

RESEARCH ARTICLE

‘Ancient lore with modern appliances’: networks, expertise, and the making of the Open Polar Sea, 1851–1853

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Abstract

This article provides a transnational analysis of the campaigns for the organization of expeditions to the central Arctic region by the American explorer Elisha Kent Kane and the Prussian cartographer August Petermann between 1851 and 1853. By adopting a comparative approach, this study focuses on three interventions in the history of Arctic science and exploration: the construction of scientific expertise surrounding the relationship between the ‘armchair’ and the field, the role of transnational networks, and the significance of maps as travelling epistemic objects in the production of knowledge about the Arctic regions. In bringing both campaigns in conversation with each other, this article demonstrates that the histories of Kane’s and Petermann’s campaigns did not constitute isolated episodes but form part of a transnational nexus of imperial science and Arctic exploration in the nineteenth century. Moreover, based on research in libraries and archives in the United States, Germany and England, this study reconnects otherwise siloed collections and contributes new findings on the interpersonal networks of science and exploration. Finally, this article illustrates the importance of adopting comparative transnational approaches for understanding the fluid and reciprocal nature of Arctic science throughout the transatlantic world.

On the evening of 14 December 1852, the American Navy surgeon and explorer Elisha Kent Kane addressed a large crowd who had gathered at a meeting of the American Geographical and Statistical Society (AGSS) to hear from an ‘Arctic celebrity’.¹ Following an introduction by the society’s president, George Bancroft, Kane took his audience on a tour of polar exploration history, as well as recent developments in what was increasingly being referred to as the field of physical geography. Kane introduced his listeners to the observations of past Arctic explorers, set out theories of geological and maritime formations, and cited reports of animal life throughout the circumpolar world. In the lecture, Kane sought not only to entertain with an account from his Arctic travels, but also have his audience arrive at one main conclusion: an Open Polar Sea free of ice and rich in maritime life existed, and could be found via the Smith Sound region between the northern reaches of Ellesmere Island, Canada and the western

¹ ‘Geographical society – Dr. Kane’s lecture’, *New York Daily Times*, 14 December 1852, p. 5.

cost of Greenland.² Surrounded by applause, Bancroft thanked Kane for presenting his expedition proposal and praised him as a ‘scientific and excellent gentleman’ having earned the respect of his ‘countrymen’. Before adjourning the meeting, the members of the AGSS unanimously approved resolutions to support Kane’s expedition towards the Open Polar Sea through Smith Sound. The lecture at the AGSS and the society’s approval of Kane’s proposed project was an important step towards what would become the second Grinnell expedition which left the US in 1853. The search for an Open Polar Sea, however, attracted intense interest far removed from the congregations of the American learned societies. At the same time, across the Atlantic, the London-based Prussian cartographer and polar neophyte August Petermann stepped into the fray of Arctic geography to advocate for an expedition towards the Open Polar Sea.

Theories espousing the existence of an Open Polar Sea, a mythical body free of ice atop the world, had been popular amongst European cartographers since the sixteenth century. Early modern European cartographers and natural philosophers, as well as whalers, inscribed the central Arctic Ocean with sweeping utopias of transpolar shipping routes, or a site for spiritual validation.³ While Indigenous peoples of the circumpolar world travelled and lived on coastal formations of sea ice for hunting and fishing, the European gaze envisioned a space commensurate with global commercial and imperial progressivism.⁴ By the mid-nineteenth century, the pull towards an Open Polar Sea was linked to attempts to construct global climatic theories and to the high-profile disappearance of the *Erebus* and *Terror* under the command of John Franklin. Kane and Petermann believed that John Franklin’s lost expedition, which left England in 1845, had reached the Open Polar Sea, and was now unable to return south. Locating John Franklin’s lost expedition was the official aim of Kane’s second Grinnell expedition as well as of Petermann’s proposed expedition, and their rescue projects were remarkably alike. They presented similar geographical theories in support of their projects, they drew on a shared body of resources, and they lobbied overlapping networks of people and societies for financial and cultural support. Yet the polar campaigns and geographical research of Kane and Petermann have been treated as largely separate projects.⁵ In addition, Kane and Petermann have typically been perceived as contrasting historical actors, one being a travelling surgeon–explorer and the other a landlocked geographical theorist. In this article, we reconsider the polar campaigns and physical geographies of Kane and Petermann to highlight the existence of a transatlantic network of polar researchers in the mid-nineteenth century. In doing so, we draw on recent literature in the history of science that has problematized the portrayed relationship between the field and the armchair and extend these insights to polar research. As this article shows, rather than working in parallel, Kane and Petermann’s expedition proposals and theoretical understandings of the Open Polar Sea were developed in an international nexus of science, personal ambitions and imperialistic visions of the Arctic space, and each navigated challenges and opportunities provided to them through the portrayed boundaries of the field and the armchair.

² Elisha Kent Kane, ‘Access to an Open Polar Sea along a North American meridian’, *Bulletin of the American Geographical and Statistical Society* (1853) 1(2), pp. 85–102.

³ Adriana Craciun, ‘The frozen ocean’, *Publications of the Modern Language Association of America* (2010) 125(3), pp. 693–7; Michael F. Robinson, ‘Reconsidering the theory of the Open Polar Sea’, in Keith R. Benson and Helen M. Rozwadowski (eds.), *Extremes: Oceanography’s Adventures*, Sagamore Beach: Watson Publishing, 2007, pp. 16–18.

⁴ Claudio Aporta, ‘The trail as home: Inuit and their pan-arctic network of routes’, *Human Ecology* (2009) 37(2), pp. 131–46; Michael Bravo, *North Pole: Nature and Culture*, London: Reaktion Books, 2019, pp. 18–29.

⁵ Philipp Felsch, *Wie August Petermann den Nordpol erfand*, Munich: Luchterhand Literaturverlag, 2010; Michael F. Robinson, *The Coldest Crucible: Arctic Exploration and American Culture*, Chicago: The University of Chicago Press, 2010; Robinson, op. cit. (3).

By way of a comparative case study of two advocates of Arctic exploration in search of the mythical Open Polar Sea, this article is centred around three interventions: the relationship between the armchair and the field, the necessity of adopting transnational approaches to polar research, and the significance of maps as travelling epistemic objects. In a first step, we situate the history of Arctic exploration and the debate over the Open Polar Sea within the broader historical context of nineteenth-century American expansionism and imperial Arctic science. Kane's organization of the second Grinnell expedition and the search for the Open Polar Sea is closely tied to personal ambition and a push to expand commercial, scientific and political interests into the Arctic regions. As with Kane, Petermann also sought to draw on imperialistic impulses of governmental and private funders in Britain to mobilize support for his proposed venture and his cartographical theories. In a second step, we interrogate how Kane and Petermann each sought to portray themselves as authoritative experts on Arctic phenomena when seeking to secure backers in an international marketplace for Arctic science and exploration. At its core, the debate surrounding theories purporting the existence of the Open Polar Sea centred on the limits of knowledge: how do you construct evidence in support of or against the existence of something that has not been observed, and can only be observationally verified or rejected by sending out a costly expedition? Historians of science now approach the epistemic and practical boundaries between the field and the armchair as historically constructed and forming part of the professionalizing strategies of researchers.⁶ Yet the category of 'explorer', as someone who saw Arctic phenomena first-hand, still holds significant traction in the construction of polar expertise, historically and in the present.⁷ The success of Kane and the failure of Petermann to raise support for their proposed projects was not simply a reflection of a supposed hierarchical distinction between the field and the armchair. Indeed, the enduring emphasis on *in situ* experience in the construction of Arctic scientific authority obscures more than it reveals of the actual working practices of nineteenth-century polar researchers.

In this article, we reveal the existence of a transatlantic network of mid-nineteenth-century Arctic research. Historians have long stressed the importance of transnational and comparative investigations in studying the ways knowledge is produced and travels beyond boundaries of geography and cultures throughout the nineteenth century.⁸ Yet research in polar history is still overwhelmingly focused on individual figures or nations, in part due to the rhetoric of nineteenth-century proponents of polar expeditions, which was embedded within nationalistic discourses of imperial geopolitical expansionism.⁹

⁶ Robert E. Kohler, *Landscapes and Labscapes: Exploring the Lab-Field Border in Biology*, Chicago: The University of Chicago Press, 2002; Vanessa Heggie, *Higher and Colder: A History of Extreme Physiology and Exploration*, Chicago: The University of Chicago Press, 2019; Henrika Kuklick, 'Personal equations: reflections on the history of fieldwork, with special reference to sociocultural anthropology', *Isis* (2011) 102(1), pp. 1–33; Efram Sera-Shriar, 'What is armchair anthropology? Observational practices in 19th-century British human sciences', *History of the Human Sciences* (2014) 27(2), pp. 26–40; Felix Driver, 'Editorial: field-work in geography', *Transactions of the Institute of British Geographers* (2000) 25(3), pp. 267–8.

⁷ Though it is beyond the aim and scope of this paper, we feel it necessary to remark that Arctic science was shaped by European and Euro-American imperialism, and that the concept of exploration is inherently violent against Indigenous peoples in the Arctic and elsewhere. This is perhaps one reason why the historiography of polar exploration and knowledge production has responded slowly to the call for transnational and comparative research, as it not only frequently challenges such nationalistic narratives of heroism but also reveals the practices and legacies of imperialism in the Arctic.

⁸ For our understanding of transnational history we refer in particular to the work of C.A. Bayly et al., 'AHR conversation: on transnational history', *American Historical Review* (2006) 111(5), pp. 1441–64; Simone Turchetti, Néstor Herran and Soraya Boudia, 'Introduction: have we ever been "transnational"? Towards a history of science across and beyond borders', *BJHS* (2012) 45(3), pp. 319–36.

⁹ Michael Bravo, op. cit. (4), p. 133, noted the emergence of a historical consciousness among polar explorers as they sought to situate their ventures within larger trajectories of polar traditions in the age of imperialism.

Through a detailed historical reconstruction of surviving records in Gotha, Berlin, London, Cambridge and Philadelphia, this article illustrates the value of adopting comparative transnational approaches to examine the history of Arctic exploration. We extend this argument to the transatlantic transit of scientific knowledge and objects, to document the entangled nature of Kane and Petermann's expedition proposals and cartographic practices. While there are no identified records of a direct correspondence between Kane and Petermann, their lectures and papers referenced each other's work, explicitly and implicitly, and they engaged in continuous discussions with the same network of people about their proposals. In particular, maps were powerful tools for circulating and mobilizing visions about the Arctic space in Europe and Euro-America.¹⁰ By focusing on maps as a communicative device, we illustrate how maps also reveal the tensions between appeals to first-hand observations and theoretical imaginations in constructing visual representations of the Arctic.¹¹ This is particularly significant in the context of the Open Polar Sea, as both Kane and Petermann utilized maps to convince their audiences of their plans. Through maps, Kane and Petermann drew the unobserved Open Polar Sea into existence and placed John Franklin's lost expedition within this body of water. More than simply retelling the story of two proposals in search of John Franklin's lost expedition and the mythical Open Polar Sea, this article shows how conceptions of expertise and the speculative nature of mid-nineteenth-century physical geography were negotiated within a transatlantic knowledge space.

American expansionism, science and the first Grinnell expedition

The history of transatlantic exploration in the Arctic regions cannot be examined in isolation from the global history of American expansionism throughout the nineteenth century. By the 1850s, claims to hemispheric hegemony and a conviction in a 'manifest destiny', a divinely ordained mission to expand American influence and control across the continent and beyond North American shores, formed central tenets of the United States' relations with the world.¹² As settler colonial violence continued to dispossess Indigenous peoples of North America and military expeditions to Mexico expanded US territory along its southern border, 'dollar diplomacy' enabled the acquisition of large swaths of land from Florida to Alaska over the course of the century.¹³ While Alaska solidified ambitions to expand commercial influence across the Pacific Ocean, exploration activities into the high Arctic held the promise of scientific prestige critical in the validation of the American imperial project. Kane and Petermann's campaigns to secure support for expeditions in search of an Open Polar Sea between 1851 and 1853 are critically

¹⁰ Mia M. Bennett, Wilfrid Greaves, Rudolf Riedlsperger and Alberic Botella, 'Articulating the Arctic: contrasting state and Inuit maps of the Canadian north', *Polar Record* (2016) 52(6), pp. 630–44; Carl-Gösta Ojala and Jonas Monié Nordin, 'Mapping land and people in the north: early modern colonial expansion, exploitation, and knowledge', *Scandinavian Studies* (2019) 91(1–2), pp. 98–133; Michael Dettelbach, 'The face of nature: precise measurement, mapping, and sensibility in the work of Alexander von Humboldt', *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* (1999) 30(4), pp. 473–504; J.B. Harley, *The New Nature of Maps: Essays in the History of Cartography* (ed. Paul Laxton), Baltimore: Johns Hopkins University Press, 2001.

¹¹ Naomi Oreskes, *The Rejection of Continental Drift: Theory and Method in American Earth Science*, Oxford: Oxford University Press, 1999; Ruth Ahnert, 'Maps versus networks', in Joad Raymond and Noah Moxham (eds.), *News Networks in Early Modern Europe*, Leiden: Brill, 2016, pp. 130–57; James Mussell, 'Cohering knowledge in the nineteenth century: form, genre, and periodical studies', *Victorian Periodicals Review* (2009) 42(1), pp. 93–103; Robert Mayhew, 'Mapping science's imagined community: geography as a republic of letters, 1600–1800', *BJHS* (2005) 38(1), pp. 73–92; Laurel Brake, "'Time's turbulence": mapping journalism networks', *Victorian Periodicals Review* (2011) 44(2), pp. 115–27.

¹² A.G. Hopkins, *American Empire: A Global History*, Princeton, NJ: Princeton University Press, 2018, pp. 191–214.

¹³ Shelagh D. Grant, *Polar Imperative: A History of Arctic Sovereignty in North America*, Vancouver: Douglas & McIntyre, 2010, pp. 115–18.

interlocked with these histories of nineteenth-century expansionism. Far from being a peripheral region, the Arctic formed an integral piece in the commercial, political and scientific economies of nineteenth-century imperialism. A subject of intense discussion in the metropolitan centres of imperial science, the region shaped transatlantic debates about the nature of geographical knowledge and scientific expertise.

The origins of the first Grinnell expedition of 1850 highlight these overlapping relationships and situate Kane's advocacy for his expedition, the second Grinnell expedition, in 1853 within the wider scientific economies of polar exploration. The first and second Grinnell expeditions were named in recognition of the main financier of the ventures, the philanthropist and merchant Henry Grinnell. Kane joined the first Grinnell expedition as a surgeon, after a series of US Navy deployments to China, Africa and the Mediterranean. In many ways, Kane was an unorthodox choice as he had no prior experience travelling in icy waters, possessed limited formal training in natural history, and had been sickly all his adult life. But Kane was also well connected, and he had made a reputation for himself as a daring and talented naval surgeon. Following the Mexican–American War between 1846 and 1848, Kane returned a minor celebrity and hero–adventurer.¹⁴ Together, Kane's reputation and his family's well-established connections within the political and scientific networks of New England were instrumental when he inquired about joining the first Grinnell expedition. In his application to join the expedition, Kane listed as references a former vice president (George M. Dallas), the current Secretary of the Treasury (William M. Meredith) and the superintendent of the US Coast Survey (Alexander Bache).¹⁵ Likewise, Kane's father served as vice president of the American Philosophical Society and as the Attorney General of Pennsylvania. Kane's connections were influential beyond recommending him to the expedition. As the patron of the venture, Grinnell highlighted Kane's ties to the American scientific and political elite in his personal correspondence with Arctic patrons in Britain.¹⁶ Thus Kane's induction into the field of Arctic science and exploration as part of Grinnell's expedition resulted from a constellation of naval experience and personal networks.

The disappearance of the British Arctic explorer John Franklin in 1845 inspired Grinnell to become involved in Arctic matters. By the end of the 1840s, Jane Franklin, an increasingly influential patron of Arctic exploration herself and the wife of the missing explorer, solicited the assistance of foreign government officials to secure support for the deployment of search missions to the North American Arctic. Dissatisfied with the efforts of the British Admiralty, Franklin appealed to US president Zachary Taylor in 1849.¹⁷ When Taylor responded positively to her request but remained unsuccessful initially to move Congress to endorse a search mission, Grinnell decided to take charge by organizing a venture to Smith Sound. The extensive correspondence between the American patron and Jane Franklin reveals a convergence of personal aspirations to support the advancement of science in Arctic regions and a humanitarian desire to assist in the search and rescue of John Franklin's missing expedition.¹⁸ A founding member of the American Geographical

¹⁴ Hopkins, *op. cit.* (12), p. 217.

¹⁵ Letter to William Ballard Preston, 7 March 1850, National Archives, publication number M148, NARA catalog ID 718927, Navy Officers' Letters 1802–1884, Record Group 45, Roll 0193.

¹⁶ In a letter to Jane Franklin, Grinnell pointed out that he was 'in correspondence with Judge Kane [who] has great political influence in his State, and the friends of the officers of the American expedition have equally as great political influence in other states'. Scott Polar Research Institute (subsequently SPRI), MS 248/414/25, letter to Jane Franklin, 16 June 1851.

¹⁷ SPRI, MS 935/1-2; D, letter and enclosure to Zachary Taylor, 4 April 1849; SPRI, MS 248/209/1-2; D, letters to the government of the United States of America, 4 April and 24 May 1849.

¹⁸ A collection of correspondence papers between Jane Franklin and Henry Grinnell is held at the Thomas H. Manning Polar Archives at the Scott Polar Research Institute in Cambridge. These fragments document a long-standing partnership between the British and the American patron and highlight Grinnell's interest in polar travel.

and Statistical Society in New York in 1851, Grinnell was well connected within political and scientific circles and a long-time ally of Jane Franklin. For Grinnell, the advancement of geographical knowledge had to extend beyond the libraries and lecture halls of learned societies. In the official expedition account of 1854, Kane accordingly identified Grinnell as the venture's 'author, and advocate, and patron'.¹⁹

Securing political support from the Taylor administration was key for a successful execution of the expedition. At the same time, Grinnell was determined for the venture to be guided by the most recent state of scientific knowledge. The expedition's route through the eastern Arctic and the ways the crews were to direct their search were to be informed by authorities from the American and British naval and scientific worlds. As a result, Grinnell enlisted Matthew Fontaine Maury and his work on navigation and ocean currents in the preparation of the expedition. Maury had served as head of the US Navy Depot of Charts and Instruments since 1847 and was superintendent at the US Naval Observatory in Washington, DC – the institution from which Grinnell further recruited Lieutenant Edwin J. De Haven to command the expedition. Maury's cartographical and literary publications on hydrography and ocean navigation, such as his 1851 *Sailing Directions* and his 1855 *The Physical Geography of the Seas*, incorporated Humboldtian impulses in the fields of data visualization and deep-sea soundings, providing new navigational instruments and geographical knowledge for ocean travel.²⁰ Beyond his foundational role in the formation of ocean science, Maury advocated vigorously for American expansionism and the export of slavery throughout the hemisphere.²¹ In 1850, he outlined his conviction in the existence of an Open Polar Sea and the reasons for believing that the crew of the missing expedition could be alive and trapped near the geographical North Pole in a series of exchanges with Grinnell and Franklin.²² Maury's role in shaping the direction and organization was likewise evident in the official instructions of the first Grinnell expedition compiled by the US Secretary of the Navy William B. Perston, who highlighted that the

facts elicited by Lieutenant Maury, in the course of his investigations touching the winds and currents of the ocean ... confirm the opinion, that beyond the icy barrier that is generally met with in the Arctic Ocean, there is a Polina, or sea free from ice.²³

Maury's work echoed beyond Grinnell's first venture to the North American Arctic. The hydrographical and meteorological rationales of an Open Polar Sea which Maury expressed in private letters in 1850 reappeared verbatim two years later in a series of public lectures delivered by Kane in preparation for the second Grinnell expedition.

The first Grinnell expedition proved formative for Kane and his ensuing polar career. The expedition itself returned unsuccessful in October 1851, having been unable to locate

¹⁹ Elisha Kent Kane, *The U.S. Grinnell Expedition in Search of Sir John Franklin*, New York: Harper and Brothers, 1854. See also SPRI, MS 248/414/2 4, letter to Jane Franklin, March 1850.

²⁰ For a full discussion of Maury see the special forum 'Reconsidering Matthew Fontaine Maury' (ed. Helen M. Rozwadowski), in *International Journal of Maritime History* (2016) 28(2), pp. 388–420; Helen M. Rozwadowski, *Vast Expanses: A History of the Oceans*, London: Reaktion Books, 2018, pp. 109–13; see also Penelope K. Hardy, 'Every ship a floating observatory: Matthew Fontaine Maury and the acquisition of knowledge at sea', in Katharine Anderson and Helen M. Rozwadowski (eds.), *Soundings and Crossings: Doing Science at Sea 1800–1970*, Sagamore Beach, MA: Science History Publications/Watson Publishing International, 2016, pp. 17–48.

²¹ Recent scholarship has turned attention to Maury's role in the Confederate Navy during the US Civil War and his sustained and aggressive support of slavery. See Penelope K. Hardy and Helen M. Rozwadowski, 'Maury for modern times: navigating a racist legacy in ocean science', *Oceanography* (2020) 33(3), pp. 10–15.

²² Maury's plans are outlined in detail in a letter which we believe was sent to Franklin: SPRI, MS 248/443; D, 25 July 1850.

²³ Kane, *op. cit.* (19), p. 492.

the missing Franklin crew and having fumbled the collection of field data such as temperature measurements.²⁴ Yet failure in the ice constituted an all-too-common trope in Arctic exploration, and it enabled Kane to position himself as the heir apparent for a return to Smith Sound.²⁵ The journey familiarized him with the theoretical debates surrounding the existence of an Open Polar Sea, while he secured practical experience in the Arctic field. Most important for a campaign to return north, the expedition equipped Kane with the epistemic authority of field expertise, making him someone who was able to relate the conditions and experience of travel in the eastern Arctic from a position of first-hand knowledge. Likewise, the first Grinnell expedition had placed at Kane's disposal the transatlantic networks critical for the exchange of scientific, logistical and financial resources.²⁶ Upon his return, Kane maintained close contact with Grinnell, as well as Franklin and her niece Sophia Cracroft. At the height of Kane's campaign, Cracroft recalled receiving notes 'from Dr Kane about twice a week now'.²⁷ Within a day of the expedition's return in October 1851, Kane took to the podium and addressed an audience at the New York Yacht Club.²⁸ A series of lectures he delivered at the Smithsonian Institute in Washington, DC later that year most prominently captured the interest of the public and the press when he outlined his views of the physical geography of the Arctic and his personal experience as part of the expedition. Interest in Kane's observations and views on the existence of an Open Polar Sea, however, was not restricted to the learned public of New England. While preparing to submit his first proposal in the field of Arctic geography, Petermann meticulously collected and studied news and reports about the first Grinnell expedition from his offices in central London.

Navigating Arctic scientific expertise

In January 1852, Petermann initiated his campaign to organize an expedition to the central Arctic Ocean, just as he was opening his first cartographical establishment in central London. While Petermann had studied travel reports and constructed maps of Arctic exploration as part of his apprenticeship in Potsdam under Heinrich Berghaus in the 1830s and 1840s, the Prussian cartographer was a newcomer to expeditionary science in the polar regions. Following a brief interlude at Alexander Keith Johnston's cartographical establishment in Edinburgh, he moved to the British capital in 1847 and produced a series of thematic maps and atlases on, for example, missionary activity, the distribution of natural and demographic data in the British Isles, and the Great Exhibition of 1851. Petermann's opening salvo in his campaign for an expedition to the Arctic Ocean came in the form of a brief essay published on 17 January 1852 in *The Athenaeum*, a London-based scientific journal.²⁹ In this essay, he suggested that a successful search mission hinged on an understanding of the Arctic region as a space defined by the principles of physical geography. Having never travelled to the Arctic himself, Petermann's argument for utilizing the predictive power of physical geography as the basis for planning an expedition should be seen as part of his strategies for establishing himself as an Arctic expert. Because of this emphasis on theory, Petermann came under criticism from contemporaries and has often been referred to as an armchair theorist.

²⁴ Robinson, op. cit. (5).

²⁵ Adriana Craciun, *Writing Arctic Disaster: Authorship and Exploration*, Cambridge: Cambridge University Press, 2016.

²⁶ Mark Sawin, *Raising Kane: Elisha Kent Kane and the Culture of Fame in Antebellum America*, Transactions of the American Philosophical Society, New Series, 98, No. 3 (2008), pp. 165–7, 265–6.

²⁷ Letter from Sophia Cracroft, 4 December 1852, SPRI, MS 248/257/36.

²⁸ Anon, 'The New-York yacht club: dinner to commodore Stevens', *New York Daily Times*, 3 October 1851, p. 2.

²⁹ Augustus Petermann, 'The Arctic expeditions', *The Athenaeum*, 17 January 1852, p. 83.

Historians of science have largely discounted the scientific aspects of Petermann's polar campaigns, and instead focused on his work as a cartographer and the founder of the successful journal *Petermanns geographische Mitteilungen*. As Jürgen Espenhorst writes, for contemporary audiences, Petermann's 'geographic writings are useful only as an illustration of the wide-ranging speculative thinking' of his time.³⁰ Similarly, Erik Tammiksaar, N.G. Sukhova and I.R. Stone have highlighted how Petermann, as a 'devoted armchair geographer', developed and advocated for a concept which 'was a false deduction based on contemporary knowledge of the Arctic Ocean'.³¹ While many of Petermann's contemporaries did refer to him as an armchair theorist, and as a speculative geographer, this representation was invoked primarily by critics who sought to counter his polar theories in the 1870s.³² In the early 1850s, on the other side of the Atlantic, Maury and Kane both integrated parts of Petermann's physical geography into their own understanding of the Arctic regions. What is more, Kane utilized Petermann's maps of the Arctic regions as part of his campaigns. As this section shows, the boundaries between the armchair and the field were socially constructed, highly situated and fluid in their use, especially as it related to the construction of Arctic expertise.

Petermann's essay appeared in *The Athenaeum* just as Kane concluded his three-part lecture series at the Smithsonian Institute in Washington, DC. At this point, very few relics from the *Erebus* and *Terror* had yet been found, and a reconstruction of their possible route relied in part on a liberal reading of the official instructions provided to John Franklin and in part on speculations of the weather patterns which the expedition might have encountered. Where had the expedition gone following their first winter at Beechy Island? Currents, ice and food resources were key indicators to their path – or, as Kane argued at the Smithsonian, it was possible to refer to 'the law of all the Arctic waters', which was 'strictly referable to familiar Natural causes', in deducing their route. When Kane joined the first Grinnell expedition, he had no experience travelling in icy waters, and no substantive knowledge of the Arctic regions. Now, with the first Grinnell expedition behind him, Kane drew on his established reputation as a daring surgeon-explorer and military officer to recommend himself as the captain of the second Grinnell expedition. His physical presence in the Arctic was, as the Smithsonian Lectures reveal, central to the construction of his Arctic authority. Yet it is important to remember that Kane's proposed search mission would take him through areas of the Arctic neither he nor any other European or Euro-American traveller had visited before. Kane was able to refer to his experiences travelling in the Arctic, but he could not draw on first-hand observations of the region he was proposing to travel through.

The Smithsonian Lectures were important for Kane in generating public support. The lectures were also important in establishing the viability of the project, and Kane's own authority on Arctic matters. However, having experience sailing in the Arctic was not necessarily the same as constructing an authoritative proposal for a new expedition, especially when this proposal fundamentally relied on predicting the nature of an area of the Arctic which had not yet been seen by Europeans and Euro-Americans. Kane allowed that the answer to the question of the path taken by the *Erebus* and *Terror* was 'conjecture', yet

³⁰ Jürgen Espenhorst, *Petermann's Planet: A Guide to German Handatlases and Their Siblings throughout the World, 1800–1950*, vol. 2 (ed. and tr. George Crossman), Falls Church, VA: Pangaea Verlag, 2003, p. 982.

³¹ E. Tammiksaar, N.G. Sukhova and I.R. Stone, 'Hypothesis versus fact: August Petermann and polar research', *Arctic* (1999) 52(3), pp. 237–43, 238.

³² Most prominently, Clements Robert Markham, honorary secretary, and later president, of the Royal Geographical Society, publicly attacked Petermann, explaining, 'Theorists have done incalculable injury to the cause of Arctic research'. See Clements Robert Markham, 'The alleged "Open Polar Sea"', *The Academy*, 1 December 1871, p. 538.

he noted the ‘treacherous leads may have closed upon him as they did upon us. He may have been borne, as we were, imbedded in some vast infield’.³³ As Kane’s proposal placed the lost expedition in a part of the Arctic where he had never been himself, his repeated reference to the experiences of the first Grinnell expedition both reminded the audience of his first-hand experiences with Arctic phenomena and underwrote his theoretical claim of ‘familiar Natural causes’ through which it was possible to universalize the Arctic experience. That is, Kane constructed an argument where the experiences he recounted in vivid detail throughout the three lectures transformed theoretical science into a predictive tool for reconstructing the route taken by the *Erebus* and *Terror*. This route, Kane declared, would have taken John Franklin and his crew into the Open Polar Sea. As to the question whether they could have survived for years in the Open Polar Sea, Kane declared that this could only be answered by veterans of Arctic exploration: ‘Let the question rest upon the views of those, who having visited the region are at least better qualified to judge of its resource than those who have formed their opinions by the fireside.’³⁴ The distinction between first-hand observation and fireside opinion was a powerful one and appears to support a historiographical division between the field and the armchair. Yet the distinction is also clearly a rhetorical one.

To unpack the function of a portrayed division between the field and the armchair, it is useful to consider what historians Lorraine Daston and Peter Galison term ‘collective empiricism’, or collective observation.³⁵ Making sense of the world is, Daston and Galison emphasize, not a solitary process, even if the researchers portray it as such. As Daston further writes, ‘Whatever the rhetoric of firsthand observation ... the reality is that modern empirical sciences have always and essentially depended on testimony’.³⁶ Testimony, in turn, depends on plurality, on the observation and knowledge of others in the formation of veracity. Kane prioritized those who had been physically present in the Arctic, yet the premise for Kane’s expedition plans was, like those of Petermann, founded on his theoretical understanding of the physical geography of the Arctic, in combination with a selective interpretation of the observations of past explorers. The first of Kane’s Smithsonian Lectures set the stage by providing an overview of the history of Arctic exploration since the sixteenth century. In doing so, Kane first placed John Franklin within the annals of explorers who had disappeared during their travels, thereby positioning the lost crew as martyrs for science to frame the first (and later the second) Grinnell expedition as an American contribution to a humanitarian endeavour. As Kane claimed, ‘The whole history of Science is full of splendid results springing from visionary pursuits’, and in the disappearance of the *Erebus* and *Terror* with their crews, ‘Science felt for its notaries, – humanity, mourned its fellows’.³⁷ This was, however, also a problem for Kane. If the experiences of past explorers had been marked by death and disaster, was a searching mission pointless? It was important for Kane to construct a vision of the lost expedition as living in reasonable comfort in the high Arctic, by the shores of the Open Polar Sea, unable to travel south unaided. For this, Kane again turned to the accounts of other travellers in his second lecture, to argue that loss of life during Arctic expeditions was rare, noting, ‘I cannot therefore look upon the simultaneous destruction of the *Erebus* and the *Terror*, still less of both their crews, as at all probable. So far as I know, it would be without a precedent in the annals of maritime disaster’.³⁸ It

³³ American Philosophical Society (hereafter APS), Elisha Kent Kane, Lecture 2, ‘The probable fate of Sir John Franklin’, Folder 3.

³⁴ Kane, op. cit. (33).

³⁵ Lorraine Daston and Peter Galison, *Objectivity*, New York: Zone Books, 2007, p. 19.

³⁶ Lorraine Daston, ‘The sciences of the archive’, *Osiris* (2012) 27(1), pp. 156–87, 163.

³⁷ Kane, APS, Lecture 1, ‘Arctic exploration’, Folder 1.

³⁸ Kane, APS, op. cit. (33), Folder 1.

had been over six years since the *Erebus* and *Terror* had left for the Arctic; it was immoral to leave them waiting much longer – especially now that he, Kane, had outlined their possible route and where to search, in a plan where ‘the open sea forms its most important feature’.³⁹

Petermann had no experience in the Arctic field, and was unable to refer to his own first-hand observations in the construction of his expedition proposal. Invocations of isothermal charts, ocean currents and sea ice distribution notwithstanding, Petermann was acutely aware of the perceived shortcomings his physical geography implied to those he considered ‘the practical men of the Old School’.⁴⁰ Isometrics and meteorological data could not make up for the lack of experience and polar credentials of those who had travelled to the Arctic. The authority invested in someone who was ‘there’, someone who spoke from a position of ‘I saw’, that rhetorical authority, was unavailable to Petermann. However, just as Kane drew on a combination of theory and observation, so did Petermann. To remedy the perceived deficiency of his lack of first-hand Arctic experience, he turned to mediated knowledge. In referring to the vast literature by past explorers, Petermann was using a hybrid model of knowledge production which cross-referenced multiple observations of natural phenomena. In invoking this mediated knowledge, Petermann mobilized the sixteenth-century traveller Willem Barentz as an ‘able, bold, and honest seaman’ and someone ‘who actually saw an open sea in winter to the north of Novaya Zemlya’ to validate his theory. Relating Barentz’s 1797 travel account, Petermann pointed to the explorer’s observations of greater warmth towards the North Pole and the phenomenon of revolving sea ice movements. The section closes with the climactic moment of simultaneous death and revelation when the crew set out on their return journey: ‘At the commencement of this voyage in the open boats, Barentz, who had been declining in health, expired, believing and with his last breath affirming that, *had he stood more between the two lands*, he would have been able to enter the open sea’.⁴¹ As a form of virtual witnessing, to borrow from Simon Schaffer and Steven Shapin, both Kane and Petermann referred to the first-hand observational authority of past explorers to construct their proposed project as viable and worth supporting.⁴²

In Barentz, Petermann found a proxy for exploration in the Arctic regions who supplied the qualities of courage, integrity, sacrifice and first-hand knowledge. These qualities were intended to shore up his Arctic authority, which increasingly was attacked for an overreliance on ‘theory’ and a lack of practical experience in the eyes of the ‘Old School’. Petermann proposed that access to the Arctic basin could best be achieved by pursuing a route between Spitzbergen and Novaya Zemlya. British expeditions had crowded the North American Arctic Archipelago in search of shipping routes connecting the Atlantic and Pacific oceans and locating a passage to the North Pole in the past at substantial expenditure, but with little success.⁴³ Calling on Barentz’s sixteenth-century observations of an ice barrier between Spitzbergen and Novaya Zemlya, Petermann quickly moved on to the relationship between sea ice and ocean currents. The warm waters of the Gulf Stream pushing far into the North Atlantic, he explained, provided for a unique passageway into the central Arctic basin, preventing the formation of intractable sea ice

³⁹ Kane, op. cit. (33), Folder 3.

⁴⁰ August Petermann to Norton Shaw, 24 April 1852, CB-4-1332, Archive of the Royal Geographical Society (subsequently ARGs), London.

⁴¹ Petermann, op. cit. (29), p. 83, original emphasis.

⁴² Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*, revised edn, Princeton, NJ: Princeton University Press, 2011 (first published 1985).

⁴³ Petermann stressed this point repeatedly and produced a map in late 1851 to illustrate the congestion of Wellington Strait with naval vessels of the British Admiralty. See August Petermann, ‘Wellington Strait, North Polar Sea. Position of the searching Ships’, ARGs, London, United Kingdom, CN18-OAR-AAA-S501.

such as is the case at similar latitudes on the North American side of the Arctic. Petermann conceded that Barentz's reports of a barrier of ice posed challenges to sailors, yet none greater than those faced by travellers in the waters of the North American Arctic. Indeed, 'the testimony of numerous whalers and other navigators' was proof, he concluded, that the sea ice was surmountable and, more important, once passed would lead into 'the great open navigable "Polinya" of the Russians'.⁴⁴

Speculations about the existence of an Open Polar Sea were not new and, in fact, held currency among a diverse set of natural philosophers, geographers and explorers.⁴⁵ More provocative to a readership of polar explorers was Petermann's second intervention. Contrary to prevailing practice, Petermann proposed that an expedition would be most successful if undertaken during the 'Arctic winter than in the summer months'.⁴⁶ This suggestion was fundamentally grounded in a conception of the Arctic region as a system of interconnected natural phenomena. The principal framework for understanding such a system was the notion of distributional geography.

Petermann had completed his apprenticeship at Heinrich Berghaus's Geographical School of Fine Arts in Potsdam, Prussia. Throughout his apprenticeship, he became a faithful disciple of Alexander von Humboldt's innovations in the spatial visualization of measurements and observations, for example through the use of isothermal lines. Having adopted what Daston describes as the 'Humboldtian gaze',⁴⁷ Petermann related the spatial and temporal dispersion of temperatures, the movement of ocean currents, and the formation of sea ice to the question of when to despatch an expedition to the central Arctic. Petermann's core argument rested on the view that ocean currents on the Asian side of the Arctic shifted direction over the year. For the Siberian Sea, this principle of revolving currents meant that sea ice migrated westwards during the summer months and eastwards during the winter months. With the Siberian river system frozen in winter, its cooling impact and generation of drift ice along its shores was further halted. As a result, Petermann suggested, the warm currents of the Gulf Stream were able to push far north unhindered by ice masses and transform the area between Spitzbergen and Novaya Zemlya into a navigable passageway to the Arctic basin. Likewise, he marshalled the annual distribution of temperatures across the Arctic in support of his proposal. Drawing on the 'invaluable data' of the meteorologist Wilhelm Dove, Petermann constructed twelve isometric maps, to conclude that a 'movable pole of cold' existed.⁴⁸ Based on annual mean temperatures, this pole indicated the point of lowest temperature in the Arctic, a locale that drifted from Melville Island and Boothia Island in the central North American Arctic in winter to the New Siberian Islands in the summer. '[I]t would be a monstrous anomaly', Petermann wrote, 'if at some distance to the west, where a warm current is known to prevail, and where the temperature is from 40 to 50 degrees higher, we should not find the same "wide immeasurable ocean"'.⁴⁹

Petermann was clearly attuned to the economy of polar exploration, as he framed his proposal as part of the ongoing efforts to locate the vessels and the crew of the Franklin expedition, while making the case for the importance of physical geography in

⁴⁴ Petermann, op. cit. (29), pp. 82–3.

⁴⁵ Craciun, op. cit. (3); Robinson, op. cit. (3); Tammiksaar, Sukhova and Stone, op. cit. (31); Felsch, op. cit. (5).

⁴⁶ Petermann, op. cit. (29), p. 83.

⁴⁷ Lorraine Daston, 'The Humboldtian gaze', in Moritz Epple and Claus Zittel (eds.), *Science as Cultural Practice: Cultures and Politics of Research from the Early Modern Period to the Age of Extremes*, vol. 1, Berlin: De Gruyter, 2010, pp. 45–60; Susan Faye Cannon, *Science in Culture: The Early Victorian Period*, New York: Science History Publications, Dawson, 1978.

⁴⁸ These maps were not included with the article. They are held at the Justus Perthes Collection in Gotha, Germany.

⁴⁹ Petermann, op. cit. (29), p. 83.



Figure 1. August Petermann, 'Polar chart', 1852, Justus Perthes Collection, Gotha, Germany, SPK-90-1 A-02.

determining the direction and composition of Arctic expeditions. More than a mapmaker, a theorist, the Prussian cartographer represented a hybrid scholar-advocate at a moment of transition in the history of the geographical sciences.⁵⁰ He positioned himself as an influential arbiter of geographical knowledge with the construction of thematic maps; his advocacy for expeditionary cartography in Africa, Australia and Asia; and the curation of a far-flung network of patrons, travellers and scientists.⁵¹ As the editors of *The Athenaeum* noted, Petermann's submission contained 'so many physical data' and 'so much scientific reasoning' that it was impossible to summarize.⁵² The editors of *The Athenaeum* concluded that Petermann's proposal should be studied 'at once' and, should it be found viable, it ought to receive the 'most serious consideration'. After all, Petermann's plan suggested a route 'at our very doors – the Gulf stream flowing past our shores – a route which Nature herself seems to point to us'.⁵³

Kane and Petermann were both playing to a perceived division between the armchair and the field in their construction of Arctic expertise. While Petermann combined the language of scientific and cartographical expertise to present his proposal as something that should be taken seriously, Kane used his first-hand experiences in the Arctic to create scientific and cartographical authority. Because they each drew on their strengths they simultaneously reinforced and deconstructed the boundaries that established their identities as armchair geographer and as explorer. In comparing rhetorical strategies employed by Kane and Petermann in their proposals, the similarities between them stand out: they situated their plans within the vast body of travel literature from past Arctic expeditions, they invoked the names of established scientific researchers such as Humboldt, and they used maps to bring to life their speculative imaginations of the northern regions – practices that Roderick I. Murchison, president of the Royal Geographical Society, described as 'a union of ancient lore with modern appliances'.⁵⁴ When Petermann identified an 'us' in 'Nature herself seems to point to us', and when Kane made references to the 'familiar Natural causes', it was a rhetorical construction of a community of knowledge makers that included both Kane and Petermann, and which bridged the field and the armchair. The community of knowledge makers, the constituents or performers of collective empiricism, further highlights the importance of attending to the transnational in Polar research.

Hidden debates and transnational networks

In February 1852, Henry Grinnell reflected on Kane's recent lectures in a letter to Jane Franklin. 'Dr Kane's lectures have done much good', he wrote, 'in giving confidence in the Public minds that Sir John may yet be living'.⁵⁵ As Grinnell told Franklin, the Smithsonian Lectures had generated interest in a continuation of their search for John Franklin and his crew among the learned and moneyed classes. In the United States, Kane's lectures established him as a public persona, one who projected scientific gravitas,

⁵⁰ Felix Driver, *Geography Militant: Cultures of Exploration and Empire*, Oxford: Blackwell Publishers, 2000.

⁵¹ See Imre Josef Demhardt and Birgit A. Schulte, *Der Erde ein Gesicht geben: Petermanns geographische Mitteilungen und die Anfänge der modernen Geographie in Deutschland*, Gotha: University of Erfurt, 2006; Moritz von Brescius, *German Science in the Age of Empire: Enterprise, Opportunity, and the Schlagintweit Brothers*, Cambridge: Cambridge University Press, 2019; Ulrike Kirchberger, *Aspekte Deutsch-Britischer Expansion: Die Überseeinteressen der deutschen Migranten in Großbritannien in der Mitte des 19. Jahrhunderts*, Stuttgart: Franz Steiner Verlag, 1999.

⁵² Petermann, op. cit. (29), p. 82.

⁵³ Petermann, op. cit. (29), p. 83.

⁵⁴ Roderick I. Murchison, 'Address to the Royal Geographical Society of London' *Journal of the Royal Geographical Society of London* (1852) 22, pp. lxii–cxxvi, cxxvi.

⁵⁵ Letter to Jane Franklin, 10 February 1852, SPRI, MS 248/414/33.

along with the moral and masculine qualities deemed indicative of a serious Arctic explorer.⁵⁶ The lectures portrayed the Arctic as a region commensurate with the commercial, scientific and political aspirations of American expansionism, but science and ambition, however, radiated far beyond the learned circles of New York, Washington and Philadelphia. Kane's account of the first Grinnell expedition, and his advocacy for a return to the Smith Sound region in the eastern Arctic, found an attentive audience among naval officers, explorers and scientists in Britain.⁵⁷ While celebrated as an American venture, the second Grinnell expedition was also an international endeavour. First and foremost, the official aim of the expedition immediately brings in an explicit link to Britain, as they set out to find a lost British expedition, and it was framed by contemporary commentators as an American act of humanitarian assistance to Britain. Second, the official aim, finding Franklin, as well as the unofficial aim, discovering the Open Polar Sea, explicitly drew on old networks and established new connections in an international community of those invested in Arctic matters which connected and reached beyond the United States and Britain. No evidence of a direct correspondence between Kane and Petermann exists, yet comparative research of their personal papers reveals a shared nexus of Arctic knowledge production that spanned the North Atlantic world. In this nexus, both operated within close intellectual proximity of each other and engaged in a transnational debate over Arctic voyaging, scientific expertise and the existence of an Open Polar Sea.

Following his proposal in *The Athenaeum* in January 1852, Petermann mobilized a network of scientific correspondents, diplomatic envoys, patrons and naval officers in support of his theory of an Open Polar Sea and a search mission for the missing expedition. Petermann had forged strong connections across Europe to facilitate his cartographical business and to establish his expertise in the field of expeditionary geography before he turned to the Arctic. A meticulous keeper of research notes and excerpts, a list of addressees compiled by Petermann for his initial proposal survives, and provides a brief window into Petermann's Arctic network in London. Alongside high-ranking officers of the Admiralty such as John Barrow, Edward Sabine and Francis Beaufort, he distributed his essay to the captains William Penny, Shillington and Charles Beke. Likewise, Jane Franklin and Carl von Bunsen, the Prussian envoy to Britain, featured prominently on the cartographer's list of patrons and surrogates.⁵⁸ Petermann and his colleagues ensured that geographical societies in Vienna and Berlin were kept abreast of his proposal, along with the British Museum, the Linnean Society and the Horticultural Society in London.⁵⁹ C.D. Weld of the Royal Society, a relative of Franklin's, applauded Petermann for raising attention to 'the cause of that officer and his companions'.⁶⁰ Prussia House likewise reacted with enthusiasm and endorsed Petermann's proposal. Bunsen instructed the representation to make available its channels to place the article in *The Times*, along with 'all sorts of amiable pleasantries'.⁶¹

Such webs of patronage and knowledge transfer were not restricted to European networks of diplomacy, naval circles and learned societies. The North Atlantic world, more broadly, was deeply connected and constituted a vibrant knowledge space long before

⁵⁶ Robinson, op. cit. (5), pp. 31–54.

⁵⁷ Sawin, op. cit. (26), pp. 300–1, 330, 346. The RGS awarded Kane the society's Founder's Medal in 1856 in recognition of his exploratory and scientific achievements.

⁵⁸ August Petermann, 'Athenaeum 17 January to send to', n.d., Konvolut box 9040/Petermanns Briefe, Justus Perthes Collection, Gotha Research Library (subsequently JPC-GRL).

⁵⁹ Unknown to August Petermann, 24 February 1852, Konvolut box 9070/Franklin Search, 1852–60, JPC-GRL.

⁶⁰ C.D. Weld to August Petermann, 17 January 1852, Konvolut box 9070/Franklin Search, 1852–60, JPC-GRL.

⁶¹ Prussia House to August Petermann, January 1852, Konvolut box 9070/Franklin Search, 1852–60, JPC-GRL. Translation from the original German 'alle schönen möglichen Redensarten' by John Woitkowitz.

the advent of the transatlantic communication revolution during the second half of the nineteenth century.⁶² The multidirectional nature of how geographical knowledge travelled throughout the British and American scientific publics was made evident in a paper entitled 'Notes on the distribution of animals available as food in the Arctic regions' read to the RGS by Petermann in February 1852.⁶³ Following his initial publication in *The Athenaeum* and a subsequent submission to the British Admiralty in January, Petermann reiterated his argument for a search mission along the Eurasian part of the Arctic Ocean. He had previously presented the systemic interplay of natural phenomena on the distribution of temperatures, and now turned his attention to the question of Arctic fauna. The prevalence of animal life in the Arctic, Petermann argued, was closely tied to the distribution of seasonal temperatures across the Arctic regions. Based on extant tables of meteorological data and observations reported by European naturalists and explorers, as well as Inuit and Chukchi, Petermann identified Melville Island in the western North American Arctic as the 'phytological North Pole', the pole of cold 'which possess the smallest number of genera and species of plants'. By contrast, Petermann noted that northern Siberia 'exhibits not only the greatest amount of animal life' but also 'noble forests are known to thrive in considerable extent'.⁶⁴ In other words, physical geography not only suggested the path to finding the Franklin ships, it also provided the rationale for the vessels' location in the area of the Siberian Sea. 'Taking all these facts into consideration', Petermann suggested, 'the conclusion seems to be a reasonable one, that Franklin ... has found himself in that portion of the Arctic regions where animals probably exist in greater plenty than in any other'.⁶⁵

Petermann's talk constituted more than an expansion of his argument presented in *The Athenaeum* earlier. Handwritten notes from the cartographer's research diary show that his talk in London on the distribution of Arctic fauna was part of a larger debate over modes of observation, voyaging and sustenance in the Arctic regions. This transatlantic dimension of Petermann's paper, however, only becomes clear in a comparative perspective, when relating his notes to Kane's campaign. Petermann's talk in London constituted a direct response to Kane's Smithsonian Lectures in Washington, DC weeks earlier. Petermann began his discussion with a thinly veiled reference to Kane's account, criticizing a 'too confined view' that was based on 'individual observations' in 'a comparatively small space on the American side'. When Petermann cited descriptions of Wellington Channel 'teeming with animal life' which were praised as 'a wonderful fact', he directly addressed Kane's mode of observational reasoning and retorted that if examined through the lens of distributional geography such occurrences were explicable by the laws of physical geography.⁶⁶ With satisfaction, Petermann took note of Kane's descriptions of the 'extreme abundance' of marine fauna in the Wellington Channel and that the American had 'fully advocated' for the existence of a 'comparatively open sea'.⁶⁷ Yet, to fully grasp the geography of open water and animal life in the Arctic, a systemic understanding

⁶² Caroline Dodds Pennock, 'Aztecs abroad? uncovering the early indigenous Atlantic', *American Historical Review* (2020) 125(3), pp. 787–814, shows how transatlantic knowledge exchanges existed since the early sixteenth century in what she terms the 'Indigenous Atlantic'.

⁶³ We draw in particular on the insights on the history of science communication of James A. Secord, 'Knowledge in transit', *Isis* (2004) 95(4), pp. 654–72; Jonathan R. Topham, 'Scientific publishing and the reading of science in nineteenth-century Britain: a historiographical survey and guide to sources', *Studies in History and Philosophy of Science Part A* (2000) 31(4), pp. 559–612.

⁶⁴ Augustus Petermann, 'Notes on the distribution of animals available as food in the Arctic regions', *Journal of the Royal Geographical Society* (1852) 22, pp. 118–27, 124.

⁶⁵ Petermann, *op. cit.* (64), p. 125.

⁶⁶ Petermann, *op. cit.* (64), p. 118 f.

⁶⁷ Petermann, 'Excerpta Geographica', 1852, SPA ARCH PGM 540/25, JPC-GRL.

of the region was necessary: 'Indeed', the cartographer explained, 'the consideration of isolated facts alone can lead to no correct result'.⁶⁸ Likewise, Petermann and Kane debated views on Inuit strategies of survival in relation to housing in the polar regions. In his Smithsonian Lectures, Kane had explained that the 'snow hut or Igloe of the Esquimaux furnishes a dry and comfortable housing'.⁶⁹ At the RGS in London, by contrast, Petermann stressed that 'we must not forget that, in addition to the natural resources, they would in their vessels possess more comfortable and substantial houses than any of the native inhabitants'.⁷⁰ While certainly pandering to potential patrons, Petermann used Kane's explications as a foil to argue for the superiority of his approach based on systemic geography and British naval power. What might have been interpreted as a moment of Victorian hubris directed at the naval sensitivities of his British audience was part of a larger transatlantic conversation on ways of voyaging, observation and the physical geography of an Open Polar Sea. At no point did Petermann make his references to Kane transparent to his audience in London. Yet his research diary and a comparative analysis of their talks reveal that Kane was his hidden interlocutor across the Atlantic. In his diary, Petermann added the note: 'Smithsonian Lecture by Dr. Kane, *Morning Herald*, 24 January 1852'.⁷¹

Knowledge of the Arctic regions moved through various channels and across scientific communities. Networks throughout Europe and across the North Atlantic served as transmission belts of debates over ways of knowing, scientific expertise and ideas about the physical geography of the Arctic Ocean. Such transnational webs connected seemingly distinct scientific circles across large distances, creating frequent channels of shared conversation but also more tenuous forms of intellectual proximity. Petermann's use of newspaper reports of Kane's lecture as a foil for his presentation to the RGS illustrates the vibrancy of these webs. Next to print publications, cartographies of the Arctic regions proved particularly versatile vehicles of knowledge transfer. Inscribed with the visual vernacular of thematic cartography, Petermann's Arctic maps travelled from London to New England carrying with them his visions of Arctic geography and sustaining the North Atlantic world as a dynamic space for transnational knowledge exchange.

Maps in transit

Fourteen months after the first Grinnell expedition had returned and Kane had kicked off his lecture tour, his address at the American Geographical and Statistical Society in December 1852 in New York constituted the culmination of his campaign for what would become the second Grinnell expedition. Following the endorsement of Kane's expedition by the society, his talk, in which he gave a full account of his views on Arctic geography, was published in the society's journal under the title 'Access to an Open Polar Sea along a North American meridian'.⁷² The map that accompanied the published version of the talk was entitled 'Circumpolar chart illustrating Kane's paper on access to an Open Polar Sea', and included the inscription 'Projected from Petermann, Berghaus and materials in the British Hydrographical Office'. That is, Kane used Petermann's map of the circumpolar region to substantiate his arguments in favour of an expedition.

Cartography and maps assumed a critical importance in Kane's and Petermann's campaigns for Arctic travel. More than illustrations of textual arguments, maps revealed a

⁶⁸ Petermann, op. cit. (64).

⁶⁹ Petermann, op. cit. (64).

⁷⁰ Petermann, op. cit. (64), p. 125.

⁷¹ Petermann, op. cit. (64).

⁷² Kane, op. cit. (2), pp. 85–103.

implemented through the techniques of thematic cartography in the ‘Polar chart’ he submitted along with his *Athenaeum* article to Parliament in Westminster. In his map, coloured armies of arrows symbolizing ocean currents rush alongside shaded areas representing sea ice extension along the North American and Asian polar rim, areas that, in turn, intersect with far-flung webs of isothermal, tree and water parting lines. Labels inscribe what ought to be, such as the ‘probable position of Franklin’s Expedition’, the ‘Probable line of Land’ of a mythical transpolar continent, and the theorized existence of ‘The Polynia or open water’ north of the New Siberian Islands. Scant are the markers of exploration history, with the only indications highlighting the travels of Willem Barentz, Edward Parry and Henry Collison. In Petermann’s cartography, physical geography superseded history and thereby made invisible Arctic communities of travel and geographical knowledge, communities that for centuries enabled polar journeying.⁷⁵

Returning to Kane’s lecture at the AGSS, it is instructive to consider how he mobilized Petermann’s visual polar imaginaries to rally support for his own expedition through Smith Sound – especially considering the alternative route proposed by Petermann. Kane’s lectures were extensively covered in the American press, and we know from these reports that the maps used during the AGSS lecture differed from the one included in the published version. According to the *New York Daily Tribune*, Kane had two maps, ‘one based upon theory, the other upon actual surveys’, both showing the ‘supposed form of the Polar Sea’. That is, both maps visualized into existence the very thing Kane intended to convince the audience of. The assumed existence of the Open Polar Sea provided an *a priori* theoretical framework for his first-hand descriptions and, by extension, for his proposed expedition. The published version of his map enforced this and labelled both ‘The Polynia (or open Water) of the Russians’ and the ‘Western or American Polar Sea’. The map retained the designators included by Petermann, with the addition of ‘Dr Kane’s Line of Descent’, giving a straight line through Smith Sound into the uncharted parts of the map. How did Kane come to use Petermann’s map so soon after its completion? This is suggestive of Jane Franklin’s role as expedition advocate and organizer. Jane Franklin furnished Grinnell and Kane with Petermann’s article in *The Athenaeum* as well as a ‘beautiful little map which appeared in the last Arctic Blue Book’.⁷⁶ Petermann’s correspondence with an acquaintance in London further documents the routine nature of Franklin’s role as an informal liaison for the exchange of cartographic and geographical material across the Atlantic. Ensuring that Grinnell would be among the recipients of Petermann’s ‘Polar chart’, the letter inquired whether ‘a copy should be addressed to him & sent with the other American ones to Lady Franklin’.⁷⁷

The versatility of maps as travelling objects and as scientific instruments allowed for Petermann’s proposal to shape debates over the geography of the Arctic Ocean in the United States. The roles of patrons such as Franklin and Grinnell provide new insights into the vibrancy and facility of British–American knowledge circulation. While Franklin supported the first and second Grinnell expeditions, she was, together with

⁷⁵ Aporta, op. cit. (4), pp. 131–46; Michael Bravo, ‘Indigenous voyaging, authorship, and discovery’, in Adriana Craciun and Mary Terrall (eds.), *Curious Encounters: Voyaging, Collecting, and Making Knowledge in the Long Eighteenth Century*, Toronto: University of Toronto Press, 2019, pp. 71–112; Elena Okladnikova, ‘Traditional cartography in Arctic and subarctic Eurasia’, in David Woodward and G. Malcolm Lewis (eds.), *The History of Cartography: Cartography in the Traditional African, American, Arctic, Australian, and Pacific Societies*, vol. 2, Chicago: The University of Chicago Press, 1998, pp. 329–52; G. Malcolm Lewis, ‘Maps, mapmaking, and map use by Native North Americans’, in Woodward and Lewis, op. cit., pp. 51–182.

⁷⁶ In addition to Grinnell, Franklin mentioned her intention to provide a copy of Petermann’s Arctic chart to William Scoresby. See Sophia Cracroft to August Petermann, 29 March 1852, Konvolut box 9070/Franklin Search, 1852–60, JPC–GRL.

⁷⁷ Unknown to August Petermann, April 1852, Konvolut box 9070/Franklin Search, 1852–60, JPC–GRL.

her niece, continuously working, at times publicly and at times behind the scenes, to send out additional searching expeditions. Histories of exploration and studies into Petermann so far have failed to situate his work and advocacy within these transatlantic networks of Arctic geography.⁷⁸ Fragments of correspondence held at the Justus Perthes Collection in Gotha, Germany, revise such accounts and document Petermann's partnership with Franklin. The patron took interest in his theories, inviting him into her home, and acted as a hub for the circulation of Petermann's writings and maps within British and American naval and scientific networks.⁷⁹ In this way, the construction of the Arctic in the European and Euro-American discourses took place within a transnational network that facilitated the flow of scientific instruments and knowledge as well, highlighting the social nature of cartography and the networked dimensions of geographical knowledge transfer throughout mid-century.⁸⁰

Petermann's extended network helped establish the cartographer's ideas and objects as Grinnell and Kane toured the eastern seaboard of the United States. At the same time, Kane's use of Petermann's work also showcases the scientific and cultural power of maps. Specifically, Kane reworked Petermann's maps to support his own proposed route to access the Open Polar Sea, and to critique Petermann's interpretation. As the *New York Daily Tribune* reported, Kane 'drew attention to some maps exhibiting the isothermal circles, and criticized at some length the isothermal projection of Humboldt, and the views of Sir John Lester, Sir David Brewster and Petermann upon that subject'.⁸¹ One key reason for this had to do with the overlap in networks Petermann and Kane were drawing on to gain support for their ventures. As Petermann and Kane proposed differing routes to access the Open Polar Sea, they were functionally in competition with each other to gain support for their projects. The map which accompanied the published version of Kane's talk at the AGSS included a dotted line indicating the 'Probable Line of the Land', which extended from the eastern coast of Greenland through the eastern side of the geographical North Pole, towards Siberia and extending around towards the northern shores of North America. As the newspapers reported, Kane's 'plan of search was based upon the probable extension of the land mass of Greenland to the far north, a view sanctioned by the natural analogies of physical geography, though not by actual travel'.⁸²

'Analogies of physical geography' is a peculiar way to justify the choice of route. It is suggestive that Kane studied under William Barton Rogers, professor of natural philosophy at the University of Virginia, and accompanied him during geological and botanical surveys of the Blue Mountains.⁸³ Rogers and his brother Henry Rogers, professor of geology at the University of Pennsylvania, developed what is known as the wave theory of mountains to account for the apparent similarities in the structure of mountain chains throughout the globe.⁸⁴ A central part of the wave theory of mountains was the use of

⁷⁸ Felsch, op. cit. (5); Tammiksaar, Sukhova and Stone, op. cit. (31); Robinson, op. cit. (3); Reinhard A. Krause, *Daten statt Sensationen: Der Weg zur internationalen Polarforschung aus einer deutschen Perspektive*, Bremerhaven: Alfred-Wegener-Institut für Polarforschung, 2010.

⁷⁹ Sophia Cracroft to August Petermann, 27 January 1852, Konvolut box 9070/Franklin Search, 1852-60, JPC-GRL.

⁸⁰ The letter also identified Henry Stevens, an American book acquirer with ties to the Library of Congress working at the British Museum in London, as a conduit for relating material to the Smithsonian in Washington, DC. See Unknown to August Petermann, April 1852, Konvolut box 9070/Franklin Search, 1852-60, JPC-GRL.

⁸¹ 'Access to an Open Polar Sea along a North American meridian', *New-York Daily Tribune*, 16 December 1852, p. 6.

⁸² 'Access to an Open Polar Sea', op. cit. (81), p. 6.

⁸³ Samuel Mosheim Smucker, *The Life of Dr. Elisha Kent Kane, and of Other Distinguished American Explorers: Containing Narratives of Their Researches and Adventures in Remote and Interesting Portions of the Globe*, Philadelphia: J.W. Bradley, 1858, p. 20.

⁸⁴ They focused their work on the Appalachians, with reference to other mountain ranges.

analogies in geological practice, which provided a way to infer about the cause, effect and appearances of unknown geological phenomena. This line of reasoning was also present in Petermann's geographical practices, and indeed formed a central part of the system for projecting isothermal lines. Rather than illustrating a difference in approach, one based on direct observation and fieldwork, the other on speculative theory, Kane's use of Petermann's map and Rogers's wave theory of mountains reveal the fluidity of these categories.

To showcase the viability and importance of his project, Kane made four interconnected main arguments in his AGSS lecture. First, he argued that Greenland had the character of a peninsula, and that the landmasses of Greenland extended far to the north. This drew on the Rogers brothers' theory of mountain formation. Second, he argued that the coldest point in the polar region was below the geographical north pole, somewhere between parallel 75 and 80 degrees. North of this point the climate becomes progressively milder. For this, Kane made explicit references to the work of Maury and Petermann. Third, he argued that there was theoretical evidence for the existence of an Open Polar Sea, which had not yet been proved by observation. Though the Rogers brothers' theory of mountain formation did not gain much traction in American geological circles, this approach to geological research appears to have had a lasting impact on Kane's scientific views. It was highly speculative, but used in combination with Kane's reliance on figures such as Maury and having the backing of the American Geographical and Statistical Society, Kane sought to construct an image of himself as a scientific thinker. It helped him evidence his fourth main point, that it was not only possible, but probable, that survivors from John Franklin's lost expedition had sought refuge in the milder climate towards the North Pole. There, he argued, they were waiting to be rescued, unable to travel south again unaided.⁸⁵

Though Kane succeeded in getting support for his expedition, while Petermann did not, this was not simply due to the viability of their projects or their ability to raise support. Over the course of 1852, Petermann continued to lobby societies and patrons for his proposal. Confidential news from Prussia House in London gave encouraging signs of a favourable decision by the British Navy. Information collected from the Russian envoy and Roderick Murchison indicated that 'the Admiralty is said to have adopted your plan and to send out a steamer along the projected route already in three weeks', a letter to Petermann explained.⁸⁶ Carl Ritter, who resided in London that summer, and the meteorologist Wilhelm Dove kept the geographical circles in Prussia apprised of the cartographer's plans and activities, characterizing Petermann's plans as 'likely imminent'.⁸⁷ For the annual meeting of the RGS in May, Petermann provided Murchison with information and distributed widely a collection of his writings, including his polar chart.⁸⁸ By the end of the year, however, it had become clear that neither Franklin, the RGS nor the Admiralty would furnish Petermann with a crew and a vessel to put his plans into action.

⁸⁵ His plan was, Kane argued, founded in humanitarian concerns and in a desire to contribute to scientific research, especially physical geography.

⁸⁶ Prussia House to August Petermann, 31 January 1852, Konvolut box 9070/Franklin Search, 1852-60, JPC-GRL (translation by John Woitkowitz).

⁸⁷ In the October meeting of the Geographical Society of Berlin, Ritter reports on the various scientific work under way in London, noting specifically the ethnographical collections at the British Museum and the botanical collections presented by Hooker and Thomson. See 6th session, 2 October 1852, in *Monatsberichte über die Verhandlungen der Gesellschaft für Erdkunde zu Berlin* (1853) 10, p. 206; for comments on Petermann's Arctic activities see 11th session, 6 March 1852, in *Monatsberichte über die Verhandlungen der Gesellschaft für Erdkunde zu Berlin* (1852) 9, p. 412.

⁸⁸ August Petermann, *The Search for Franklin: A Submission to the British Public*, London: Longman, Brown, Green, and Longmans, 1852.

Over the summer, Jane Franklin funded an expedition under the naval officer Captain Edward Augustus Inglefield, who continued cartographical and nautical work in the area of Baffin Bay, Lancaster Sound and Smith Sound – the North American route that Petermann rejected in his plans. With tensions mounting over his involvement in the British expedition to sub-Saharan Africa, Petermann grew increasingly bitter over the lack of support in Britain for his Arctic proposal. In his research diary, he later recorded,

Many reproaches, if not direct, but indirect have been heaped upon me, that I, as a mere ‘theorizer’, (the ‘young German Physical Geographer’) should have ventured to express opinions upon the subject different from those celebrated explorers as have actually been in the Arctic Regions ... Altogether, the way in which my endeavours have been treated by a great number of persons is quite contemptible.⁸⁹

The very categories of what constituted Arctic expertise, who was validated as an Arctic authority, and what modes of knowledge production were considered legitimate rested at the centre of Petermann’s lament. If ‘England persists in having that large sea a mare incognitum’, the cartographer argued, the United States was well prepared to act on its claim to hemispheric expansion. Writing from London, Petermann was aware of the wide distribution of his writings and his charts, and of the ways his theories informed debates in geographical circles abroad. If the ‘Old School’ of British naval exploration refused to listen to his mode of Arctic geography, Petermann felt that American explorers had appropriated his theories and ways of knowing with far greater enthusiasm. Evidence for the validity of his work and his position as a scientific authority on Arctic exploration was exemplified in Kane’s presentation to the AGSS in New York and the version published in the society’s journal, including Petermann and Berghaus’s cartographical projections: ‘witness Dr. Kane’s Essay on the “Access to the Open Polar Sea”’.⁹⁰

Conclusion

Maps as vehicles of scientific knowledge formed a versatile instrument in the circulation of geographical knowledge throughout the transatlantic world. They constituted a powerful visual vocabulary for speculating about the physical geography of the central Arctic region. Maps accompanied Petermann’s submissions to the British Admiralty, the learned societies and the wider interested publics throughout Europe and the United States, and Kane used Petermann’s maps in his lectures. Petermann’s maps and their use also reveal the fluidity of the relationship between the armchair and the field. Petermann had not visited the Arctic himself, but as a cartographer he drew both on the collective empiricism of past travellers to the Arctic regions and on the large number of scientific theories and cartographic modelling available to him, in constructing his vision of the Arctic. Petermann’s maps were not constructed simply as a theoretical representation of the Arctic, but as a practical visualization which could be mobilized to locate the missing Franklin expedition. Though Kane and Petermann diverged as to the preferred route to enter the Open Polar Sea, their projects and techniques for gaining support were remarkably similar. Rather than reflecting two distinct figures, one a fieldworker and the other an armchair theorist, the two proposals reveal the interconnectedness of theory and first-hand observation in the mid-nineteenth century. The proposals, and in particular the use of maps, also highlight the necessity of considering nineteenth-century Arctic research within a transnational perspective. Hubs of patronage and knowledge circulation such as Grinnell in New England and Franklin in London sustained a transatlantic knowledge

⁸⁹ Petermann, op. cit. (64).

⁹⁰ Petermann, op. cit. (64).

space, transferring scientific instruments, geographical theory, modes of observation and expectations for scientific expertise in the crowded field of explorative geography in the Arctic regions. The campaigns by Kane and Petermann between 1851 and 1853, as a result, were waged within this shared space. Re-establishing these transnational connections among Arctic collections through transnational and comparative research, then, is central to understanding the history of science in and about the Arctic as part of the wider histories of science, imperialism and knowledge in the nineteenth century.

Reconnecting Arctic history in this way further opens up the field for a broader understanding of debates over the construction of scientific expertise. The distinction between the field and the armchair as categories of analysis for the study of scientific expertise in Arctic explorative geography remains too confined. Expertise and authority were constructed across these categories as the use of Kane's Smithsonian Lectures in Petermann's campaign and the incorporation of the Prussian's cartography in the American's campaign, for example, made evident. Kane's proposal for a return voyage to Smith Sound and his observations of Arctic flora and fauna figured prominently, if not explicitly, in Petermann's presentations, complementing the cartographer's use of past travel accounts and his conviction in the analytical power of distributional geography. Likewise, Petermann's systemic theory and his Arctic projections were marshalled by Kane in support of his proposal and stood alongside data and experience collected during the first Grinnell expedition. Observations made in the field by contemporary travelers as well as historic explorers were interwoven with theories of geography and the technological capabilities of cartography, blurring the distinction between knowledge production in the field and the armchair. Examining such constructions of scientific expertise across the transatlantic knowledge communities of Kane and Petermann, therefore, not only highlights its transnational dimensions. It also documents the central role of hybrid forms of knowing and underwriting scientific expertise in the field of Arctic geography and exploration.

The history of Arctic science and exploration provides a rich field to integrate the histories of geographical knowledge production, transnational networks and scientific objects within the wider historiographies of science and expansionism of the nineteenth century. This discussion of Kane and Petermann's campaigns for organizing expeditions to the central Arctic Ocean in search of an Open Polar Sea and the missing Franklin ships has illustrated the importance of comparative and transnational research. If existing studies provide important research for contextualizing their Arctic activities within national historiographies of polar exploration, more work is needed to resituate their roles and their legacies as advocates of Arctic science in transatlantic historiographies of colonial science and imperialism. In this vein, this study has documented the power of learned networks in sustaining knowledge spaces and the scientific construction of the central Arctic region. Reconnecting otherwise siloed repositories and collections of fragmented Arctic histories is central, therefore, for understanding the fluid and reciprocal nature of Arctic geography and the varied forms of knowledges that built shared scientific communities throughout the Atlantic world.

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