Journal of Historical Geography 42 (2013) 77–87

Contents lists available at ScienceDirect

Journal of Historical Geography

journal homepage: www.elsevier.com/locate/jhg

Science at sea: soundings and instrumental knowledge in British Polar expedition narratives, *c*.1818–1848

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Abstract

Measuring the depth of the sea in the early nineteenth century was a complicated but vital component in helping ensure safe passage through treacherous coastal waters, and increasingly as the century progressed, in providing scientific insights into previously scarcely-touched regions of the globe. However, no one sounding device was universally agreed upon to provide reliable results. In consequence, the resulting cartographic representation of the deep sea was error strewn and open to continual modification. This paper focuses on depth recording during British Polar expeditions between 1818 and 1845, drawing on the published expedition narratives, as accounts of sounding as science at sea. The paper engages with work on the role of inscriptions to suggest that expedition captains were forced continually to perform new soundings, and to construct new maps of the polar seas as they experienced them. In showing how soundings were part of a wider network of scientific investigation and navigation, and how the collection and recording of depth measurements with precision instruments was vital in ensuring epistemological credibility, the paper for the first time scrutinises the sounding instruments and the practices of ship-board science in this period.

Keywords: Sounding; Arctic; Instrumentation; Inscriptions; Nineteenth century

In 1817 William Scoresby Junior, whaling captain and scientist, returned from the Arctic to report that 'a remarkable diminution of the polar ice had taken place, in consequence of which I was able to penetrate in sight of the east coast of Greenland, in the parallel of 74°. A situation which for many years had been totally inaccessible'.[1] This news prompted John Barrow, second secretary to the Admiralty and himself long motivated by a desire to secure the sea's shipping routes for British commerce, to initiate a 25-year program of expeditions into the Arctic to search for a North-West passage: a route through the ice from the Atlantic to the Pacific Ocean that would cut thousands of miles off the journey from Europe to the East. In the same period, Scoresby conducted his own, private and unfunded scientific investigations into the Arctic, and Captain James Clark Ross led an exploring and scientific mission into Antarctic waters.[2] Official Instructions issued by the Admiralty to the captains of the Polar expeditions, and later included as a matter of course in their resultant narratives, expressed the desire not only to discover new routes, and new land, but to engage scientifically with the sea and the seabed. Captain John Ross, commander of the first Arctic expedition in 1818, was ordered, for example, to take 'soundings of the sea, and [investigate] the nature of the bottom; for which purpose you are supplied with an instrument better calculated to bring up substances that the leads usually employed for this purpose'.[3] The Polar expeditions were to become one of the first testing grounds for instrumentation that promised to offer new insights into the depths of the sea.[4]

Nineteenth-century geopolitical and economic concerns pushed more European explorers into the Polar regions: to the Arctic in search of a North-West Passage, and to the Antarctic to locate a viable whale fishery and sealing grounds, as well as to ensure territorial advantage.[5] Nations whose economic strength rested largely with their maritime influence relied on their ships'

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[1] Quoted in: T. Stamp and C. Stamp, *William Scoresby: Arctic Scientist*, Whitby, 1975, 64.

[2] See J. Cawood, The magnetic crusade: science and politics in early Victorian Britain, *Isis* 70, 4 (1979) 492–518; A. Gurney, *The Race to the White Continent: Voyages to the Antarctic*, London, 2000.

[3] J. Ross, *A Voyage of Discovery, Made Under the Orders of the Admiralty, in His Majesty's Ships Isabella and Alexander, For the Purpose of Exploring Baffin's Bay and Inquiring into the Probability of a North-West Passage*, London, 1819.

[4] Sounding also began to be regularly undertaken at the end of this period – the mid-nineteenth century – on surveying vessels. Thomas Abel Brimage Spratt, in particular, conducted years of sounding investigation, largely in his own time, in the Mediterranean aboard surveying ships. See M. Deacon, *Vice-Admiral T. A. B. Spratt and the Development of Oceanography in the Mediterranean, 1841–1873*, Greenwich, 1978.

[5] M. Reidy, Introduction, in: K.R. Benson, H.M. Rozwadowski (Eds), *Extremes: Oceanography's Adventures at the Poles*, Sagamore Beach, 2007, 1–14.

0305-7488/$ – see front matter
http://dx.doi.org/10.1016/j.jhg.2013.06.003

ability to cross ocean's in the most extreme weather conditions, and to find safe and strategic harbours around dangerous coastlines when in proximity to land. The strength of Britain as an island and imperial nation demanded that it was increasingly capable of interacting with, and understanding, the world's oceans. As the politics of imperialism intensified, the Admiralty's need for scientific and technical expertise became ever more important, as Reidy acknowledges: 'Empire thus subtly transformed science: in the research questions asked, and the theories adopted'.[6] Emerging information from these voyages of exploration was essential and influential in matters of imperial expansion. The Navy was crucial to this programme of development and John Barrow's dual role in the Admiralty and as a prominent member of the Royal Society, gave him considerable influence on the direction of scientific investigation during the first half of the nineteenth century.

The ways in which science was organised and pursued in this period has been termed 'Humboldtian science', and is characterised by the intellectual programme epitomised by undertakings such as the magnetic crusade that resulted in Ross's 1839 voyage to the Antarctic, reflecting a new 'professionalism' in the natural sciences.[7] This programme of science brought to the fore the need for a focus on the instrumentation rather than on the explorer: particularly so for portable, precision instruments. The Humboldtian example, Susan Faye Cannon argues, inspired the explorers and early scientists of the early and mid-nineteenth century across Europe to follow in his footsteps. Dettelbach argues that Humboldt broke the mould by focussing on measurement rather than collection and, in so doing, instruments took pride of place: Humboldt's personal narratives posited the instruments as the main protagonist rather than himself. For Humboldt, a single instrument to perform a task was insufficient. What was needed were instruments by different instrument makers, built on different principles, being used together with their errors constantly compared. Using precision instruments thus corroborated basic standards and constants for the first time.[8] This type of scientific pursuit required global observations because general theories were desired, not local principles. Whilst Cannon's model has been criticised by some for its generalisations and its better applicability to some fields of science over others, it is a framework that fits well with scientific practice, and the resulting representations, in the Polar regions in the first half of the nineteenth century.[9]

Whilst studies of terrestrial exploration and expeditionary culture have long been emphasised over those of maritime endeavour, recent work has attempted to redress the imbalance, focussing on the role of the ship in the production of scientific knowledge at sea; the place of the maritime expedition narrative; the activities of more marginalised figures in maritime knowledge production such as William Dampier the pirate, and William Scoresby the whaler; the representation of the deep sea, and of wrecks, in the early nineteenth century.[10] Whilst there has been recent innovative work on the role of instruments used at sea, there is still comparatively little emphasis on the role of sounding instrumentation, and on the epistemic importance it confers on the user.[11] Studies of deep-sea sounding have focused on the period after 1850, when the need to lay trans-Atlantic telegraph cables caused a surge in interest in knowing precisely the nature of deep water in the Atlantic basin, and Lieutenant Matthew Maury began to use data from ship log books to produce the first bathymetric maps of the deep-sea floor in 1853.[12] Likewise, emphasis has been placed on the importance of the voyage of *HMS Challenger*, which, in 1872, began a 5-year scientific expedition of the world's oceans, signalling in so doing a shift from terrestrial exploration to maritime scientific discovery.[13] Before 1850, however, a less-structured approach to sounding existed in which new machines were constructed and tested; individual knowledge of the deep sea was as great as that held by any single institution; maps remained simple and without standards; and soundings, taken when necessary for navigation and to avoid danger, were rarely made with science in mind. Moreover, that sounding technology which was used widely at the beginning of the nineteenth century was totally obsolete by the century's end. As a consequence, the picture that is left to us today of sounding as a scientific, navigational and cartographic practice in the early nineteenth century is patchy and unclear, and, perhaps, has been overlooked as a result.

This paper examines deep-sea soundings from the beginning of the period of Admiralty-sponsored Arctic expeditions into the Polar regions, to the end of this phase of intensive sea-going expeditions in 1845 with the loss of the Franklin expedition, in order to reposition focus on the development of deep-sea sounding through advances in instrumentation and cartography. This paper considers the importance of the role of sounding instrumentation and positions sounding in a fluid network of activity at sea, highlighting the vital and changing role of cartographic representation in influencing the perception of the deep sea at this time. The argument advanced is that sounding in the Polar regions in this period formed part of a wider network of scientific and navigational activity that included not only the instruments and the operators but also the resulting representations in the form of maps and charts. The paper contends that examining sounding within Polar narratives can offer important perspectives on the early development of sounding instrumentation and, in turn, upon

[6] M. Reidy, *Tides of History: Ocean Science and Her Majesty's Navy*, Chicago, 2008, 292.

[7] S. F. Cannon, *Science in Culture: The Early Victorian Period*, New York, 1978, Ch. 4.

[8] M. Dettelbach, Humboldtian science, in: N. Jardine, J.A. Secord and E.C. Spary (Eds), *Cultures of Natural History*, Cambridge, 1996, 287–304; M. 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*, 30, 4 (1999) 473–504.

[9] Dettelbach also argues that Cannon's work prematurely 'black-boxed' a complex set of concerns and practices, and criticises the need to 'decouple' professional and disciplinary concerns from those regarding sensibility and the aesthetic. Miller champions the role of other key groups – mathematical practioners, the Cambridge network and scientific servicemen – in the development of the physical sciences in early nineteenth century Britain. See: Dettelbach, Humboldtian science (note 8); Dettelbach, The face of nature (note 8); D.P. Miller, The revival of the physical sciences in Britain, 1815–1840, *Osiris* 2 (1996) 107–134.

[10] For work on the ship see: R. Sorrenson, The ship as a scientific instrument in the eighteenth century, *Osiris 2nd series* 11 (1996) 221–236; W. Hasty and K. Peters, The ship in geography and the geographies of ships, *Geography Compass* 6 (2012) 660–676; A. Winter, 'Compasses all awry': the iron ship and the ambiguities of cultural authority in Victorian Britain, *Victorian Studies* 38 (1994) 69–98; for maritime book history and inscriptions see A. Craciun, Oceanic voyages, maritime books, and eccentric inscriptions, *Atlantic Studies* 10 (2013) 170–196; for piracy see W. Hasty, Piracy and the production of knowledge in the travels of William Dampier, c.1679–1688, *Journal of Historical Geography* 37 (2011) 40–54; for Arctic exploration in the early nineteenth century see M. Bravo, Geographies of exploration and improvement: William Scoresby and Arctic whaling, 1782–1822, *Journal of Historical Geography* 32 (2006) 512–538; and for wrecks see F. Driver and L. Martins, Shipwreck and salvage in the tropics: the case of HMS Thetis, 1830–1854, *Journal of Historical Geography* 32 (2006) 539–562.

[11] For more on instruments at sea, see: M. Deacon, *Scientists and the Sea 1650-1900: A Study of Marine Science*, London; Reidy, *Tides of History* (note 6); H. Rozwadowski, *Fathoming the Ocean: The Discovery and Exploration of the Deep Sea*, Harvard, 2008.

[12] For more on Maury, see: Rozwadowski, *Fathoming the Ocean* (note 11); D.G. Burnett, Matthew Fontaine Maury's 'sea of fire': hydrography, biogeography and providence in the tropics, in: F. Driver, L. Martins (Eds), *Tropical Visions in an Age of Empire*, Chicago, 2005, 113–134.

[13] For more on the contribution of the Challenger expedition, see M. Deacon, T. Rice and C. Summerhayes (Eds), *Understanding the Oceans*, London, 2001.