

Reading between the Lines

The name of the game will be to leave the boundaries open and to close them only when the people we follow close them.

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THE DEATH OF DR. VOGEL

When the combined interests of commerce, abolition, and exploration catalyzed British support for the massive Niger Expedition of 1841, the ambitious Theodor Vogel managed to get himself appointed to the distinguished post of chief botanist.² It was a minor coup. The young Prussian had never actually been to the tropics. In fact, he had never been any closer to West Africa than western Germany, where the nearest thing to the tropical Niger was the distinctly temperate Rhine.³ Nor had he much exposure to West African flora. His expertise was based on the study of a Brazilian collection conveniently ensconced in a herbarium in Berlin. But

¹ Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Cambridge, MA: Harvard University Press, 1987), 175.

² The following account is taken from a combination of Vogel's botanical and private journals, large sections of which are reproduced in *Niger Flora; or, An Enumeration of the Plants of Western Tropical Africa, Collected by the Late Dr. Theodore Vogel, Botanist to the Voyage of the Expedition Sent by Her Britannic Majesty to the River Niger in 1841, under the Command of Capt. H. D. Trotter, R. N., &c.*, ed. W. J. Hooker (London: Hippolyte Bailliere, 1849).

³ Parts of which were as likely as not to freeze in the winter, as observed by the seventeenth-century Jesuit Athanasius Kircher and described in John Glassie, *A Man of Misconceptions: The Life of an Eccentric in an Age of Change* (New York: Riverhead Books, 2012), 27–30.

that was enough – and it was a measure of just how coherent the tropics now were in the minds of European naturalists: where expertise was concerned, plants collected from the expansive Brazilian interior could stand in for those that lined a discrete corner of the sub-Saharan world.

By the time he reached the yawning delta of the Niger, after layovers spread from Funchal to Accra, Vogel had assembled a collection of plants so numerous that they crowded him out of his cramped stateroom. The sweltering climate, he griped, made his specimens “fall to pieces and mold continuously.”⁴ He preserved as many of them as possible in his journal, its pages a thicket of binomial nomenclature: *Tamarix senegalensis*, *Cassia obovata*, *Elais guineensis*, *Sarcocephalus esculentus*, *Anona murciata*.⁵ Had he lived, the ambitious young doctor would have consolidated his reputation as an authority on the distinctive botany of the immense tropical world.

But of course, he did not live. “Tropical fevers,” Vogel wrote, worried everyone on the expedition.⁶ His colleagues in medicine thought these fevers were the result of the combined heat, humidity, and dense vegetation of the tropics. Widespread putrefaction, they believed, caused miasma – the pernicious, earthy exhalations of mist and haze that seemed to pervade the tropics. How, exactly, miasma caused fevers, what the differences were between them, and how each should be treated were among the questions then driving medical transformations within metropolitan Europe.⁷ In Europe’s expanding tropical colonies, fevers were so ubiquitous, so baffling, and so virulent that, in clinical terms, subtle distinctions could often seem meaningless.⁸ By all accounts, tropical fevers were deadlier than most.

Vogel’s fever began on September 6, far up the Niger, only days from his destination at the confluence of the Benue. Over the following weeks, his condition grew worse. By September 18, he could muster little more than clipped sentences and tortured grammar. “I continue unwell” he

⁴ Hooker, ed., *Niger Flora*, 11.

⁵ Hooker, ed., *Niger Flora*, 24–37. These are, respectively, salt cedar, senna, African oil palm, Guinea peach, and soursop.

⁶ Hooker, ed., *Niger Flora*, 17.

⁷ A classic statement is Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception*, trans. A. M. Sheridan (New York: Pantheon Books, 1973 [1963]). Perhaps the best recent survey is Christopher Hamlin, *More Than Hot: A Short History of Fever* (Baltimore, MD: Johns Hopkins University Press, 2014).

⁸ Philip D. Curtin, *Death by Migration: Europe’s Encounter with the Tropical World in the Nineteenth Century* (New York: Cambridge University Press, 1989).

wrote, “head-ache and fever.”⁹ His ship turned downstream, headed for the sea, and a safe harbor on the island of Fernando Po.

At just over three degrees and three minutes north latitude, and tucked deep into the Gulf of Guinea, Fernando Po (now Bioko, Equatorial Guinea) sits almost exactly on the equator, in the very heart of the tropics. There, in Clarence Cove, Vogel spent the last ten weeks of his life – bedridden, febrile, and delirious. His botanical collection was brought ashore where it was variously invaded, occupied, and purloined by an assortment of unspecified bugs. Vogel mused that he had turned from gathering plants to collecting insects.¹⁰ On December 17, 1841, amid his dwindling collection and an insurgent nature, Theodore Vogel, chief botanist of the British Niger expedition of 1841, “succumbed,” as one of his colleagues put it, “to the destructive influence of the climate.”¹¹ His death helped mark the disastrous conclusion to one of Victorian Britain’s most ambitious West African ventures.¹²

It did not take a tropical botanist to understand something of the world that Vogel confronted. For many in nineteenth-century Europe and the United States, the tropics could be found almost anywhere. Empires actual and aspirational (the United States had no formal tropical holdings until 1898¹³) had already begun to bring the tropics home. Plants, animals, objects, and people from across the tropical world had become the subjects not only of specialized inquiry but also of general public fascination. Crowds at Kew marveled at enormous Amazonian lilies; rhododendrons from India lined a park near the Thames.¹⁴ The Berlin

⁹ Hooker, ed., *Niger Flora*, 61, 69. The emphasis in the latter appears in the original.

¹⁰ Hooker, ed., *Niger Flora*, 72. ¹¹ Hooker, ed., *Niger Flora*, 1.

¹² Hooker, ed., *Niger Flora*, vii–ix; Philip D. Curtin, *The Image of Africa: British Ideas and Action, 1780–1850*, 2 vols. (Madison, WI: University of Wisconsin Press, 1964); Daniel R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (New York: Oxford, 1981); David Lambert, *Mastering the Niger: James MacQueen’s African Geography and the Struggle over Atlantic Slavery* (Chicago, IL: University of Chicago Press, 2013).

¹³ American geopolitical ambitions during and after the early Republic are surveyed in Michael Adas, *Dominance by Design: Technological Imperatives and America’s Civilizing Mission* (Cambridge, MA: Belknap Press, 2006), the notes to which reference an array of more specialized studies in both the Pacific and the Caribbean. According to Hooker, ed., *Niger Flora*, 33, Vogel noted an already-ambiguous political relationship between the United States and Liberia during his short stay in Monrovia.

¹⁴ Richard Drayton, *Nature’s Government: Science, Imperial Britain, and the Improvement of the World* (New Haven, CT: Yale University Press, 2000), chapter 6; and, more broadly, Beth Fowkes Tobin, *Colonizing Nature: The Tropics in British Arts and Letters, 1760–1820* (Philadelphia, PA: University of Pennsylvania Press, 2005).

zoo filled with monkeys and giraffes, while pythons and parrots were hawked in the back alleys of Hamburg.¹⁵ Parisians paid to ride pachyderms. In the woods of Maine, Americans hunted them. Crowds in Washington eyed the cranium of a Fijian “chief”; live “Nubians” captured the Parisian public’s attention.¹⁶ Meanwhile, traveling menageries sporting tropical creatures – zebras, hippos, and rhinos – toured between New York, Boston, and Philadelphia.¹⁷ The spoils of empire were, by turns, signs of affluence, measures of metropolitan reach, symbols of imperial power, and emblems of colonial mastery.¹⁸

Such public displays juxtaposed tropical objects and dramatized tropical difference – and the tropics were not just different, they were pathologically so. Tropical heat and humidity seemed to pervert human nature, excite the passions, and damage the intellect. Unchanging climates and vegetable abundance obviated daily labor and left time for intercourse verbal and otherwise. Tropical inhabitants were viewed as lazy, lascivi-

¹⁵ Nigel Rothfels, *Savages and Beasts: The Birth of the Modern Zoo* (Baltimore, MD: Johns Hopkins University Press, 2002), chapter 2; and Herman Reichenbach, “A Tale of Two Zoos: The Hamburg Zoological Garden and Carl Hagenbeck’s Tierpark,” in *New Worlds, New Animals: From Menagerie to Zoological Park in the Nineteenth Century*, eds. R. J. Hoage and William A. Deiss (Baltimore, MD: Johns Hopkins University Press, 1996), although the author makes the wildly inaccurate claim that recently arrived rhinoceroses were the first to come to Europe “since ancient times” (55). On the rhinoceros in Europe see, for example, Juan Pimentel, *El Rinoceronte y el Megaterio: Un ensayo de morfología histórica* (Madrid: Abada Editores, 2010); and Donald F. Lach, *Asia in the Making of Europe*, 3 vols. (Chicago, IL: University of Chicago Press, 1967), vol. 1, 169, 488, and 569, n. 398.

¹⁶ Ann Fabian, *The Skull Collectors: Race, Science, and America’s Unburied Dead* (Chicago, IL: University of Chicago Press, 2010), chapter 4; Michael A. Osborne, *Nature, the Exotic, and the Science of French Colonialism* (Bloomington, IN: Indiana University Press, 1994), 7, 115–116, 126.

¹⁷ Michael A. Osborne, “Zoos in the Family: The Geoffroy Saint-Hilaire Clan and the Three Zoos of Paris,” in *New Worlds*, eds. Hoage and Deiss, 39–41; Richard W. Flint, “American Showmen and European Dealers: Commerce in Wild Animals in Nineteenth Century America”; in *New Worlds*, eds. Hoage and Deiss, 98; and Vernon N. Kising Jr., “The Origin and Development of American Zoological Parks to 1899,” in *New Worlds*, eds. Hoage and Deiss, 112–113.

¹⁸ Here I draw on a good deal of postcolonial scholarship. But the act of collecting as part of both personal and imperial self-fashioning was not a strictly European phenomenon and those who engaged in it, including British and French connoisseurs, did not necessarily draw such hard and fast distinctions as the scholarly dichotomy between “colonized” and “colonizer” might suggest. See Maya Jasanoff, *Edge of Empire: Lives, Culture, and Conquest in the East, 1750–1850* (New York: Vintage, 2005).

ous, unclean, and immoral.¹⁹ Visions of unruly nature and debilitating illness fostered research programs and propelled global bioprospecting campaigns.²⁰ They helped legitimate imperial dominance and inspired techniques of colonial rule.²¹ Metropolitan physicians identified diseases of the tropics. Medical geographers plotted them on their maps.²² Colonial authorities outfitted themselves with pith helmets and quinine. They built hill stations and hydrotherapy spas, installed personal hygiene regulations and sanitation regimes. They separated the sick from the healthy and – after germ theory made it possible to map disease agents onto native bodies – they increasingly separated European settlers from indigenous inhabitants.²³ In the tropics, where the line between nature and humanity

¹⁹ David N. Livingstone, “Tropical Climate and Moral Hygiene: The Anatomy of a Victorian Debate,” *The British Journal for the History of Science* 32 (1999): 93–110; Alan Bewell, *Romanticism and Colonial Disease* (Baltimore, MD: Johns Hopkins University Press, 2003); Gavin Bowd and Daniel Clayton, “Tropicality, Orientalism, and French Colonialism in Indochina: The Work of Pierre Gourou, 1927–1982,” *French Historical Studies* 28 (2005): 297–327; David Brody, *Visualizing American Empire: Orientalism and Imperialism in the Philippines* (Chicago, IL: University of Chicago Press, 2010).

²⁰ Lucile H. Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New Haven, CT: Yale University Press, 1979); Helen Tilley, *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870–1950* (Chicago, IL: University of Chicago Press, 2011); Philip D. Curtin, *Disease and Empire: The Health of European Troops in the Conquest of Africa* (New York: Cambridge University Press, 1998); Michael A. Osborne, *The Emergence of Tropical Medicine in France* (Chicago, IL: University of Chicago Press, 2014); and Abena Dove Osseo-Asare, *Bitter Roots: The Search for Healing Plants in Africa* (Chicago, IL: University of Chicago Press, 2014).

²¹ Osborne, *Nature, the Exotic, and the Science of French Colonialism*; Richard H. Grove, *Green Imperialism Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism* (New York: Cambridge University Press, 1995); Mark Harrison, *Climates and Constitutions: Health, Race, Environment and British Imperialism in India, 1600–1850* (New York: Oxford University Press, 1999); David Arnold, *The Tropics and the Travelling Gaze: India, Landscape, and Science, 1800–1856* (Seattle, WA: University of Washington Press, 2006); Alice L. Conklin, *In the Museum of Man: Race, Anthropology, and Empire in France, 1850–1950* (Ithaca, NY: Cornell University Press, 2013).

²² David Arnold, ed., *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500–1900* (Atlanta, GA: Rodopi, 1996); Nancy Leys Stepan, *Picturing Tropical Nature* (Ithaca, NY: Cornell University Press, 2001).

²³ Dane Kennedy, *The Magic Mountains: Hill Stations and the British Raj* (Berkeley, CA: University of California Press, 1996); Eric T. Jennings, *Curing the Colonizers: Hydrotherapy, Climatology, and French Colonial Spas* (Durham, NC: Duke University Press, 2006); David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley, CA: University of California Press, 1993); Warwick Anderson, *Colonial Pathologies: American Tropical Medicine, Race, and Hygiene in the Philippines* (Durham, NC: Duke University Press, 2006); Mariola Espinosa, *Epidemic*

seemed to collapse, installing that and other boundaries became keys to survival. The whole region was to be tamed by European and American science, medicine, technology, and discipline.

EMPIRES AND THEIR TROPICS

The tropics have been central to Western political, cultural, and intellectual life for centuries. From the pre-Romantic fiction of Daniel Defoe's *Robinson Crusoe* to the structural anthropology of Claude Lévi-Strauss, and from bygone debates over miasma to vector-based models for the transmission of disease, the tropics have remained constant – a single coherent region defined by two essential features: profuse and unruly nature, and debilitating febrile illness.²⁴

That was not always so. This book, in its broadest terms, is about the birth of that perspective – about how a single, coherent, global region now called “the tropics” was first conjured into being. Much like Fernand Braudel's “Mediterranean,” Edmundo O’Gorman’s “America,” or Edward Said’s “Orient,” “the tropics” is a historical artifact²⁵ – a totalizing spatial framework cobbled together and made to seem natural as a consequence of centuries of European empire.²⁶ Hollywood movies (such as *Outbreak*) and science fiction novels (most famously, *The Hot Zone*) no less than academic specializations (from tropical medicine to

Invasions: Yellow Fever and the Limits of Cuban Independence, 1878–1930 (Chicago, IL: University of Chicago Press, 2009); John W. Cell, “Anglo-Indian Medical Theory and the Origins of Segregation in West Africa,” *American Historical Review* 91 (1986): 307–335.

²⁴ That was true even as nineteenth-century observers quarreled over how best to gauge coherence and readily conceded the fact of internal variation. See Warwick Anderson, “Climates of Opinion: Acclimatization in Nineteenth-Century France and England,” *Victorian Studies* 35 (1992): 135–157; and David Arnold, “‘Illusory Riches’: Representations of the Tropical World, 1840–1950,” *Singapore Journal of Tropical Geography* 21 (2000): 6–18.

²⁵ Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, 2 vols., trans. Siân Reynolds (Berkeley, CA: University of California Press, 1995 [1949]); Edmundo O’Gorman, *La invención de América* (Mexico City: Fondo de Cultura Económica, 1986); Edward Said, *Orientalism*, (New York: Pantheon, 1978).

²⁶ As is the case with globalizing perspectives generally, according to Martin W. Lewis and Karen E. Wigen, *The Myth of Continents: A Critique of Metageography* (Berkeley, CA: University of California Press, 1997).

evolutionary biology) continue to normalize the concept.²⁷ Yet it has never been merely a reflection of the natural order of things and there was nothing inevitable about its creation.

The origins of the tropics lay in the ancient Aristotelian concept of the “torrid zone.” By the mid-nineteenth century, these two terms had become virtually interchangeable. But whereas the tropics and the torrid zone refer to an identical area of the globe – one demarcated by the Tropic of Cancer north of the equator and the Tropic of Capricorn to its south²⁸ – they are not the same thing. The fundamental difference is environmental. The tropics brim with life; the torrid zone, at least in the narrowest Aristotelian sense (beset with the searing intensity of the sun directly overhead), was bereft of it.²⁹

How, when, and why these views were reconciled, and what was at stake when that happened, are principal concerns of this book. A dominant narrative shared by the histories of science, medicine, and geography alike date the invention of “the tropics” to European imperial pursuits at the end of the eighteenth century. The central figure in this account is Vogel’s elder countryman, the Prussian Alexander von Humboldt, who, together with the botanist Aimé Bonpland, trekked through the Andes between 1799 and 1804. Humboldt had a predilection for instrumentation and measurement, and a penchant for lyrical descriptions of equinoctial vegetation. His travels, lyricism, and faith

²⁷ Priscilla Wald, *Contagious: Cultures, Carriers, and the Outbreak Narrative* (Durham, NC: Duke University Press, 2008), chapters 1 and 4; and Gary Y. Okihiro, “Unsettling the Imperial Sciences,” *Environment and Planning D: Society and Space* 28 (2010): 745–758. See also, for example, the widely-cited essay by the influential geneticist Theodosius Dobzhansky, “Evolution in the Tropics,” *American Scientist* 38 (1950): 209–221. I thank Tito Carvalho for this reference.

²⁸ These lines mark, respectively, the northern- and southern-most positions at which it is still possible to observe the sun directly overhead. They presently correspond to 23 degrees and 51 minutes north and south latitude. Because the Earth’s rotational axis itself rotates (the motion of precession: much like a spinning top, the Earth wobbles), the sun’s apparent motion shifts over long spans of time and therefore the precise latitudes of the northern and southern tropics also shift.

²⁹ The classic statement appears in Aristotle, *Meteorologica*, trans. H. D. P. Lee (Cambridge, MA: Harvard University Press, 1952), bk. 2, pt. 5. For a discussion, see Denis Cosgrove, “Tropic and Tropicality,” in *Tropical Visions in an Age of Empire*, eds. Felix Driver and Luciana Martins (Chicago, IL: University of Chicago Press, 2005), 199–202.

in precision measurement inspired similar intertropical itineraries.³⁰ Vogel's was among them.³¹

Humboldt gave short shrift to disease, although fever ("yellow fever" in particular) made its way into volume three of his widely read *Personal Narrative*.³² He need not have said more. Imperial rivalries, renewed settler colonialism in Africa and Asia, the intensification of global trade, and the compilation of colonial health statistics had all begun to focus European attention on the problem of disease in many parts of the intertropical world.³³ The climate and vegetation that Humboldt helped make emblematic of that world always implied the presence of miasma

³⁰ Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation*, 2nd edn. (New York: Routledge, 2008), chapter 6; Hugh Raffles, *In Amazonia: A Natural History* (Princeton, NJ: Princeton University Press, 2001); Michael Dettelbach, "Global Physics and Aesthetic Empire: Humboldt's Physical Portrait of the Tropics," in *Visions of Empire: Voyages, Botany, and Representations of Nature*, eds. David Philip Miller and Peter Hanns Reill (New York: Cambridge University Press, 1996), 258–292; Malcolm Nicholson, "Alexander von Humboldt and the Geography of Vegetation," in *Romanticism and the Sciences*, eds. Andrew Cunningham and Nicholas Jardine (Cambridge: Cambridge University Press, 1990); John Hemming, *Naturalists in Paradise: Wallace, Bates, and Spruce in the Amazon* (London: Thames and Hudson, 2015); Stepan, *Picturing Tropical Nature*; Arnold, "Illusory Riches"; Driver and Martins, eds., *Tropical Visions*.

In addition, Aaron Sachs, *The Humboldt Current: Nineteenth-Century Exploration and the Roots of American Environmentalism* (New York: Penguin, 2006), credits Humboldt with shaping domestic American attitudes toward nature. The life and travels of the Prussian engineer-turned-explorer continue to inspire literature aimed at general audiences. See, for example, Andrea Wulf, *The Invention of Nature: Alexander von Humboldt's New World* (New York: Alfred A. Knopf, 2015); and Daniel Kehlmann, *Measuring the World: A Novel*, trans. Carol Brown Janeway (New York: Vintage Books, 2006).

³¹ According to D. Graham Burnett, *Masters of All They Surveyed: Exploration, Geography, and a British El Dorado* (Chicago, IL: University of Chicago Press, 2001), 123, n. 21, Vogel would have been part of a community of expatriate Prussian naturalists who had gathered in London by the late 1830s.

³² These are scattered throughout Alexander von Humboldt, *Personal Narrative of Travels to the Equinoctial Regions of the New Continent, during the Years 1799–1804*, trans. Helen Maria Williams, 3 vols. (London: Longman, Hurst, Rees, Orme, and Brown, 1814–1822), vol. 3, 32, 301, 310, 380–381, 387, 390–406, 466, 468. According to Nicolaas A. Rupke, "Humboldtian Medicine," *Medical History* 40 (1996): 293–310, his work also inspired a short-lived area of medicine.

³³ David Arnold, "Introduction: Tropical Medicine before Manson," in *Warm Climates*, Arnold, ed., 1–19; Mark Harrison, "A Global Perspective: Reframing the History of Health, Medicine, and Disease," *Bulletin of the History of Medicine* 89 (2015): 639–689; Daniel R. Headrick, *Power over Peoples: Technology, Environments, and Western Imperialism, 1400 to the Present* (Princeton, NJ: Princeton University Press, 2012); Curtin, *Death by Migration*; Curtin, *Disease and Empire*; Harrison, *Climates and Constitutions*; Stepan, *Picturing Tropical Nature*.

and therefore pervasive illness. As Humboldt's work found readers across Europe, and as the figure of the afflicted explorer became an icon of scientific heroism,³⁴ fever became the signal disease of the intertropical world. It was foremost among the ills that contemporary physicians began to identify as "diseases of warm climates." And in the 1880s, even as the emerging field of tropical medicine dispensed with environmental explanations in favor of germ theory and parasitology, fever remained the focus.³⁵

Yet long before metropolitan readers began to immerse themselves in the ink of Humboldt's prodigious pen – before the extension of colonial empires in the nineteenth century, before the beginnings of English and French settlement in Asia and the Americas, decades even before the Columbian voyages of the 1490s – a tentative link had been drawn between intertropical latitudes, prodigious nature, and debilitating fevers. The connection came not as British, French, or Spanish ships sailed across the Atlantic to the Americas but as ships sailing under Portuguese auspices ventured southward, into the Atlantic, along the West African coast.

Beyond the Senegal River, the unexpected virulence of fevers amid verdant landscapes and abundant wildlife called into question a set of ancient and authoritative accounts of both nature and disease. Instead of the scorched and desolate landscape imagined by Aristotle, fifteenth-century travelers found one that was lush and verdant. Bountiful nature was supposed to be a sign of health and vitality. Yet travelers found themselves besieged by debilitating, often deadly, fevers. Seemingly irresolvable questions had been opened. What could explain the coincidence of fecund landscapes and virulent fevers? How could an entire region that

³⁴ Nigel Leask, *Curiosity and the Aesthetics of Travel Writing, 1770–1840* (New York: Oxford University Press, 2002); Christopher Lawrence and Michael Brown, "Quintessentially Modern Heroes: Surgeons, Explorers, and Empire, c. 1840–1914," *Journal of Social History* 50 (2016): 148–178; Johannes Fabian, *Out of Our Minds: Reason and Madness in the Exploration of Central Africa* (Berkeley, CA: University of California Press, 2000).

³⁵ Deborah J. Neill, *Networks in Tropical Medicine: Internationalism, Colonialism, and the Rise of a Medical Specialty, 1890–1930* (Stanford, CA: Stanford University Press, 2012); Michael A. Osborne, *The Emergence of Tropical Medicine in France* (Chicago, IL: University of Chicago Press, 2014); Michael Worboys, "Germs, Malaria, and the Invention of Mansonian Tropical Medicine: From 'Diseases in the Tropics' to 'Tropical Diseases,'" in *Warm Climates*, ed. Arnold, 181–207; Michael Worboys, "The Emergence of Tropical Medicine: A Study in the Establishment of a Scientific Specialty," in *Perspectives on the Emergence of Scientific Disciplines*, eds. Gerard Lemaire, Roy Macleod, Michael Mulkay, and Peter Weingart (The Hague: Mouton, 1976), 75–98.

was otherwise teeming with life be so inhospitable? And how could travelers survive in such bedeviling circumstances? Prevailing notions of miasma seemed unable to explain the problem. Familiar medicines seemed inadequate to resolve it. In environmental and epidemiological terms, fifteenth-century voyages into the Atlantic were as disorienting as later voyages across it.³⁶

The proposition that intertropical lands might everywhere be endowed with profuse and exploitable nature would soon raise the stakes of exploration. Southerly sailing came to be seen as an asset by European statesmen and seafarers alike.³⁷ But in the closing decades of the fifteenth century, it was not at all clear that the situation in West Africa should be taken as characteristic of the entire intertropical world. The true extent of intertropical abundance remained unknown. The causes and distribution of fevers were uncertain. What in the postcolonial, biomedical present has come to seem self-evident was, for some two centuries, anything but so. The many disorientations provoked by fifteenth-century voyages, and the strategies devised by travelers to cope with them, are the subject of Chapter 2.

The history of the tropics is the story of what happened next. The Portuguese established colonies from sub-Saharan Africa to Southeast Asia and South America, enabling the earliest global comparisons of nature and disease across the vast intertropical world. From Malacca in Southeast Asia to Olinda and Salvador da Bahia in Northeastern Brazil, a loosely connected network of Portuguese physicians and apothecaries emerged. For the first time ever, persons with a common intellectual inheritance and similar training spanned the intertropical world. Everywhere, unfamiliar nature and debilitating fevers became a focus of colonial inquiry and vigorous debate. Yet in Portugal's colonies, encounters with nature and disease inspired a range of geographical imaginings. For physicians such as Garcia de Orta in India or Aleixo de Abreu in Brazil,

³⁶ With an emphasis on geography and cross-cultural encounter, a similar point has been made, for example, by Luís Filipe Barreto, *Descobrimento e renascimento: Formas de ser e pensar nos séculos XV e XVI* (Lisbon: Imprensa Nacional-Casa da Moeda, 1983); Fernández-Armesto, *Before Columbus: Exploration and Colonization from the Mediterranean to the Atlantic, 1229–1492* (Philadelphia, PA: University of Pennsylvania Press, 1987); and Alida C. Metcalf, *Go-Betweens and the Colonization of Brazil, 1500–1600* (Austin, TX: University of Texas Press, 2005), chapter 2.

³⁷ Nicolás Wey Gómez, *The Tropics of Empire: Why Columbus Sailed South to the Indies* (Cambridge, MA: MIT Press, 2008); Maria da Graça Mateus Ventura, ed., *Viagens e viajantes no Atlântico quincentista* (Lisbon: Edições Colibri, 1996).

the intertropical world was vast and internally differentiated – nature and disease were widely variable, the tropics a patchwork of distinctive places.³⁸ In neither theater of empire did Portuguese authors imagine themselves as inhabiting an environmentally or epidemiologically coherent intertropical zone.

Meanwhile, plants, animals, objects, and people from across the Portuguese colonial world flooded into Lisbon.³⁹ Finely carved African ivory, silken Indian headdresses, brightly glazed martabans from Pegu, Chinese porcelain, Japanese armor, and silver-ornamented coconuts from the Maldives filled shops along the bustling Rua dos Mercadores.⁴⁰ A skilled goldsmith from India, Rauluchantim, arrived to make finery for the Portuguese Crown. Some dozen elephants and three rhinoceroses ambled ashore into the heart of Lisbon during the sixteenth century. Civet cats scampered across the grounds of the royal menagerie. Baboons scaled its trees. Gray parrots from Guinea, parakeets from South Asia, and macaws from the far side of the Atlantic all spread their wings in the aviary of the Alçaçova palace – their plumage spanning the rainbow from luminous yellows to regal blues and reds.⁴¹ Gardens greened with the leaves of exotic flora. Bananas and plantains from Guinea, taro from South Asia, and tobacco from the Americas grew on the estates of imperial ministers, royal factors, and returned colonial governors.⁴² Abbeys

³⁸ Such a multiplicity of visions of imperial geography also characterized the Spanish case, as described by Ricardo Padrón, *The Spacious Word: Cartography, Literature, and Empire in Early Modern Spain* (Chicago, IL: University of Chicago Press, 2004).

³⁹ Annemarie Jordan Gschwend and K. J. P. Lowe, eds., *The Global City: On the Streets of Renaissance Lisbon* (London: Paul Holberton, 2015).

⁴⁰ Donald F. Lach, *Asia in the Making of Europe*, vol. 2, bk. 1, 10–16; Annemarie Jordan Gschwend, “Catarina de Áustria: Coleção e *Kunstkammer* de uma Princesa Renascentista,” *Oceanos* 16 (1993): 62–70; Annemarie Jordan Gschwend, “As Maravilhas do Oriente: Coleções de Curiosidades Renascentista em Portugal/The Marvels of the East: Renaissance Curiosity Collections in Portugal,” in *A Herança de Rauluchantim/The Heritage of Rauluchantim*, ed. N. V. Silva (Lisbon: Museu de São Roque, 1996), 82–127.

⁴¹ Gschwend, “A Procura Portuguesa”; and Palmira Fontes da Costa, “Secrecy, Ostentation, and the Illustration of Exotic Animals in Sixteenth-Century Portugal,” *Annals of Science* 66 (2009): 59–82.

⁴² Garcia de Orta, *Colloquies on the Simples and Drugs of India*, trans. Clements Markham (London: Henry Southern and Company, 1913), 200 and n. 1; Carolus Clusius, *Rariorum aliquot stirpium per Hispanias* (Antwerp: Christopher Plantin, 1576), 131, 254, 280, 289, 299, 444; Rose Standish Nichols, *Spanish and Portuguese Gardens* (London: Constable and Company, 1922), 225–226; Damião de Góis, *Chronica do felicissimo rei Dom Emanuel* (Lisbon: Francisco Correa, 1566–1567), part 1, chapter 56, 52–52v; *MB* vol. 1, 423, n. 10 and 424, n. 14.

and apothecaries alike stocked tamarind and senna from West Africa, along with Asian drugs, spices, and aromatics ranging from amber to zedoary. Dispensaries sold them to the sick. Infirmaries served them to the poor. The spoils of empire delighted the senses, filled the bellies, and fortified the souls of even the kingdom's unlikeliest subjects.⁴³

Global seafaring, cross-cultural encounter, and colonization had shown not only that tremendous human diversity⁴⁴ but also climatic, geographic, environmental, and epidemiological diversity characterized the very part of the world that Aristotle had insisted was a single, coherent, and uniformly lifeless region. Yet none of the exotic plants, animals, and people pouring into Lisbon were taken as an index of essential intertropical similarity and used to articulate a vision of environmental and epidemiological coherence.⁴⁵

The tropics – its nature and its characteristic qualities – was not a discovery but a political project. Intertropical objects and their varied provenances had to be imbued with new meaning. How and why disparate places spread across the midriff of the terraqueous globe finally became aggregated and assimilated to one another is the subject of Chapter 8. Across the latter half of the seventeenth century, I argue, a coterie of politically connected, university-trained physicians turned the empire into an epistemic, curative, and professional resource. Manuel de Azevedo, Simão Pinheiro Mourão, and João Curvo Semedo are not well known even among specialists of early modern medicine. But they were among a number of physicians in Lisbon who tried to resolve the intractable medical questions surrounding the causes of fever and the relationship between nature and disease – the questions first posed by those early

⁴³ Lach, *Asia in the Making of Europe*, vol. 2, bk. 1, 11–12; Isabel M. R. Mendes Drummond Braga, *Assistência, saúde pública e prática médica em Portugal: Séculos XV–XIX* (Lisbon: Universitária Editora, 2001); Lisbeth de Oliveira Rodrigues and Isabel dos Guimarães Sá, “Sugar and Spices in Portuguese Renaissance Medicine,” *Journal of Medieval Iberian Studies* 7 (2015): 176–196.

⁴⁴ Surekha Davies, *Renaissance Ethnography and the Invention of the Human: New Worlds, Maps, and Monsters* (New York: Cambridge University Press, 2016); João-Pau Rubiés, *Travel and Ethnology in the Renaissance: South India through European Eyes, 1250–1625* (New York: Cambridge University Press, 2000); Anthony Pagden, *The Fall of Natural Man: The American Indian and the Origins of Comparative Ethnology* (New York: Cambridge University Press, 1982).

⁴⁵ Some may object that such a framework was indeed present earlier as evidenced in works such as Shakespeare's *The Tempest*. But there as elsewhere in the early seventeenth century, disease was mentioned with reference to putrid airs in localized swamps rather than as a generalized condition of the intertropical world. Mine is, in essence, an account of how that view became generalized.

Atlantic encounters. For them, naming and defining the tropics was part of a strategy of personal and professional advancement. They embraced what they saw as the exceptional therapeutic value of intertropical nature but argued that intertropical diseases demanded metropolitan curative acumen. Drawing attention to epidemics of fever in both Portugal and its colonies, they stressed the combination of university learning and intertropical itineraries as grounds for both authoritative medical knowledge and superior clinical practice. They attempted to showcase their learning through increasingly elaborate treatises on fever, its causes, categorization, and treatment. In metropolitan Portugal, claims of intertropical coherence became foundational for claims about the authority and necessity of learned medicine throughout the empire.⁴⁶

By itself, a story that links fifteenth-century epidemiological encounters in the Atlantic to seventeenth-century intertropical imaginings in Lisbon is important for several reasons. Most narrowly, this story challenges a prominent depiction of learned medicine in early modern Portugal. Rather than an era in which single-minded Portuguese physicians remained mired in an implacable, backward-looking Galenism,⁴⁷ I show that metropolitan physicians of the seventeenth century vigorously and creatively disputed the cause and treatment of fevers then plaguing the Portuguese colonial world. As part of a bid to shore up the ever-tenuous authority of learned medicine in Portugal and its empire, I argue, these debates were a prelude to the better-known pursuits of the eighteenth century, when metropolitan physicians partnered with powerful churchmen to prosecute lay healers in Inquisitorial courtrooms.⁴⁸

More broadly, because these earlier contests for clinical primacy unfolded in the pages of published books and pamphlets, their story draws attention to the largely uncharted place of medicine in the history

⁴⁶ That ideological changes underpin the formulation of new visions of the globe is a pattern of metageographical thinking more generally according to Lewis and Wigen, *Myth of Continents*, xi.

⁴⁷ Augusto da Silva Carvalho, *A Medicina Portuguesa no século XVII* (Lisbon: Academia das Ciências de Lisboa, 1940); Ian Maclean, *Learning and the Market Place: Essays in the History of the Early Modern Book* (Boston: Brill, 2009), chapter 13.

⁴⁸ Timothy D. Walker, *Doctors, Folk Medicine, and the Inquisition: The Repression of Magical Healing in Portugal during the Enlightenment Era* (Boston: Brill, 2005); and Braga, *Assistência*.

of Portuguese print culture, and to the as-yet unexamined role of physicians in a transformational era of Portuguese imperial politics.⁴⁹

This story also highlights the ways in which the earliest decades of Atlantic exploration shaped not just early modern therapeutics (itself now the subject of a rich literature⁵⁰) but also metropolitan medical and philosophical frameworks. Medical theory was not impervious to the epidemiological feedback generated by some of the earliest Atlantic voyages. Rather, West African encounters helped propel shifts in medical thinking that implied more sweeping claims about the inner workings of the natural world.⁵¹ In the seventeenth century, Portuguese physicians promoted the view that fever was a form of contagion. As a disease, fever became the consequence of noxious particles rather than a

⁴⁹ A lucid exploration of political and intellectual life can be found in Diogo Curto, *O Discurso político em Portugal (1600–1650)* (Lisbon: Universidade Aberta, 1988). For the history of the book in Portugal, see, for example, the bibliography compiled by Manuela D. Domingos, ed., *Estudos sobre História do Livro e da Leitura em Portugal, 1995–2000* (Lisbon: Biblioteca Nacional, 2002); and the essays surveying printed work on medicine in Palmira Fontes da Costa and Adelino Cardoso, eds., *Percursos na História do Livro Médico* (Lisbon: Edições Colibri, 2011). On physicians and politics generally see Laurinda Abreu, “A organização e regulação das *profissões médicas* no Portugal Moderno: entre as orientações da Coroa e os interesses privados,” in *Arte Médica e Imagem do Corpo: de Hipócrates ao final do século XVIII*, eds. Adelino Cardoso, et al. (Lisbon: Biblioteca Nacional de Portugal, 2010), 97–122; and Francis A. Dutra, “The Practice of Medicine in Early Modern Portugal: The Role and Social Status of the *Físico-mor* and the *Surgião-mor*,” in *Libraries, History, Diplomacy, and the Performing Arts: Essays in Honor of Carleton Sprague Smith*, ed. Israel J. Katz (Stuyvesant, NY: Pendragon Press, 2001), 135–169.

⁵⁰ See, for example, Mauricio Nieto Olarte, *Remedios para el imperio: historia natural y la apropiación del Nuevo Mundo* (Bogota: Universidad de los Andes, 2006); Crisina Gurgel, *Doenças e curas: o Brasil nos primeiros séculos* (São Paulo: Editora Contexto, 2010); Pratik Chakrabarti, *Materials and Medicine: Trade, Conquest and Therapeutics in the Eighteenth Century* (Manchester: University of Manchester Press, 2010); Timothy D. Walker, “The Medicines Trade in the Portuguese Atlantic World: Acquisition and Dissemination of Healing Knowledge from Brazil (c. 1580–1800),” *Social History of Medicine* (2013): 403–431; Matthew James Crawford, *The Andean Wonder Drug: Cinchona Bark and Imperial Science in the Spanish Atlantic, 1630–1800* (Pittsburgh, PA: University of Pittsburgh Press, 2016); and Londa Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA: Harvard University Press, 2004).

⁵¹ The point is usually made with reference not to fever along the African coast but to the plague pandemic of the fourteenth century and the outbreak of venereal syphilis in Mediterranean Europe in the wake of the first Columbian voyages. See Roger French, *Medicine before Science: The Business of Medicine from the Middle Ages to the Enlightenment* (New York: Cambridge University Press, 2003); and Jon Arrizabalaga, John Henderson, and Roger French, *The Great Pox: The French Disease in Renaissance Europe* (New Haven, CT: Yale University Press, 1997).

humoral imbalance. The episode not only dramatizes the little-known ways that Lisbon's physicians participated in wider contemporary debates over the causes and classification of fever.⁵² But claims that endowed disease with a discrete ontological existence were also consonant with the emergent mechanical philosophy of the New Science, which raises questions about the relationship of Portuguese physicians to their counterparts in London and elsewhere.⁵³

Most important, here, is the link between medical ontology and global geography. The seventeenth century was an era in which a raft of novel spatial frameworks came into being within metropolitan Europe.⁵⁴ The tropics, I contend, was one of them, and debates surrounding fever were central to its creation.⁵⁵ The point is not merely that colonial diseases shaped metropolitan medical debates and permitted new geographical distinctions – or even that lines of geographical distinction supported lines of professional exclusion. The intertwined processes of imperial expansion and colonial settlement did not simply enable encounters with disparate febrile environments. In ways both material and discursive, those processes helped to create such environments.⁵⁶ The Portuguese empire mobilized peoples, pathogens, and therapeutics, and compelled them to cluster in locations spread across the intertropical world.⁵⁷ In so

⁵² On the contemporaneous emergence of fever as a focus of English medical debate, see Mark Harrison, *Medicine in an Age of Commerce and Empire: Britain and Its Tropical Colonies, 1660–1830* (New York: Oxford University Press, 2010).

⁵³ On the larger question of the participation of physicians in the New Science, see Harold J. Cook, “The New Philosophy and Medicine in Seventeenth-Century England,” in *Reappraisals of the Scientific Revolution*, eds. David C. Lindberg and Robert S. Westman (New York: Cambridge University Press, 1990), 397–365. On the relationship between the often separate histories of science and medicine that this approach is meant to address, see Nancy Siraisi, “Medicine, 1450–1620, and the History of Science,” *Isis* 103 (2012): 491–514.

⁵⁴ Lewis and Wigen, *Myth of Continents*; Benjamin Schmidt, *Inventing Exoticism: Geography, Globalism, and Europe's Early Modern World* (Philadelphia, PA: University of Pennsylvania Press, 2015).

⁵⁵ Though marginal to the account of Grove, *Green Imperialism*.

⁵⁶ Classic studies include Alfred W. Crosby, *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, CT: Greenwood, 1972); and Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (New York: Cambridge University Press, 1986); but for an approach that moves beyond what many have seen as Crosby's biological determinism, see Mark Harrison, *Contagion: How Commerce Has Spread Disease* (New Haven, CT: Yale University Press, 2012).

⁵⁷ A standard of account of which is A. J. R. Russell-Wood, *The Portuguese Empire, 1415–1808: A World on the Move* (Baltimore, MD: Johns Hopkins University Press, 1992).

doing, the empire also permitted physicians to assemble those elements together on the pages of books and manuscripts, to collectively name and define them, and to seek personal advantage and build professional alliances based on that vision⁵⁸ – all while helping to alter the techniques of colonial rule.⁵⁹ In Portugal's empire, global geography, febrile disease, and professional medicine proved mutually constitutive.

CULTURES OF INQUIRY AND THE LOCATION OF EXPERTISE

Read another way, this book is about the investigative practices of disparate colonial communities spread across the intertropical world. Although a vision of intertropical coherence constituted an intellectual and political project among physicians in metropolitan Lisbon, its history cannot simply be found among the European books, curiosities, and medical debates of the sixteenth and seventeenth centuries any more than it can among the research laboratories, public parks, and traveling menageries of the nineteenth and twentieth centuries. In Lisbon, if perplexing fevers and exotic plants and animals all became emblems of tropicality in the late seventeenth century, it was because physicians there mobilized and reconfigured knowledge to serve their own ends – knowledge that originated in places throughout the intertropical world.

A history of the tropics is necessarily one of proliferating centers and cosmopolitan colonies.⁶⁰ Just as successive cycles of encounter, reportage, and tabulation linked Europe to the wider world and led to the production of new knowledge in imperial Lisbon, so too did empire have similar effects in Portugal's colonies.

In the commercial city of Goa in India and on the plantations of Pernambuco in Brazil, distinctive cultures of inquiry took shape. They were composed of an idiosyncratic amalgam of participants. They allocated authority and expertise – and they focused investigative and curative efforts – in unpredictable ways. And they endowed nature and disease

⁵⁸ I have in mind the dynamic elaborated in Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), chapter 3.

⁵⁹ Physicians' efforts helped "territorialize" the intertropical world in the sense developed by Robert D. Sack, *Human Territoriality: Its Theory and History* (New York: Cambridge University Press, 1986).

⁶⁰ The concept of cosmopolitanism for the early modern world has been worked out by a number of historians, but for the history of science in particular, see Kapil Raj, "The Historical Anatomy of a Contact Zone: Calcutta in the Eighteenth Century," *The Indian Economic and Social History Review* 48 (2011): 55–82.

with meanings of their own. Imperial networks may have mobilized objects like ivory sculptures, plants like coconut palms, and creatures like elephants and macaws but their meanings were unstable and plastic rather than “immutable.”⁶¹

What, then, were the varied meanings given to nature and disease in Portugal’s colonies? How were they constituted? How and why were they packed into the pages of books and letters in the first place? By whom? How were expertise and authority configured? What kinds of intellectual projects motivated colonial natural inquiry and what spatial frameworks were they part of? To answer these questions, this story sweeps out across Portugal’s empire. It retraces the passages of books and letters, animals and plants from imperial Lisbon back to the colonial port cities that set them in motion.

In following the successive processes of recontextualization by which things and creatures were repeatedly given new meanings, *Assembling the Tropics* establishes important material and ideological relationships between the Atlantic and Indian Ocean worlds. In so doing, this story challenges a range of more conventional historical-spatial frameworks (center-periphery models, oceanic worlds, and area studies perspectives).⁶² The story also refuses the centripetal pull of imperial histories of science, especially Iberian science, that focus primarily on metropolitan outlooks and transformations.⁶³

Here the dominant narrative is about a scientific revolution. During the sixteenth and seventeenth centuries, contentious debates over the content and inner workings of the natural world within Europe are supposed to have led to paradigmatic transformation in Western definitions of nature and in the procedures judged appropriate for natural inquiry. What had once been an animate, even mischievous cosmos is supposed to have been endowed instead with an inert, regular, and mechanical existence.⁶⁴ Thick, leather-bound tomes by ancient authors no longer vouchsafed claims to

⁶¹ Contrary to the model of “immutable mobiles” in Latour, *Science in Action*, especially 223–228. See also David Turnbull, “Travelling Knowledge: Narratives, Assemblage, and Encounters,” in *Instruments, Travel and Science: Itineraries of Precision from the Seventeenth to the Twentieth Century*, eds. Marie-Noëlle Bourguet, Christian Licoppe, and H. Otto Sibum (London: Routledge, 2002), 273–294.

⁶² Building on discussions by Lewis and Wigen, *Myth of Continents*; and Harrison, “A Global Perspective.”

⁶³ The key concept here of course is that of “centers of calculation” from Latour, *Science in Action*.

⁶⁴ But see Lorraine Daston, “The Nature of Nature in Early Modern Europe,” *Configurations* 6 (1998): 149–172.

truth. Sensory experience and instruments did. In Galileo's telescope or Boyle's air pump, nature could be made to testify on its own behalf. Reasoning from universal axioms gave way to reasoning from particular instances. Knowledge was to be built from mechanically produced, experimentally verified, collectively attested, and discreet matters of fact.⁶⁵

The contemporaneous creation of overseas empires have more recently been implicated in these transformations. Unanticipated encounters overseas, no less than telescopic observations of the heavens at home, expanded Europeans' sense of what was possible in nature. The intensification of global trade, which placed a premium on discerning eyes, noses, mouths, and hands, further eroded the bookish predilections of naturalists and enhanced the value of evidence drawn from the senses.⁶⁶

Faced with the long-standing exclusion of Spanish and Portuguese endeavours from this standard account,⁶⁷ scholars from a range of disciplinary backgrounds have begun to highlight Iberian contributions to fields ranging from metallurgy and medicine to natural history, navigation, and cosmography. They have traced the varied routes by which exotica, iconography, instruments, and print media circulated back and forth across the Pyrenees, and in the process have stressed the importance of the Spanish and Portuguese empires to the wide range of cultural and intellectual transformations unfolding within early modern Europe.⁶⁸

⁶⁵ Foundational are Steven Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985); and Lorraine Daston and Katherine Park, *Wonders and the Order of Nature, 1150–1750* (New York: Zone Books, 2001).

⁶⁶ A bellwether of the shift was Anthony Grafton with April Shelford and Nancy Siraisi, *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: Belknap Press, 1992). See more recently Harold J. Cook, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age* (New Haven, CT: Yale University Press, 2007); and Dániel Margócsy, *Commercial Visions: Science, Trade, and Visual Culture in the Dutch Golden Age* (Chicago, IL: University of Chicago Press, 2014).

⁶⁷ An omission, moreover, that helps sustain lasting assertions about the impoverished character of Iberian and Latin American society, culture, and politics: Jeremy Adelman, ed., *Colonial Legacies: The Problem of Persistence in Latin American History* (New York: Routledge, 1999). A central issue is the so-called "black legend" of Iberian colonial violence and political tyranny, the invention of which is covered in Benjamin Schmidt, *Innocence Abroad: The Dutch Imagination and the New World, 1570–1670* (New York: Cambridge University Press, 2001).

⁶⁸ Broadly representative of the range of approaches are Ana Cristina Araújo, *A Cultura das Luzes em Portugal: Temas e problemas* (Lisbon: Livros Horizonte, 2003); Miguel de Asúa and Roger French, *A New World of Animals: Early Modern Europeans on the Creatures of Iberian America* (Burlington, VT: Ashgate, 2005); Miruna Achim, *Lagartijas medicinales: Remedios americanos y debates científicos en la ilustración* (Mexico City: Consejo Nacional para la Cultura y las Artes, 2008); Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago, IL: University of Chicago

Under the unifying rubric of Iberian science, some have argued that it was in Spain, Portugal, and their empires that empirical, experimental, and utilitarian approaches to the study of nature first emerged. Iberian empires, rather than metropolitan virtuosi, birthed modern science and its ontologies.⁶⁹

These are large claims that deserve, and have garnered, a great deal of attention.⁷⁰ Most studies in this vein have focused on Spain and its empire. But the perspective has patterned interpretations of the Portuguese world too. If they are studied at all, most of the authors and institutions that appear in the pages that follow – Garcia de Orta in India, Jesuit missionaries in both South Asia and South America, Aleixo de Abreu in the South Atlantic – have been pitched as prefigurations of an epistemic or clinical modernity to come.⁷¹ Yet tethering these histories to

Press, 2008); María M. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago, IL: University of Chicago Press, 2009); Daniela Bleichmar, Paula de Vos, Kristin Huffine, and Kevin Sheehan, eds., *Science in the Spanish and Portuguese Empires, 1500–1800* (Stanford, CA: Stanford University Press, 2009); Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago, IL: University of Chicago Press, 2012); Mauricio Nieto Olarte, *Las máquinas del imperio y el reino de Dios: reflexiones sobre la ciencia, tecnología y religión en el mundo Atlántico del siglo XVI* (Bogotá: Universidad de los Andes, 2013); and Eliane Cristina Deckman Fleck, *Entre a caridade e a ciência: a prática missionária e a científica da Companhia de Jesus (América platina, séculos XVII e XVIII)* (São Leopoldo: Oikos and Editora Unisinos, 2014).

⁶⁹ Jorge Cañizares-Esguerra, *How to Write the History of the New World: Histories, Epistemologies, and Identities in the Eighteenth-Century Atlantic World* (Stanford, CA: Stanford University Press, 2001); Jorge Cañizares-Esguerra, “Iberian Science in the Renaissance: Ignored How Much Longer?,” *Perspectives on Science* 12 (2004): 86–124; Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin, TX: University of Texas Press, 2006); Victor Navarro Brotóns and William Eamon, eds., *Más allá de la Leyenda Negra: España y la Revolución Científica* (Valencia: Instituto de Historia de la Ciencia y Documentación López Piñero of the University of Valencia and CSIC, 2007). For a broader discussion, see Stephen Toulmin, *Cosmopolis: The Hidden Agenda of Modernity* (Chicago, IL: University of Chicago Press, 1992).

⁷⁰ These debates have had an influence well beyond the history of science. See, for example, David J. Weber, *Bárbaros: Spaniards and Their Savages in the Age of Enlightenment* (New Haven, CT: Yale University Press, 2005).

⁷¹ Onésimo Teotónio de Almeida, “Portugal and the Dawn of Modern Science,” in *Portugal, the Pathfinder: Journeys from the Medieval toward the Modern World, 1300–ca. 1600*, ed. George Winias (Madison, WI: University of Wisconsin Press, 1995), 341–361; Lopes Rodrigues, *Anchieta e a Medicina* (Belo Horizonte: Edições Apollo, 1934); Steven J. Harris, “Long-Distance Corporations, Big Sciences, and the Geography of Knowledge,” *Configurations* 6 (1998): 269–304; Steven J. Harris, “Jesuit Scientific Activity in the Overseas Missions, 1540–1773,” *Isis* 96 (2005): 71–79; Miguel de Asúa, “Los jesuitas y el conocimiento de la naturaleza Americana,” *Stromata* (2003): 1–20; and F

an (ultimately dubious⁷²) origins story of modernity comes at considerable cost. Colonial cultures of inquiry were never merely extensions of metropolitan concerns, priorities, questions, investigative techniques, and representational conventions.⁷³ The fullness of their stories is valuable not because those stories reflect seemingly modern clinical and investigative dispositions but because they are emblematic of the profusion of practices born in the crucible of early modern empires. The era in question did not witness a single scientific revolution nor was Europe the only site of dramatic investigative and curative transformation. Early modern empires produced a proliferation of ways of knowing, suffering, diagnosing, and healing.⁷⁴

In the middle chapters of this book, I attempt to rediscover colonial cultures of natural inquiry on their own terms – to identify their various preoccupations, sort out their priorities, and watch as some of their protagonists fashioned epistemic tools and representational conventions of their own. Colonial encounters unsettled older epistemologies, yes, but they rarely produced a stable consensus around new ones. When it came to the investigation of nature generally and to the explanation and treatment of disease in particular, authority was up for grabs. While it was certainly true that the climatic, environmental, and epidemiological particularities of the colonial world propelled the consolidation of cultural and racial typologies used to legitimize Iberian imperial expansion and colonial rule,⁷⁵ it was also true that rhetorics of strict cultural conformity

[rancisco]. Guerra, “Aleixo de Abreu (1568–1630), Author of the earliest book on Tropical Medicine describing Amoebiasis, Malaria, Typhoid Fever, Scurvy, Yellow Fever, Dracontiasis, Trichuriasis and Tungiasis in 1623,” *The Journal of Tropical Medicine and Hygiene* 71 (1968): 55–69.

⁷² Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993); Daston, “The Nature of Nature in Early Modern Europe”; Ralph Bauer, “A New World of Secrets: Occult Philosophy and Local Knowledge in the Sixteenth-Century Atlantic,” in *Science and Empire in the Atlantic World*, eds. James Delbourgo and Nicholas Dew (New York: Routledge, 2008), 99–126.

⁷³ A point variously illustrated by Barbara E. Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago, IL: University of Chicago Press, 1996); and Crawford, *Andean Wonder Drug*.

⁷⁴ A point illustrated most recently for the Caribbean by Pablo F. Gómez, *The Experiential Caribbean: Creating Knowledge and Healing in the Early Modern Atlantic* (Chapel Hill, NC: University of North Carolina Press, 2017).

⁷⁵ Jorge Cañizares-Esguerra, *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, CA: Stanford University Press, 2006), chapter 4; Marcy Norton, *Sacred Gifts, Profane Pleasures: A History of Tobacco and Chocolate in the Atlantic World* (Ithaca, NY: Cornell University Press, 2008); Rebecca Earle, *The*

masked quotidian colonial realities that fostered invention and collaboration.⁷⁶ Familiar, text-centered approaches to the investigation of nature and Hippocratic-Galenic perspectives on the cause treatment of disease jostled for adherents alongside a raft of unfamiliar but appealing alternatives. Portuguese governors in Goa patronized Hindu temples; Jesuit missionaries in Brazil enacted the shamanic rituals of their native Tupi opponents.⁷⁷ Everywhere, claims about nature and disease that were committed to paper were often partial and probabilistic rather than total and certain.⁷⁸ Knowledge about nature and disease was never self-evident or of obvious value to metropolitan officials. Only deliberate strategies of self-fashioning and presentation could render knowledge produced in Goa or along the coast of Brazil intelligible, credible, and valuable to readers an ocean away.⁷⁹ And that act of translation was laborious, uncertain, even dangerous.

Chapters 3 to 5 use the work of Garcia de Orta to examine the networks and preoccupations that shaped medicine and natural history in the cosmopolitan colony of Portuguese Goa. In Goa, the heart of Portugal's trading empire in Asia, commerce propelled epistemic innovation, but it also produced intractable problems of knowledge that perpetuated the bookish learning of old. Orta's *Colóquios dos simples e drogas e coisas medicinais da Índia* exemplifies the kind of inquiry enabled by Portuguese empire in Asia. Rather than a masterful triumph

Body of the Conquistador: Food, Race and the Colonial Experience in Spanish America, 1492–1700 (New York: Cambridge University Press, 2012).

- ⁷⁶ A similar point has been made by Stuart Schwartz, *All Can Be Saved: Religious Tolerance and Salvation in the Iberian Atlantic World* (New Haven, CT: Yale University Press, 2008).
- ⁷⁷ Similar episodes from the Portuguese Atlantic appear in James H. Sweet, *Domingos Álvares: African Healing and the Intellectual History of the Atlantic World* (Chapel Hill, NC: University of North Carolina Press, 2011); Cécile Fromont, *The Art of Conversion: Christian Visual Culture in the Kingdom of Kongo* (Chapel Hill, NC: University of North Carolina Press, 2014).
- ⁷⁸ John V. Pickstone, "Working Knowledges before and after circa 1800: Practices and Disciplines in the History of Science, Technology, and Medicine," *Isis* 98 (2007): 489–516; Serge Gruzinski, *The Mestizo Mind: The Intellectual Dynamics of Colonization and Globalization*, trans. Deke Dusinberre (New York: Routledge, 2002).
- ⁷⁹ James A. Secord, "Knowledge in Transit," *Isis* 95 (2004): 654–672; Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900* (New York: Palgrave Macmillan, 2007); Lissa Roberts, "Situating Science in Global History: Local Exchanges and Networks of Circulation," *Itinerario* 33 (2009): 9–30.

of Renaissance empiricism or a vessel in which unmediated South Asian therapeutic knowledge was passed off as Orta's own,⁸⁰ I contend that the dynamic intra-Asian exchanges that predated Portuguese arrival also shaped colonial natural inquiry. The *Colóquios* embodied the connected histories⁸¹ of Renaissance naturalists in Italy, Portuguese apothecaries in Cochin and Malacca, and Hindus and Muslims, women and men, ayurveda and unani specialists, Javanese midwives, and the Konkani-speaking servants who inhabited Goa, passed through the Orta household, and populated Orta's book. To assemble the *Colóquios*, I argue, Orta collected people.⁸² The credibility of the former hinged on the diversity of the latter. And that made getting those claims into print especially tricky in the only city outside of metropolitan Portugal to be home to a standing tribunal of the Inquisition.

Chapters 6–8 focus on Brazil and the Atlantic world. They explore the overlapping practices of medicine and natural history as they took shape in the midst of missionary incursions, epidemic disease, plantation agriculture, and chattel slavery. Here the time span is longer and the cast of characters is larger. Beginning in 1549, I argue, contests between Jesuit missionaries and native Tupi shamans (*pajés*) over the explanation and treatment of disease helped pattern subsequent colonial approaches to both medicine and the study of nature. Contrary to most other work on the subject, the upshot was not, I contend, a committed empiricism among seamlessly interconnected Jesuit missions but a learned ignorance of colonial nature, sustained by an epistolary network of factious Company men.⁸³ At the turn of the

⁸⁰ Prominent interpretations to this effect include, respectively, Teresa Nobre de Carvalho, *Os desafios de Garcia de Orta. Colóquios dos Simples e Drogas da Índia* (Lisbon: Esfera do Caos, 2015); and Grove, *Green Imperialism*. For alternative formulations see the essays in Palmira Fontes da Costa, ed., *Medicine, Trade and Empire: Garcia de Orta's Colloquios on the Simples and Drugs of India (1563) in Context* (Burlington, VT: Ashgate, 2015); and in António Manuel Lopes Andrade, Carlos de Miguel Mora, and João Manuel Nunes Torrão, eds., *Humanismo e Ciência: Antiguidade e Renascimento* (Coimbra: The University of Aveiro and the University of Coimbra Press, 2015).

⁸¹ The formulation has been worked out by Sanjay Subrahmanyam, *Explorations in Connected History: From the Tagus to the Ganges* (New York: Oxford University Press, 2005).

⁸² James Delbourgo, "Listing People," *Isis* 103 (2012): 735–742.

⁸³ Among the interlocutors here are Rodrigues, *Anchieta e a Medicina*; Harris, "Long-distance Corporations"; Harris, "Jesuit Scientific Activity"; Asúa, "Los jesuítas"; and Andrés I. Prieto, *Missionary Scientists: Jesuit Science in Spanish South America, 1570–1810* (Nashville, TN: Vanderbilt University Press, 2011).

seventeenth century, the physician Aleixo de Abreu and the sugar planter Ambrósio Brandão penned competing visions of the cause and treatment of fevers in the Portuguese Atlantic. They debated the prospect of an epidemiologically coherent Atlantic world, not an intertropical one. Brandão's work in particular dramatically expanded the catalog of colonial nature and suggests that the longstanding portrait of Brazilian planters as willfully disengaged from contemporary intellectual life is in need of revision. The example of Brandão shows how and why sugar planters might become planter-naturalists.

The expertise that enabled and sustained Portugal's global empire was not purveyed by benighted physicians and naturalists from metropolitan Portugal. That expertise was instead created by – and remained located within – colonial cultures of inquiry in both Asia and the Atlantic.

ON METHOD AND TERMINOLOGY

In the chapters that follow, I identify and try to make sense of important differences between the Asian and Atlantic theatres of Portuguese colonization. But this is not an attempt at systematic comparison. I have not assembled what I would consider commensurate bodies of archival evidence. Rather, I have emphasized local and regional particularities as part of an effort to historicize and reinterpret some of the best-known books and manuscripts on nature and disease from the sixteenth and seventeenth century Lusophone world, and to bring to light some of the least-known but potentially most illuminating ones.

To investigate these diverse histories of early modern natural inquiry, I draw on scholarly literatures ranging from the history of the book to colonialism and historical epidemiology. I have drawn on print media, maps, and manuscripts. Early modern printed books have proven useful not only for their content but also as objects whose physical attributes (size, organization, illustration) provide clues to the meanings they were meant to carry.

When referring to the Jesuits, I use the archaic “Company of Jesus” rather than the current “Society of Jesus.” This is not only how early modern Jesuits themselves referred to the Catholic missionary order of which they were a part, but it also connotes the centralized organization, bureaucratic character, clear stratification, and direct lines of communication taken to characterize the order and which are central to modern studies of its epistemic practices. These are characteristics that I variously call into question.

My concern for the perspectives of the people of the past has led me to eschew retrospective diagnosis.⁸⁴ Where appropriate, the notes reference important findings in ongoing debates over the possible identity of the diseases in question. But early modern diagnostic categories were often more capacious than familiar post-germ-theory terminology would suggest. For the period in question, the same language could be applied to diseases now understood as entirely different. My interest is in the contests for the definition of those categories. So, with few exceptions, as overlapping stories of disease and natural history unfold, I have preferred terms such as ‘fever,’ ‘dysentery,’ and ‘pox’ to the anachronistic use of modern diagnostic categories like ‘malaria,’ ‘cholera,’ ‘smallpox,’ and ‘measles’ – even as I acknowledge that these, too, have histories that predate modern nosology, and even though it may be argued that in some cases symptoms described in contemporary sources were pathognomonic. Finally, wherever possible, I have used the term ‘naturalist’ to refer to anyone engaged in a process that I refer to as ‘natural inquiry.’ Though they, too, are somewhat anachronistic, I have preferred these to the distinctly unsuitable ‘scientist’ and ‘science.’⁸⁵

⁸⁴ On handling this contentious issue, I have relied on Andrew Cunningham, “Identifying Disease in the Past: Cutting the Gordian Knot,” *Asclepio* 54 (2002): 13–34; Jon Arrizabalaga, “Problematising Retrospective Diagnosis in the History of Disease,” *Asclepio* 54 (2002): 51–70; Piers Mitchell, “Retrospective Diagnosis and the Use of Historical Texts for Investigating Disease in the Past,” *Journal of International Palaeopathology* 1 (2011): 81–88; and Bruno Latour, “On the Partial Existence of Existing and Nonexisting Objects” in *Biographies of Scientific Objects*, ed. Lorraine Daston (Chicago, IL: University of Chicago Press, 2000), 247–269. Characteristic of an alternative approach would be J. R. McNeill, *Mosquito Empires: Ecology and War in the Greater Caribbean, 1620–1914* (New York: Cambridge University Press, 2010).

⁸⁵ Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago, IL: University of Chicago Press, 2006), takes a more nuanced approach to the term. I follow Daston and Park, *Wonders*, in this more general usage. For a consideration of similar linguistic tangles, see Andrew Cunningham, “Getting the Game Right: Some Plain Words on the Identity and Invention of Science,” *Studies in History and Philosophy of Science Part A* 19 (1988): 365–389.