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Framing Asian atmospheres: Imperial weather science and the problem of the local c.1880–1950

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SPECIAL SECTION: INTRODUCTION

Framing Asian atmospheres: imperial weather science and the problem of the local *c.*1880–1950

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'It would be of the greatest importance to meteorology', noted the editor of the *Singapore Chronicle* in 1829, 'if a set of hourly meteorological observations could be instituted at Calcutta, Bombay, Madras, Singapore, Malacca, and some station on the elevated plains of Hindostan'.[1] Of course, the author's comments speak from a uniquely imperial perspective, whereby such observations would benefit the colonial service of – in this case – the British Empire, enabling enhanced knowledge of imperial atmospheres and the related economic and scientific benefits that this could bring. That meteorology was closely linked to empire and imperial control has long been acknowledged, as the ability to institutionalize knowledge about an environment, and thus to define what constituted legitimate knowledge, was ultimately a question of power.[2] In Asia, a long history of weather observation was gradually pushed into institutional scientific spaces after the 1860s, with key observatories in Tokyo, Shanghai, Manila and Hong Kong, and meteorological services in India and across the China coast.[3] This shift is attributed to the recognition that the science was critical to state building, especially for increasing agricultural yields; for safeguarding nascent aviation services, the latter particularly critical during the Asia-Pacific War; and for enabling better prediction systems for extremes of weather.[4]

[1] *Singapore Chronicle and Commercial Register*, 29 January 1829, p. 2.

[2] Angelo Matteo Cagliotti, 'Meteorological imperialism: colonialism and the making of meteorology in liberal and Fascist Italy, 1870–1940', PhD dissertation, 2017; Martin Mahony, 'For an empire of "all types of climate": meteorology as an imperial science', *Journal of Historical Geography* (2016) 51, pp. 29–39; Christopher Carter, *Magnetic Fever: Global Imperialism and Empiricism in the Nineteenth Century*, Philadelphia: American Philosophical Society, 2009.

[3] Robert Bickers, '"Throwing light on natural laws": meteorology on the China coast, 1869–1912', in Robert Bickers and Isabella Jackson (eds.), *Treaty Ports in Modern China: Law, Land and Power*, Abingdon: Routledge, 2016, pp. 180–201, 180–1; James Francis Warren, 'Scientific superman: Father Jose Algué, Jesuit meteorology, and the Philippines under American rule, 1897–1924', in Alfred McCoy and Francisco Scarrano (eds.), *Colonial Crucible: Empire in the Making of Modern American State*, Madison: University of Wisconsin Press, 2009, pp. 508–22; Masumi Zaiki and Togo Tsukahara, 'Meteorology on the southern frontier of Japan's empire', *East Asian Science, Technology and Society* (2007) 1(2), pp. 183–203; Agustin Udias, 'Jesuits' contribution to meteorology', *Bulletin of the American Meteorological Society* (1996) 77(2), pp. 2307–16.

[4] For more on these topics in an Asian context see Liu Fang-yu, 'Chinese meteorology during World War II', *Oxford Research Encyclopaedia (History of Climate)*, forthcoming 2021; Kae Takarabe, 'The Smithsonian meteorological project and Hokkaido, Japan', *History of Meteorology* (2020) 9, pp. 1–23; Matthew Henry, 'Assembling the weather: expertise, authority and the negotiation of trans-Tasman aviation forecasts', *History of Meteorology* (2017) 8, pp. 179–201; M. Aso, 'How nature works: experts, ecology, and rubber plantations in colonial southeast Asia, 1919–1939', in Frank Uekötter (ed.), *Comparing Apples, Oranges, and Cotton: Environmental Histories of the Plantations*, New York: Campus Verlag, 2014.

Linked to this was the development of better communications systems and the encroachment of imperial powers into more remote areas.

The contributors to this special section direct their attention to the practice of meteorological science across this period of institutionalization in republican China, British India and Hong Kong.[5] Collectively, the papers speak to the themes of science, colonialism and power, drawing also from the themes explored in Secord's 'Knowledge in transit'.[6] In particular, they show how local contexts shaped the production, reception and adoption of science. Meteorological practice is an excellent lens into such processes, yet the history of meteorology has been a latecomer to this field, a fact that these authors hope to address.[7] Meteorology is acknowledged as a way in which governments could bring order to chaotic atmospheres and unite disparate regions through widespread observational networks, at the same time helping to counter anxieties about foreign climates.[8] Nonetheless, these papers reveal tensions between imperial visions and local processes, often when imperial and scientific concerns clashed against the backdrop of complex interactions between local knowledge production, circumstances and global scientific transitions.[9] Essentially, this boils down to an important narrative concerning how imperial and scientific visions were shaped by local agencies and environments and in the relations between imperial authorities and local staff.

Central to these newly adopted directions in the history of meteorology has been a shift away from European or American situations to highlight stories from Asia, Africa, Australasia, Canada and South America, albeit often complicated by colonial pasts.[10] Focusing on formal scientific institutions – the department, the observatory and their staff – the authors here view imperialism as central to their arguments, exploring how incumbent regimes managed and conceptualized meteorological services, atmospheres and people in new environments. The relocation of meteorological practices from their domestic origin – in these cases China and Britain – rested on the success (or failure) of

[5] Republican China is not considered an empire officially, but its territorial expansion and political domination regionally offer an interesting contrast and close comparison.

[6] James A. Secord, 'Knowledge in transit', *Isis* (2004) 95, pp. 654–72.

[7] Robert M. Rouphail, 'Cyclonic ecology: sugar, cyclone science, and the limits of empire in Mauritius and the Indian Ocean world, 1870s–1930s', *Isis* (2019) 110(1), pp. 48–67; Deborah R. Coen, *Climate in Motion: Science, Empire, and the Problem of Scale*, Chicago: The University of Chicago Press, 2018; Zeke Baker, 'Meteorological frontiers: climate knowledge, the West, and US statecraft, 1800–50', *Social Science History* (2018) 42(4), pp. 731–61.

[8] Siobhan Carroll, *An Empire of Air and Water: Uncolonizable Space in the British Imagination 1750–1850*, Philadelphia: University of Pennsylvania Press, 2015, p. 6.

[9] These tensions have been extensively charted in other contexts. See Matthew J. Crawford, 'Science as statecraft: imperial ideology, botany, and monopoly in the Spanish Atlantic world (1742–1790)', in Michael Rotenberg-Schwartz and Tara Czechowski, eds., *Global Economies, Cultural Currencies in the Eighteenth Century*, New York: Abrahams Magazine Service (AMS) Press, 2012; Paul N. Edwards, Lisa Gitelman, Gabrielle Hecht, Adrian Johns, Brian Larkin and Neil Safier, 'AHR conversation: historical perspectives on the circulation of information', *American Historical Review* (2011) 116(5), pp. 1393–1435; Neil Safier, 'Itineraries of Atlantic science: new questions, new approaches, new directions', *Atlantic Studies* (2010) 7(4), pp. 357–64.

[10] Victoria Slonosky, *Climate in the Age of Empire: Weather Observers in Colonial Canada*, Boston, MA: American Meteorological Society, 2018; Martin Mahony, 'The "genie of the storm": cyclonic reasoning and the spaces of weather observation in the southern Indian Ocean, 1851–1925', *BJHS* (2018) 51(4), pp. 607–33; Henry, op. cit. (4), pp. 179–201; Anya Zilberstein, *A Temperate Empire: Making Climate Change in Early America*, Oxford: Oxford University Press, 2016; J.L. Pietruska, 'Hurricanes, crops, and capital: the meteorological infrastructure of American empire in the West Indies', *Journal of the Gilded Age and Progressive Era* (2016) 15(4), pp. 418–45; Fiona Williamson, 'Weathering the British Empire: meteorological research in the early nineteenth-century Straits Settlements', *BJHS* (2015) 48(3), pp. 475–92; Deborah R. Coen, 'Imperial climatographies from Tyrol to Turkestan', *Osiris* (2011) 26(1), pp. 45–65; Gregory T. Cushman, 'Humboldtian science, creole meteorology, and the discovery of human-caused climate change in South America', *Osiris* (2011) 26(1), pp. 16–44.

colonial authorities to tame or frame problematic atmospheres and meteorological roles across mixed communities of local and foreign inhabitants and scientific staff.

Sarah Carson's study starts in 1886, the year of the first monsoon forecast of the new Indian Meteorological Department (IMD). Predicting the monsoon was an almost impossible task, however, with both public and government quickly frustrated by the service's inability to make the unpredictable predictable. Carson's lens into this issue is the widespread coverage of the service in the local press. With critical reporters, editors and readers stoking negativity about the IMD's abilities, Carson finds that the general public defaulted to traditional methods of foretelling the weather, undermining meteorology's authority as a fulcrum of the colonial state. This was not just an issue in India. As Chi Chi Huang and Fiona Williamson note, Hong Kong's extreme weather tested the limits of British meteorological science. Here, understanding and predicting typhoons was – like the Indian monsoon – economically critical, but the predictive system was fraught with problems and traditional prognostication continued to be practised amongst the general public. In Mark Frank's essay, the climatically misunderstood and treacherous weather of the Tibetan plateau likewise confounded the efforts of those who sought to order the atmosphere through mathematical formulae and meteorological management. Situated at the outermost reaches of the republican government's reach, it was also hoped that the new meteorological research units and registering stations would offer an infrastructure to channel central authority into the borderlands.

Frank, Huang and Carson also explore how the notion of hazardous weathers (savage, barbarian and unhealthy) that we gain from colonial texts was specific to the imperial gaze. Building on David Arnold's notion of tropicality,[11] but within the less studied typhoon climate, Huang interrogates the British home press as a medium for knowledge about Hong Kong. Their portrayal of the storms, she argues, not only defined European views about the colony but framed the Western expatriates who lived there as somehow heroic for living with tempests (akin to the notion that colonialism could somehow 'civilize' the tropics). Huang also argues that the British press's storm reportage became increasingly technical in tone after the early 1900s. A situation thus existed where the romantic and sensational became blurred with routine practice, revealing different strands of knowledge generated at multiple scales, none fully replacing or subsuming another, and buffeted by competing pressures from the public, the government and the scientific elite. This tension is also alluded to in Frank's study as he explores what constituted meteorological fact, revealing an amalgamation of more recent instrumental meteorological methods and scientific theories alongside anecdotal and long-established means of explaining the weather as the norm.

The growing institutionalization of weather also required an extensive human investment to help generate and analyse the large quantity of data necessary for weather research in the style of the late nineteenth and early twentieth centuries. The foreign authorities relied on an army of local workers who found themselves in a difficult position. Though familiar to historians of science,[12] the exploration of worker's lives and

[11] David Arnold, *The Tropics and the Traveling Gaze: India, Landscape and Science, 1800–1856*, Seattle: University of Washington Press, 2006.

[12] Steven Shapin, 'The invisible technician', *American Scientist* (1989) 2, pp. 554–63. For recent work in this field see Patricia Fara, *A Lab of One's Own: Science and Suffrage in the First World War*, Oxford: Oxford University Press, 2018; Roger Turner, *Weather Workers: The Unseen Scientific Labor behind Air Transport* (2018), at https://t2m.org/weather-workers-the-unseen-scientific-labor-behind-air-transport; Giuditta Parolini, 'From computing girls to data processors: women assistants in the Rothamsted Statistics Department', in Valérie Schafer and Benjamin Thierry (eds.), *Connecting Women: Women, Gender and ICT in Europe*, Cham: Springer International Publishing, 2015; Georgina Endfield and Carol Morris, 'Exploring the role of the amateur in the production and circulation of meteorological knowledge', *Climatic Change* (2012) 113, pp. 69–89; Jeremy Vetter, 'Lay observers, telegraph

their contribution to scientific knowledge has been less apparent in the history of meteorology, a situation that has led to calls for change.[13] Frank tells the story of the people who worked at the remote outposts of the Sino-Tibetan borderlands, revealing how the extreme conditions resulted in much personal trauma and ill health. While they escaped the ravages of the 'high cold country' of Frank's discussion, the staff of Williamson's study of Hong Kong Observatory did not work under ideal conditions either. Long hours of observational work and limited leave, pay and acknowledgement defined their working lives, yet without them the service could not have functioned. In both cases, the reality of the workers' lives undermined the framing of imperial power and authority.

As Fa-ti Fan argued in 2007, looking beyond the traditional scientific establishment and, more specifically, exploring cultural borderlands has been an important historiographical shift for understanding knowledge production and experience from within, and without, imperial contexts.[14] Collectively, these papers reveal the importance of locally situated studies, even when working within colonial contexts.[15]

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lines, and Kansas weather: the field network as a mode of knowledge production', *Science in Context* (2011) 24, pp. 259–80.

[13] Martin Mahony and Angelo Matteo Cagliotti, 'Relocating meteorology', *History of Meteorology* (2017) 8, pp. 1–13, 13.

[14] Fa-ti Fan, 'Science in cultural borderlands: methodological reflections on the study of science, European imperialism, and cultural encounter', *East Asian Science, Technology and Society* (2007) 1(2), pp. 213–31. See also Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, Basingstoke: Palgrave Macmillan, 2007; Sarah Strauss, 'Weather wise: speaking folklore to science in Leukerbad,' in Sarah Strauss and Benjamin Orlove (eds.), *Weather, Climate, Culture*, New York: Berg, 2003, pp. 52–3.

[15] Coen, op. cit. (1), esp. pp. 4–20.

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