportive and impressed by the dataset we had collected and our detailed methods, and another that thought our methods a ‘plodding’ distraction from the narrative. Another expressed a lack of confidence in our work because they assumed we were all humanities scholars,

but felt that we had missed key texts in the field (ironically, they pointed to the published work of one of us as the definitive model of investigation). After two consecutive rounds of major revisions in two different geographical journals, each ending with rejections by the editor, we pulled the paper apart and published the quantitative results in a science journal and saved the rest for another venue. Possibly we were trying to do too much in a single paper, but our experience may also reflect the inadequacy of the current academic journal and peer-review system for publishing highly interdisciplinary work.

This tension between an integrative holism and the rigidities of academia has been a recurring theme throughout the project. The traditional scientific article is problematic, because the word length is short and the style rigid. A book-length history of the Dry Valleys was always a planned outcome of the project, but neither this nor traditional historical articles are truly optimal, because narrative does not allow for detailed data and methods descriptions, let alone figures and supporting datasets. While these are certainly challenges, they are also opportunities. Because we have so much information from different sources, our strategy has been to publish papers in a mixture of science and humanities journals. So far, we and our collaborators have published four papers from this project, with two more in the works. At the same time, the book we are writing draws on figures and insights from each article but also includes ideas and observations not included therein. This strategy – while imperfect – satisfies our own integrative ambitions as well as the expectations of our funders and respective departments.

When I started on this project, I thought of myself as a scientist. Now I no longer know what to call myself. A geographer? An interdisciplinary researcher? What I do know is that a historical perspective is now central to my work and interests, and I'm exceedingly grateful for my encounter with the humanities. The project has reaffirmed what I always felt to be true – that there is less separating us than our respective disciplining implies. As we three have experienced a scholarly transformation through this project, we have also come to hope that our scholarship will lead to eco-social transforma-

tion. We are now providing policy recommendations and challenging narratives and framings – especially those centred around wilderness, which remain hegemonic in Antarctica. Our project shows that historians have much to contribute to contemporary scientific practice and policy, and that scientists have much to contribute to historical research.

Our project is embedded in and simultaneously studies a larger team of scientists with the NSF-funded Long-term Ecological Research network. This dual insider-outsider perspective has benefited both the doing and dissemination of our research. Over time, we have become increasingly reflective about our roles. As three English-speaking white men based at Canadian, US and UK institutions, we are in many ways a reflection of the dominant culture of the eco-social system we are studying, and critiquing. Our book will be explicit about these issues and our own positionalities – relatively uncommon though this may be for historians and even more so for natural scientists.

A final takeaway – and perhaps the most important – is the value inherent in slowing down the research process, to embark on a form of ‘geographical expedition’ that has allowed us to recognise ‘...the power of the subjects of our research, human or non-human, to speak back, if we allow them to do so, and hence engender that slightly different understanding of the world around us...’⁹

⁹ S.N. Lane, ‘Slow science, the geographical expedition, and Critical Physical Geography: Slow science and Critical Physical Geography’, *The Canadian Geographer / Le Géographe canadien* 61 (2017): 84–101. doi:10.1111/cag.12329.