European Cloth and “Tropical” Skin: Clothing Material and British Ideas of Health and Hygiene in Tropical Climates

RYAN JOHNSON

SUMMARY: As Britain’s imperial and colonial ambitions intensified toward the end of the nineteenth century, the preservation of white European health in tropical climates became an increasingly important concern. Since at least the seventeenth century, the “tropics” had been seen as spaces holding vast potential wealth but also death and disease. To combat these deadly but desirable landscapes, the British built a considerable commodity culture around the preservation of white European health, and for many, tropical clothing was one of the most important and essential items in their “kits.” This article investigates the composition and use of such clothing in relation to British ideas of health and hygiene in tropical climates. First, it considers debates that ensued over the best material—wool, cotton, linen, silk, or a combination of these materials—and the role of “black” skin and local practice in the development of tropical clothing. Second, it demonstrates the importance of location in any discussion of tropical medicine and hygiene, and the tension and ambiguity that still surrounded British ideas of health and hygiene in the tropical colonies. Third, it argues that tropical clothing was important in the maintenance of climatic etiologies despite advances in parasitology and sanitary science. Finally, it considers the relationship of tropical clothing to the formation of a unique colonial identity. To British men and women embarking for any number of tropical destinations, proper clothing was not a banal and mundane component of their outfitting. For many, the clothing signified a departure from the safe and “civil” climes of Britain for adventure in the expanding tropical empire.

KEYWORDS: tropical health and hygiene, cloth, skin color, British colonialism

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In 1907, James Cantlie, lecturer in surgery at the London School of Tropical Medicine and the cofounding editor of the *Journal of Tropical Medicine*, published an article addressing the importance of European clothing in relation to African dress and cutaneous qualities of skin. He stated that "The question of clothing in the tropics, both as regards colour and texture is of vital importance to the European dwelling in the tropics," but, "to copy the natives in their dress is neither scientific nor hygienic, for the skin of the white man is unprovided with the protective pigment which adapts the coloured man to his environment."¹ Commenting on recent advances in tropical clothing, Cantlie supported the belief that it should imitate "black" skin instead of imitating local practice: "By imitating nature . . . the white man can hope to overcome this defect in his cutaneous covering," and it "will be by suitable clothing that the modern man of the north will be enabled to conquer the exigencies of tropical life."²

This article investigates the development and use of clothing in relation to British imperial tropical medicine and racialized ideas of health and hygiene in Britain's tropical colonies. Its focus is primarily on the material, or fabric, of such clothing. I do not consider other items of outfitting that might fall under the heading "tropical clothing," such as pith helmets, flannel belts, boots, and spinal pads.³ The term "tropical clothing" in this article refers to specialized attire—both outer- and undergarments—that was promoted in metropolitan Britain as possessing the ability to protect white Europeans against the supposed harmful effects of a tropical climate.

Ideas of clothing in relation to the preservation of white European health in tropical climates stretch back to at least the seventeenth century.⁴ Physicians generally believed that climate directly impacted the production of disease. Initially, climatic disease's main culprit was tropical heat, or fluctuations in temperature, and appropriate tropical clothing was supposed to maintain equilibrium of physiological functions. At the beginning of the twentieth century, the chemical rays of the sun were

1. James Cantlie, "Tropical Clothing," *J. Trop. Med.*, 1907, 10: 71.

2. Ibid.

3. See E. T. Renbourn, "The History of the Flannel Binder and the Cholera Belt," *Med. Hist.*, 1957, 1: 211–25; Renbourn, "Life and Death of the Solar Topi. A Chapter in the History of Sunstroke," *J. Trop. Med. Hyg.*, 1962, 65: 203–18; and Francis A. de Caro and Rosan A. Jordan, "The Wrong Topi: Personal Narratives, Ritual, and the Sun Helmet as a Symbol," *West. Folk.*, 1984, 43: 233–48.

4. See Mark Harrison, *Climates and Constitutions: Health, Race, Environment, and British Imperialism in India, 1600–1850* (Oxford: Oxford University Press, 1999); and Jan Golinski, "Climate and Civilization," in *British Weather and the Climate of Enlightenment* (Chicago: University of Chicago Press, 2008), pp. 170–203.

introduced alongside heat as detriments to Anglo-Saxon health, and tropical clothing changed accordingly. Nonetheless, whether the worry was tropical heat or the chemical rays of the sun, the primary concern among travelers was the type of material best able to preserve a “white” body in a tropical climate, and the best material, according to Western tropical practitioners, imitated the one aspect that became the ultimate marker of difference between colonizers and colonized: skin color.

The development, manufacture, and sale of tropical clothing designed to mimic “black” skin increased in Britain as imperial ambitions intensified in both Africa and Asia at the end of the nineteenth century. The clothing was meant to be worn in any number of Britain’s newly acquired tropical possessions, primarily during the daytime. For example, it would have been donned by district and medical officers, army and navy personnel, traders, merchants, missionaries, planters, and others engaged in occupations that necessitated long periods working under a “tropical sun.” Clothing manufacturers, such as Jaeger and Burberrys, sold suits specifically tailored for various occupations in the colonies. Although these suits sometimes differed sartorially, at the level of material and function in the supposed preservation of white European health, they did not. Appropriate undergarments for working and traveling in the “torrid zone” followed similar principles regarding material and function and were also considered vital in the protection of Anglo-Saxon health. This everyday work attire, however, was often shed after retiring inside and during dinner, where clothing changed little from that worn in metropolitan Britain. Although the clothing discussed in this article was not meant to be continuously worn, it still provides an important and neglected means of investigating the manner in which tropical health and hygiene were framed in metropolitan Britain and the articulation of a unique colonial identity.⁵

During the late nineteenth century, several European powers were pursuing aggressive imperial expansion in regions that were considered tropical. Germany, France, Portugal, Belgium, and the United States, for instance, were also dealing with problems surrounding the preservation of white European health in tropical climates. Among these countries—and as this article illustrates, particularly in the cases of Germany and Britain—ideas were certainly exchanged. Although a transnational approach to

5. For a discussion of colonial identity, see Warwick Anderson, *The Cultivation of Whiteness: Science, Health, and Racial Destiny in Australia* (New York: Basic Books, 2003); Mary P. Sutphen and Bridie Andrews, eds., *Medicine and Colonial Identity* (London: Routledge, 2003); and Anna Crozier, *Practising Colonial Medicine: The Colonial Medical Service in British East Africa* (London: I. B. Tauris, 2007).

European ideas of health and hygiene in tropical climates is important and necessary, I argue that focusing on tropical clothing in the British context helps shed light on what might not only be similar but peculiar or parochial about British imperial tropical medicine and hygiene at the start of the twentieth century. Tropical clothing represents the practical concerns of travelers regarding their health and safety at the time, but it also highlights the tension and ambiguity surrounding British imperial tropical medicine and racialized ideas of health and hygiene in Britain's tropical empire.

"Imperial tropical medicine" refers to the increasing emphasis on research of vector-borne parasitic diseases in metropolitan Britain and programs in the tropical colonies that focused on their control. According to Michael Worboys, "Such programs began in the late nineteenth century and were first promoted by scientists and colonialists as having the potential to stop tropical colonies from being the 'white man's grave,' and hence to consolidate imperial rule and promote trade."⁶ The current historiography of imperial tropical medicine has charted its evolution from a marginalized and diffuse body of knowledge at the periphery toward a consolidated discipline in the metropole for the maintenance of empire.⁷

6. Michael Worboys, "The Colonial World as Mission and Mandate," *Osiris*, 2000, 15: 207–18, quotation on p. 207.

7. See Michael Worboys, "The Emergence of Tropical Medicine: A Study in the Establishment of a Scientific Specialty," in *Perspectives on Western Medicine and the Experience of Scientific Disciplines*, ed. Gerard Lemaine (The Hague: Mouton, 1976), pp. 75–98; David Arnold, ed., *Imperial Medicine and Indigenous Societies* (Manchester: Manchester University Press, 1988); Michael Worboys, "Manson, Ross, and Colonial Medical Policy," in *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion*, ed. Roy MacLeod and Milton Lewis (London: Routledge, 1988), pp. 21–37; Philip D. Curtin, *Death by Migration: Europe's Encounter with the Tropical World in the Nineteenth Century* (Cambridge: Cambridge University Press, 1989); John Farley, *Bilharzia: A History of Imperial Tropical Medicine* (Cambridge: Cambridge University Press, 1991); François Delaporte, *The History of Yellow Fever: An Essay on the Birth of Tropical Medicine* (Cambridge, Mass.: MIT Press, 1991); Michael Worboys, "Germs, Malaria, and the Invention of Mansonian Tropical Medicine: From 'Disease in the Tropics' to 'Tropical Diseases,'" in *Warm Climates and Western Medicine*, ed. David Arnold (Amsterdam: Rodopi, 1996), pp. 181–207; Lise Wilkinson and Anne Hardy, *The London School of Hygiene and Public Health: A Twentieth-Century Quest for Global Public Health* (London: Keegan Paul International, 1998); W. F. Bynum and Caroline Overy, eds., *The Beast in the Mosquito: The Correspondence of Ronald Ross and Patrick Manson* (Amsterdam: Rodopi, 1998); Helen Power, *Tropical Medicine in the Twentieth Century: A History of the Liverpool School of Tropical Medicine, 1898–1990* (London: Keegan Paul International, 1999); Douglas Haynes, *Imperial Medicine: Patrick Manson and the Conquest of Tropical Disease* (Philadelphia: University of Pennsylvania Press, 2001); and Nancy Leys Stepan, "The New Tropical Pathology," in *Picturing Tropical Nature* (London: Reaktion, 2001), pp. 149–79.

When investigating the local context of Britain, such histories turn their attention to the elite physicians, scientists, and institutions involved in the development of imperial tropical medicine but pay less attention to how it was still influenced by old ways of knowing and popular understandings of tropical environments and disease. As a consequence, imperial tropical medicine emerges from the metropole as a stable, singular, and universal modernity in most histories of British colonial and imperial medicine.

When researchers investigate local contexts at the level of society and culture, they tend to examine colonial settings, assessing the implementation of imperial tropical medicine and the outcomes.⁸ Such histories have revealed how tropical medicine was accepted, contested, and altered in local colonial contexts but pay considerably less attention to the local context of Britain itself. This article attempts to bridge such a gap by looking at tropical clothing through several popular medical manuals and guidebooks written for travel and life in the tropical colonies. Anna Crozier has argued that such guidebooks and manuals were “one of the chief means for settlers and travelers to gain impressions of the healthiness of a place, and so [provided] a useful window into the way the colonial medical encounter was perceived.”⁹

The manuals and guidebooks were generally written by former tropical physicians but sometimes by missionaries, military officers, and government officials. They specifically targeted a metropolitan audience that was contemplating traveling to or living in any number of Britain’s tropical colonies. Some were penned specifically for colonial state officials, and others targeted missionaries, military personnel, or simply the curious traveler. Along with advice on tropical health and hygiene, many also contained a significant advertising section promoting tropical clothing

8. See Megan Vaughan, *Curing Their Ills: Colonial Power and African Illness* (Cambridge, U.K.: Polity Press, 1991); Maryinez Lyons, *The Colonial Disease: A Social History of Sleeping Sickness in Northern Zaire, 1900–1940* (Cambridge: Cambridge University Press, 1992); David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century British India* (Berkeley: University of California Press, 1993); Mark Harrison, *Public Health in British India: Anglo-Indian Preventative Medicine, 1859–1914* (Cambridge: Cambridge University Press, 1994); Soma Hewa, *Colonialism, Tropical Disease, and Imperial Medicine: Rockefeller Philanthropy in Sri Lanka* (London: University Press of America, 1995); Lenore Manderson, *Sickness and the State: Health and Illness in Colonial Malaya, 1870–1940* (Cambridge: Cambridge University Press, 1996); Julian G. Peard, *Race, Place, and Medicine: The Idea of the Tropics in Nineteenth-Century Brazilian Medicine* (Durham, N.C.: Duke University Press, 1999); Warwick Anderson, *Colonial Pathologies: American Tropical Medicine, Race, and Hygiene in the Philippines* (Durham, N.C.: Duke University Press, 2006); and Crozier, *Practising Colonial Medicine* (n. 5).

9. Anna Crozier, “Sensationalising Africa: British Medical Impressions of Sub-Saharan Africa, 1890–1939,” *J. Imp. Commonw. Hist.*, 2007, 35: 393–415, quotation on p. 394.

and other items of outfit. Although personal accounts regarding tropical clothing—and tropical medicine and hygiene in general—in diaries and notebooks written by those planning travel are scarce, the manuals and guidebooks, and their discussions of tropical clothing, can still tell us something about how the average traveler would have understood tropical health and hygiene before leaving the shores of Britain. They can help us build a better picture of what was "tropical" about British imperial tropical medicine at the beginning of the twentieth century.

To accomplish this, the first section of this article looks in detail at debates that ensued over the best clothing material for use in tropical climates. It argues that understanding why these debates arose is important for two reasons. First, they show us how location is central to any discussion of imperial tropical medicine and hygiene. Commentary on the best material is found by individuals writing throughout the empire. Reflecting changes in British imperialism, many of the manuals discussing tropical clothing focused on Africa at the beginning of the twentieth century, whereas those written earlier generally concentrated on South Asia. However, although some manuals and guidebooks looked at specific locations—usually still large in scope, such as all of West or East Africa, or India—many took the more ambiguous location of the "tropics" as their focus. This, along with the manner in which clothing manufacturers promoted and advertised their particular brand of tropical clothing, helped give rise to the debates and uncertainty over the best material for tropical wear.

Second, and in relation to the ambiguity that arose over location, the debates demonstrate that imperial tropical medicine was never composed of a stable and universal set of ideas in metropolitan Britain. For instance, tropical attire helps explain how and why climatic etiologies lingered despite significant advances in parasitology and sanitary science. This is illustrated in the second section of the paper by considering the role of Italian-born scientist and physician Louis Westerna Sambon in the development of a new form of tropical clothing, Solaro. Unlike clothing promoted for use in tropical climates today, Solaro was meant to prevent more than sunburn and carcinomas. It was designed to inhibit the "actinic" rays—what we would now call ultraviolet (UV) radiation—of the sun, which were thought to disrupt proper physiological functioning and produce nervous disorders. The design of the clothing was linked to the observation that skin color was darkest where sunlight was most intense. Sambon, the clothing's chief designer, was a prominent tropical physician and lecturer at the London School of Tropical Medicine; he was one of the more outspoken critics of climatic theories of tropical disease, and

his involvement in the production of Solaro demonstrates that climatic etiologies were not easily discarded.

In addition to revealing the importance of location and the tension and uncertainty surrounding ideas of health and hygiene in tropical climates, debates over tropical clothing can also tell us something about how the British understood themselves in the tropical colonies. The final section of this article investigates the manner in which tropical clothing helped articulate a distinctive colonial identity. When adorned in clothing that was designed to both mimic “black” skin and blend the sartorial effects of metropolitan citizen and colonial explorer, the wearer was at once separated and connected with Britain and its tropical empire. Cloth that explicitly mimicked qualities of people white Europeans were attempting to “civilize” and rule reveals ongoing connections: though it might appear that tropical clothing furthered the fixing of difference between colonizers and colonized, its composition and history belie such a proposition. Cloth believed to provide benefits naturally bestowed on local inhabitants reminded white Britons of the drastically different environment they were in, or would find themselves in; and rather than simply reinforcing and upholding a Britishness associated with metropolitan values, everyday tropical clothing reflects the constant shifting, open, and ambivalent identity of the European “civilizer.”

A Settled Axiom? Debates Over Tropical Clothing Material

Throughout the nineteenth century, the primary concern of physicians and clothing manufacturers regarding tropical clothing was the material best suited for tropical climates. Such was the case, according to tropical practitioner Alexander Kenny, because “when we consider that a man’s health and comfort are so materially dependent upon the manner in which his body may be clothed, under the varying circumstances of climate . . . the selection of the proper material . . . becomes a question of great paramount.”¹⁰ Historians have generally portrayed wool as the textile of choice—often the only choice—in late Victorian Britain for supposedly healthy living in the tropical colonies, despite the existence of considerable debate. For instance, tropical practitioner Leonard Bostock stated in 1913 that “Garments of wool, cotton, linen, silk, and mixed fabrics all have their earnest advocates, both on the part of the manufacturer

10. Alexander S. Kenny and S. Leigh, *On Duty Under a Tropical Sun: Being Some Suggestions for the Maintenance of Health and Bodily Comfort and the Treatment of Simple Disease* (London: W. H. Allen, 1882), p. 97.

and the wearer."¹¹ Evidence was compiled in favor of one material over another, but, according to the *Journal of Tropical Medicine*, "With all this knowledge . . . the actual material best suited for a warm climate is still an unsettled point."¹²

Debate over the best material is a constant feature in the history of tropical attire because of the great local variation encountered in the tropical colonies. Former Church Missionary Society medical missionary Charles F. Harford-Battersby confessed that "To attempt to lay down hard and fast rules as to costume would be futile, for even in Africa some respect must be paid to prevailing fashions, and the proper thing in Zanzibar, in Uganda, or the Upper Congo, or in Lagos, varies considerably."¹³ Throughout the late nineteenth and early twentieth centuries, numerous reports from physicians, explorers, missionaries, and administrators working and living in the tropical colonies detailed differences in local climate, inhabitants, and disease, acknowledging that some tropical locations resembled Britain and other European countries as much as any idealized tropical landscape.

Nonetheless, against this recognized difference, tropical clothing manufactured in Britain was enveloped within complex colonial and metropolitan networks contributing to a universalizing discourse of tropicality.¹⁴ Manufacturers, for instance, took advantage of accounts portraying the tropical colonies as hot, humid, and diseased while using medical and scientific authority to sell their own brands of clothing for

11. Leonard Bostock, *Health and Sickness in the Tropics: A Guide for Travellers and Residents in Remote Districts* (London: Simpkin, Marshall, Hamilton, Kent & Co., 1913), p. 18.

12. Editors, "Clothing in Tropical Countries," *J. Trop. Med.*, 1909, 12: 135–36, quotation on p. 136.

13. Charles F. Harford-Battersby, "Central Africa," in *Health Abroad: A Medical Handbook of Travel*, ed. Edmund Hobhouse (London: Smith, Elder and Co., 1899), pp. 105–40, quotation on p. 110.

14. Drawing on the work of Edward Said, David Arnold has used the term "tropicality" to describe how the tropics were constructed in the Western imagination as a specific geographical location but also as a conceptual space—something culturally and politically alien, as well as environmentally distinctive, from the West. Throughout Western discourse, the tropics have been subject to a duality—a "tropical alterity"—of paradisiacal and pestilential, the site of luxuriant abundance alongside primitiveness, violence, and destruction. Language describing tropical climates was saturated with words such as "paradise," "plush," and "superabundant" alongside words such as "danger," "disease," and "darkness." See David Arnold, "Inventing Tropicality," in *The Problem of Nature: Environment, Culture, and European Expansion*, ed. David Arnold (London: Blackwell, 1996), pp. 141–68. For a discussion of Western "visions" of tropical places and people as a negotiation between the West and the tropics, rather than a one-way Saidean construction by the West, see Felix Driver and Luciana Martins, eds., *Tropical Visions in an Age of Empire* (Chicago: University of Chicago Press, 2005).

use in all tropical climates. Placed alongside an increasing number of local reports and established Western constructions of the tropics, their motive for profit helped create confusion over the best material for use in the tropical colonies. Overall, the contested nature of tropical clothing demonstrates that knowledge regarding tropical health, hygiene, and disease was much more ambiguous in Britain than elite medical and scientific journals might suggest.

Since at least James Johnson's text *The Influence of Tropical Climates on European Constitutions* in 1813, proper functioning of the skin was the "grand and fundamental object in tropical prophylactics."¹⁵ Excessive perspiration or prevention of perspiration was believed to lead directly to problems of the stomach, liver, and lungs. In addition, perspiration could lead to "chilling" effects if one were exposed to a cool breeze or a sudden change in temperature, disrupting the function of internal organs and precipitating latent fever or producing it directly. This is why Johnson warned against the practice of the Bengal dandy, clad in the equivalent of Adam's fig leaf while "'tugging at the oar' for hours together in the scorching noontide heat, till perspiration issues from every pore . . . darts overboard," resurfacing to expose his body to open air "with a rapid evaporation from the whole surface of his body!"¹⁶

To combat these supposed deadly effects, several manuals and guidebooks on living in the tropics advised that "cotton is the material best suited for tropical climates," because "woollen fabrics, being bad conductors of heat felt very uncomfortable . . . irritating the skin and increasing the perspiration, the converse of which being what we require"; however, "The cotton dress . . . from its slowness of conducting heat, is admirably adapted for the tropics."¹⁷ Tropical practitioners maintained that cotton kept the body cooler longer than if exposed directly to heat, or clothed in linen, which "transmits heat through everything beneath it."¹⁸ George W. Thomson, a British surgeon with extensive experience in Africa, extolled the virtues of cotton, claiming that, "Experience has shown that cotton is the most suitable material for tropical climates."¹⁹ Like Johnson, Thomson

15. James Johnson, *The Influence of Tropical Climates on European Constitutions: Being a Treatise on the Principal Diseases Incidental to Europeans in the East and West Indies, Mediterranean, and Coast of Africa*, 3rd ed. (New York: Evert Duyckinck, George Long, Collins & Co., 1826), p. 360.

16. *Ibid.*, p. 390.

17. James A. B. Horton, *The Diseases of Tropical Climates and Their Treatment* (London: J. Churchill, 1874), p. 664.

18. *Ibid.*, p. 663.

19. George W. Thomson, *The Preservation of Health in Tropical Climates* (Edinburgh: Neill and Company, 1878), p. 27.

advised that "it is necessary to wear something which, by conducting heat slowly, will retain the equilibrium as much as possible . . . Cotton absorbs the perspiration, and retains as far as possible, an equable warmth under circumstances which linen would become cold or wet."²⁰ Thomson and other tropical practitioners writing during the 1870s and '80s, such as the famous West African physician James Africanus Beale Horton, cited almost word for word the reasons given by Johnson in 1813 for cotton as the ideal material in tropical climates, and James Ranald Martin's substantial revision of Johnson's text in 1856 left the section on tropical clothing virtually unchanged.²¹

Johnson and his late-nineteenth-century followers considered wool appropriate only under certain circumstances, not as an everyday tropical fabric. Thomson declared that, "In general . . . the spiculae of flannel prove too irritating, and increase the action of the perspiratory vessels on the surface of the body, where our great object is to moderate the process."²² Such knowledge was partly derived from observations of local, "black" skin, and according to Johnson, cotton was the most efficient imitator. Johnson stated, "Nature has previously done a great deal toward the security of the dandy . . . in such as manner, that the extreme vessels on the surface are neither so violently stimulated by the heat, nor so easily struck torpid by sudden transitions to cold."²³ These were exactly the same functions he believed cotton could provide when draped over "white" skin in tropical climates.

Bernard Cohn also notes Johnson's enthusiasm for cotton and objections to wool: "Nevertheless, for many decades thereafter flannel next to the skin was recommended to the European living in the tropics," and "Physicians, old India hands, tropical outfitters, and the writers of guide books and manuals of instruction were unanimous and constant in advising the traveler or sojourner in India to wear flannel next to the skin at all times."²⁴ Although Cohn's emphasis is on India and its local European practitioners, statements from Thomson and Horton show that wool was never a unanimously and constantly accepted material for clothing in India, or elsewhere. Although many European practitioners in India toward the end of the nineteenth century might have considered wool the

20. Ibid.

21. James Ranald Martin, *The Influence of Tropical Climates on European Constitutions* (London: John Daniellson & Son, 1856).

22. Thomson, *The Preservation of Health in Tropical Climates* (n. 19), p. 27.

23. Johnson, *The Influence of Tropical Climates on European Constitutions* (n. 15), p. 390.

24. Bernard S. Cohn, *Colonialism and Its Forms of Knowledge: The British in India* (Princeton, N.J.: Princeton University Press, 1996), pp. 152–53.

best material, this was not conveyed in all medical texts and popular manuals and guidebooks, many of which considered India part of a vast and generalized tropical world. Wool was generally the material for the famous cholera belt and for bedtime, but it was not always the first choice.

German zoologist and physician Gustav Jaeger did more than any other to promote wool as a sanitary and hygienic form of clothing in tropical climates. Jaeger developed a “sanitary woollen system” of clothing by observing that “Animals suffer in a greatly less degree than man from a variety of diseases which affect the organs of respiration and digestion . . . Yet they are in general much more exposed to than man the influences of . . . climatic changes.”²⁵ According to Jaeger, vegetable fibers such as linen and cotton were not intended for use as clothing: “Nature has clothed the animals. Man clothes himself. Animal wool, which Nature has created to clothe the animal body, is the ‘survival of the fittest’ clothing material.”²⁶ Like Johnson, Jaeger considered the two most important qualities of tropical clothing to be keeping the skin uniformly warm and allowing free outlet “for the cutaneous exhalation of watery vapours.”²⁷ Reversing Johnson’s arguments, Jaeger claimed that cotton, when subject to excessive perspiration, clung to the skin and hindered exhalation, producing chill and preventing uniform warmth. Wool, unlike cotton, was porous in quality, allowing perspiration and noxious elements to pass freely, keeping cutaneous exhalation functioning properly.

Jaeger advertised “outfits for India and the Colonies,” arguing that they protected against the “evil effects of change of climate and the injury to health which may ensue.”²⁸ In one Jaeger advertisement, a “tropical traveller” remarked, “The Sanitary Woollen System seems to me to be eminently adapted for hot climates . . . Light stockingette underclothing, with coat and trousers of white cashmere, all of pure woollen material, appears to me the most suitable dress for the tropics.”²⁹ Another claimed, “I rode daily, nearly six hours, through river and swamp, slept in the open air, under rain, and was for months in the worst fever nests . . . without having to complain of illness for so much as a minute . . . Now, as I am by no means a Hercules, there must be some reason for this. I feel very grateful for wool.”³⁰

25. Gustav Jaeger, *Dr. Jaeger's Essays on Health-Culture*, trans. Lewis R. S. Tomalin (London: Waterlow and Sons, 1887), p. 115.

26. *Ibid.*, p. 116.

27. *Ibid.*, p. 117.

28. *Ibid.*, p. 8.

29. *Ibid.*

30. *Ibid.*

Toward the end of the nineteenth century wool did, for many, become the ideal fabric for tropical wear. A particularly convincing argument was made by Andrew Duncan, surgeon to the Bengal Army. Duncan stated, "I advise strongly against any other material than flannel or wool ever being employed for the soldier's campaigning dress in hot climates. It may be taken, then, for granted that cotton and linen are not the materials for a campaigning dress."³¹ Duncan considered, "The highest perfection . . . in material for a campaigning dress in hot climates would seem that introduced by Dr. Jaeger. This inventor has supplied the army with various kinds of his wool sanitary clothing, one kind being adapted for the tropics."³² And, as if in warning to the British Army Clothing Department, "It has already been introduced into the German army. No linen is worn; wool is everywhere in contact with the skin."³³ Not taking the matter of clothing lightly, Duncan insisted that "The subject of clothing is of the greatest importance, and merits a full disquisition."³⁴ In the pursuit of empire, clothing was not a minor detail, and tropical clothing, like many advances in tropical medicine and hygiene, found its beginning or strongest support in the military. Soldiers on campaign in tropical climates often served as test subjects, and Jaeger's clothing was enthusiastically worn and endorsed by both the German and British military. Woolen clothing, modeled after military uniforms, soon filtered into civilian use for travelers, hunters, and explorers, reinforcing Duncan's observation that "Sport is but 'the image of war' as far as jungle life is concerned."³⁵

Although prominent tropical and military practitioners swore by the properties of wool, and although Jaeger built a considerable fortune through advertisement, military contracts, and endorsements, the dedicated use of wool was always subject to compromise. British tropical practitioner Gilbert Brooke spoke for outright opponents of wool when he declared, "It is a great mistake, made by Jaeger and others to imagine that wool is 'porous' in the sense of allowing free passage of air through the material . . . It is an especially bad material for tropical underwear . . . It is an ideal underwear for the sub-tropics or for the warmer seasons of temperate climates, but inferior to cotton for the tropics."³⁶ Another skeptic confided that "People cannot stand wool next to the skin. I have

31. Andrew Duncan, *The Prevention of Disease in Tropical and Sub-Tropical Campaigns* (London: J. A. Churchill, 1888), p. 39.

32. Ibid.

33. Ibid.

34. Ibid., p. 36.

35. Ibid., p. 41.

36. Gilbert E. Brooke, *Tropical Medicine, Hygiene, and Parasitology: A Handbook for Practitioners and Students* (London: Charles Griffen & Co., 1908), p. 25.

never been able to understand the propaganda in favour of wool."³⁷ Overall, the editors of the *Journal of Tropical Medicine* noted that "There seems no finality, no scientific precision in what, from the large experience of British folk especially, should one think, be a settled axiom."³⁸

In 1909, the *Journal of Tropical Medicine* considered clothing in detail for the first time, reflecting on the importance of location in the choice of what to wear in the tropical colonies. The editors of the journal attempted to settle debates by conducting a survey and published accounts of what was worn by both Europeans and locals throughout the tropical empire. In the special section devoted to tropical clothing, tropical practitioner George H. Fink stressed the importance of local variation, noting differences between "India, Burma, or Assam, where there are so many shades of difference in temperature while travelling from north and north-west to south or south-east, and where, on the same day you might see people wearing wool, silk, cotton, or linen as clothing or wraps."³⁹ Such an emphasis on local variation in relation to tropical clothing was not typical, as most manuals and guidebooks dealt with the "tropics" rather than individual locations within Africa, South and Southeast Asia, the West Indies, or South America. Instead of selecting clothing specifically for the Congo or Calcutta, a British traveler often purchased clothing sold for use in all tropical climates. According to Thomson, "The same rules which apply to India will be found of service in China, and the means of enjoying health on the West Coast of Africa will be equally beneficial in the worst parts of Panama."⁴⁰

When such generalizations are placed next to an increasing number of local reports, it becomes possible to understand why tropical clothing was subject to debate throughout the late nineteenth and early twentieth centuries. More Europeans were writing about their experiences in different tropical colonies with different climates and cultures, while a discourse was in place portraying a uniform tropical world. Acknowledging this problem, the editors of the *Journal of Tropical Medicine* noted that "a mistake frequently made is for the intending traveler to leave behind all warm clothing," a mistake made because the inexperienced consider it "unnecessary for countries popularly believed to be hot."⁴¹

37. Editors, 'Clothing in Tropical Countries: Questions Issued,' *J. Trop. Med.*, 1910, 13: 250–51, quotation on p. 250.

38. Editors, "Clothing in Tropical Countries" (n. 12), p. 136.

39. George H. Fink, "Clothing in the Tropics," *J. Trop. Med.*, 1910, 12: 328–32, quotation on p. 328.

40. Thomson, *The Preservation of Health in Tropical Climates* (n. 19), p. 4.

41. Editors, "Clothing in Tropical Countries" (n. 12), p. 136.

To remedy this, they suggested asking, "Is the climate equable? Is there a 'winter'? . . . Is the climate dry or moist . . . Is there a wet or dry season . . . What is the material used by native (a) labourers (b) well-to-do," and "What material is used by Europeans in hot weather (a) for underclothing (b) for coats and trousers?"⁴² When considering clothing in Rhodesia, modern-day Zimbabwe and Zambia, an unnamed writer reported that locals wore "bark-cloth or calico loin cloth" while Europeans donned "thin underwear of wool or wool and silk." In Bengal, physician A. G. Newell noticed, "Native labourers occasionally wear linen and cast-off European clothing. Europeans wear ordinary summer clothing as in England." Nurse Edith Billington, serving in the Upper Congo, informed her audience that "Native labourers wear cloth or prints, or calico. Well-to-do natives wear calico, drill, khaki, flannelette," while "Europeans for underclothing wear Pryce Jones' merino vests, with cholera belts, or instead silk-and-wool combinations."⁴³ Reports continued for various tropical locations, and in every instance, the dress of the local—laborer and well-to-do—was contrasted with that of the European. As these observations demonstrate, Europeans were not directly copying local practice but were using it as a guide for how they should dress in tropical climates. Although the dress of locals was not openly worn or advocated, the special section on tropical clothing in the *Journal of Tropical Medicine* shows how local practice and conditions were still looked to for inspiration.

The special section also reflects the growing knowledge of local climates and inhabitants in the tropical colonies and the difficulty in consolidating and differentiating it for readers in Britain. The editors of the *Journal of Tropical Medicine* conveyed this difficulty when they stated, "Here cotton seems in favour, there woollen garments are worn; linen and silk have their advocates," and "It must be confessed that even the most scientifically set forth descriptions of these qualities leaves us rather at sea . . . and still further are we confused when we try to apply the scientific finding to practical experience."⁴⁴ George M. Giles, a prominent tropical practitioner and climatologist, acknowledged that "The climates of the hotter parts of the world vary even more widely than those of the temperate zones, so that it is often impossible to offer suggestions applicable to all of them."⁴⁵ Despite such observations, and the recognition that the

42. Editors, "Clothing in Tropical Countries: Questions Issued," *J. Trop. Med.*, 1909, 12: 305-7, on p. 306.

43. *Ibid.*

44. Editors, "Clothing in the Tropics," *J. Trop. Med.*, 1909, 12: 304-5, quotation on p. 305.

45. George M. Giles, *Climate and Health in Hot Countries* (London: J. Bale Sons & Danielsson, 1904), p. v.

tropical colonies varied considerably, they were still often lumped together into one category: the tropics.

Part of the explanation for this, and for the confusion and controversy that arose over the best clothing material, lies in how clothing manufacturers went about selling their own brands of tropical clothing.⁴⁶ As shown in this section, reports from practitioners, administrators, missionaries, and other agents of empire attest to the extreme variations of climate in so-called tropical locations; however, their voices were often drowned out by powerful clothing manufacturers who helped maintain the image of a uniform and manageable tropical world by promoting their clothing for all tropical regions. Large clothing firms like Jaeger and Burberrys aggressively promoted their own brands of clothing “calculated to empty the fattest purse, and to tax to the utmost the available space for luggage” with research data and endorsements from medical and scientific professionals, as well as from state and military institutions.⁴⁷ Tropical clothing manufacturer Ellis & Johns, for instance, relied on testimony from Patrick Manson and the Colonial Office to sell their particular brand, which they touted as suitable for all of Britain’s tropical colonies.⁴⁸ Rather than deal with the considerable local variation, manufacturers took the profitable and sensible route by promoting their brands of tropical clothing as universally applicable. They were able to effectively accomplish this by taking advantage of medical and scientific authority and of an established Western discourse on tropical climates.

Solaro: A Fabric for Tropical Wear

By the early twentieth century, developments in parasitology and sanitary science had brought into further disrepute the idea that climate had a direct role in the production of tropical disease. Metropolitan and colonial physicians who earnestly believed in its importance often became the subject of ridicule.⁴⁹ Nonetheless, it is well known in the history of colonial and imperial medicine that climatic etiologies lingered despite these new developments and criticisms.⁵⁰ It is argued here that climatic

46. Tabloid brand medicine chests and the manner in which they were sold by Burroughs Wellcome & Co. provide another example of a commodity and its marketing contributing to a universalizing discourse of tropicality in relation to Britain’s tropical colonies. See Ryan Johnson, “Tabloid Brand Medicine Chests: Selling Health and Hygiene for the British Tropical Colonies,” *Sci. Cult.*, 2008, 17: 249–68.

47. Editors, “Clothing in Tropical Countries” (n. 12), p. 136.

48. Advertisement column, “Solaro,” *Climate*, 1905, 5: xviii.

49. Harrison, *Climates and Constitutions* (n. 4), pp. 204–14.

50. There is a rich body of literature whose authors have looked at the role of climate, race, and place in the history of colonial and imperial medicine. See Dane Kennedy,

theories were reinforced and maintained when tropical travelers continued to purchase elaborate outfits explicitly designed to protect them from the tropical heat and, later, the chemical rays of the sun.

In British scientific and medical circles throughout most of the nineteenth century the tropical climate was believed to manifest disease in two primary ways. The first was straightforward and considered the roles of sunlight, moisture, intense heat, seasonal changes, and fluctuations in temperature in causing disease—a climatic etiology. The second was more ambiguous. In a pathologization of space developed through a Manichean medical mapping of the world, tropical climates became associated with poor hygiene and sanitation, and climate was responsible for creating an environment that was intensely diseased.⁵¹ However, as public health

"Climatic Theories and Culture in Colonial Kenya and Rhodesia," *J. Imp. Commonw. Hist.*, 1981, 10: 50–66; Karen Ordahl Kupperman, "Fear of Hot Climates in the Anglo-American Colonial Experience," *William Mary Q.*, 1984, 41: 213–40; David Livingstone, "Human Acclimatization: Perspectives on a Contested Field of Enquiry in Science, Medicine, and Geography," *Hist. Sci.*, 1987, 15: 359–94; Dane Kennedy, "The Perils of the Midday Sun: Climatic Anxieties in the Colonial Tropics," in *Imperialism and the Natural World*, ed. John Mackenzie (Manchester: Manchester University Press, 1990), pp. 118–40; David N. Livingstone, "The Moral Discourse of Climate: Historical Considerations on Race, Place, and Virtue," *J. Hist. Geogr.*, 1991, 17: 413–34; Warwick Anderson, "Climates of Opinion: Acclimatization in Nineteenth-Century France and England," *Vic. Stud.*, 1992, 35: 135–37; David Livingstone, "Climate's Moral Economy: Science, Race, and Place in Post-Darwinian British and American Geography," in *Geography and Empire*, ed. Anne Godlewska and Neil Smith (Oxford: Blackwell, 1994), pp. 132–54; Judith T. Kenny, "Climate, Race, and Imperial Authority: The Symbolic Landscape of the British Hill Station in India," *Ann. Assoc. Am. Geogr.*, 1995, 85: 694–714; Harish Naraindas, "Poisons, Putrescence, and the Weather: A Genealogy of the Advent of Tropical Medicine," *Contrib. Indian Sociol.*, 1996, 30: 1–36; Dane Kennedy, "Climate and the Colonial Question," in *The Magic Mountains: Hill Stations and the British Raj* (Berkeley: University of California Press, 1996), pp. 19–38; Mark Harrison, "'The Tender Frame of Man': Disease, Climate, and Racial Difference in India and the West Indies, 1760–1860," *Bull. Hist. Med.*, 1996, 70: 68–93; Thomas Dunlap, "Remaking the Land: The Acclimatization Movement and Anglo Ideas of Nature," *Journal of World History*, 1997, 8: 303–19; Harrison, *Climates and Constitutions* (n. 4); David N. Livingstone, "Tropical Climate and Moral Hygiene: The Anatomy of a Victorian Debate," *Br. J. Hist. Sci.*, 1999, 32: 93–110; M. A. Osborne, "Acclimatizing the World: A History of the Paradigmatic Colonial Science," *Osiris*, 2000, 15: 135–51; David N. Livingstone, "Race, Space, and Moral Climatology: Notes Towards a Genealogy," *J. Hist. Geogr.*, 2002, 28: 159–80; Richard Eves, "Unsettling Settler Colonialism: Debates Over Climate and Colonization in New Guinea," *Ethn. Racial Stud.*, 2005, 28: 304–30; G. H. Endfield and D. J. Nash, "'Happy is the Bride the Rain Falls On': Climate, Health, and 'The Woman Question' in Nineteenth-Century Missionary Documentation," *Trans. Inst. Br. Geogr.*, 2005, 30: 368–86; and Eric T. Jennings, "Acclimatization, Climatology, and the Possibility of Empire," in *Curing the Colonizers: Hydrotherapy, Climatology, and French Colonial Spas* (Durham, N.C.: Duke University Press, 2006), pp. 8–39.

51. Naraindas, "Poisons, Putrescence, and the Weather" (n. 50).

measures and sanitary science improved throughout Europe and Britain, some physicians considered improving hygiene and sanitation, and the moral regulation of the individual, more important than guarding against the effects of a tropical climate.

Indexing appropriate moral and racial modes of behavior, tropical sojourners were advised to adhere to an intense regime of rules controlling diet, alcohol, clothing, sleep, and the “passions.” It was believed that if hygienic and sanitary precautions were taken, life could be satisfactorily maintained in the tropics—even, perhaps, maintained with a modicum of enjoyment. This did not imply, however, that Europeans could permanently inhabit tropical climates. Physicians still advised long furloughs back to temperate climates, and it was widely assumed that Europeans would inevitably degenerate after extended periods of residence in the “torrid zone.” Joseph Fayrer, president of the medical board at the India Office at the time, warned: “In hot climates . . . as a rule the European does at length become debilitated, and needs to change to a cooler climate which he should take, if he can, after five or six years.”⁵² Arguments influenced by polygenist theories of human origins and the belief in rigid, biologically inherited racial characteristics insisted that white Europeans were fundamentally different from tropical inhabitants and, therefore, could not successfully colonize and permanently inhabit tropical climates.

Toward the end of the nineteenth century, however, Fayrer’s outlook, and others like his derived from long residence in India and other tropical outposts, drew fire from metropolitan physicians who dismissed them as antiquated and unscientific. The primary locus of disease in the tropics had shifted from the environment to parasites and “native” bodies. These developments resulted in more optimistic attitudes among scientists and physicians regarding permanent European colonization of the tropics. The “new” tropical medicine reinvigorated the importance of hygiene and sanitation, and its followers argued that sustaining life and residence in the tropics was merely a matter of protecting against microscopic invaders.⁵³ Nonetheless, while elite medical and scientific consensus might have been moving away from theories of climate directly precipitating disease, climate was still considered a primary reason why tropical spaces could be so lethal. There was an easy transition from ideas about tropical environments creating miasmas to ideas about their becoming ideal

52. Joseph Fayrer, *On the Preservation of Health in India* (London: Macmillan, 1894), p. 25.

53. See Louis Westerna Sambon, “Acclimatization of Europeans in Tropical Lands,” *Geogr. J.*, 1898, 12: 589–99.

breeding grounds for mosquitoes and predisposing an Anglo-Saxon body to disease. In this case, as Harish Naraindas has argued, climate was at once exorcised and reinscribed.⁵⁴

Early historical accounts of the "new" tropical medicine are generally triumphant narratives of physicians and scientists overcoming and abolishing entrenched climatic theories, revealing microbes and parasites as the real culprits of tropical disease.⁵⁵ Recently, historians have acknowledged problems with this approach, showing how climatic etiologies did not simply fade away. Dane Kennedy, one of the first to approach the problem, has attributed the lingering of climatic etiologies to white European anxieties concerning the security of their health, culture, and social and economic privileges based on race, as well as the need for legitimizing programs of so-called development—primarily geared toward the comforts of white Europeans—in the tropical colonies.⁵⁶ Anna Crozier has argued that sensational accounts of the African environment might have contributed to the maintenance of climatic etiologies alongside new theories of parasites and insect vectors,⁵⁷ whereas David N. Livingstone has repeatedly pointed to the role climate played in creating and sustaining distinctions of race and place. He argues that a Victorian "moral hygiene" or "moral climatology" accounts for the continued importance of climate in theories of the production of tropical disease and acclimatization.⁵⁸

Livingstone has also hinted at the importance of clothing in relation to an "anticipative geography of the tropics," suggesting that the tropics were also "likely to have been shaped by a variety of material practices."⁵⁹ He briefly points to Sambon and the development of Solaro clothing as an example of how embodied practices revolving around health and hygiene in the tropics "ran counter to theoretical prescription."⁶⁰ The theoretical prescription, in this case, was the belief that microscopic organisms were

54. Naraindas, "Poisons, Putrescence, and the Weather" (n. 50), p. 31.

55. See Philip Manson-Bahr, *History of the School of Tropical Medicine in London, 1899–1949* (London: H. K. Lewis, 1956); Michael Gelfand, *Tropical Victory: An Account of the Influence of Medicine on the History of Southern Rhodesia, 1890–1923* (Cape Town: Rhodes Centenary Celebration Committee, 1953); H. Harold Scott, *A History of Tropical Medicine* (London: E. Arnold & Co., 1939).

56. Kennedy, "Perils of the Midday Sun" (n. 50), pp. 118–40.

57. Crozier, "Sensationalising Africa" (n. 9), pp. 393–415.

58. Livingstone, "Tropical Climate and Moral Hygiene" (n. 50), pp. 93–110; Livingstone, "Race, Space and Moral Climatology" (n. 50), pp. 159–80.

59. David N. Livingstone, "Tropical Hermeneutics and the Climatic Imagination," in *Science, Space, and Hermeneutics: Hettner-Lecture 2001*, ed. Hans Gebhardt and Peter Meusburger (Heidelberg: University of Heidelberg Press, 2002), pp. 43–73, quotation on p. 63.

60. Ibid.

the only cause of tropical disease. Therefore, at first glance, Sambon's role in developing clothing to prevent climatic disease appears to mark a reversal of his previous beliefs. I argue that rather than viewing Sambon's role in developing Solaro clothing as a reversal of his supposed steadfast belief in microbes as the sole agents of tropical disease, we should understand it as a *confessional* of long-held climatic concerns. Combined with Kennedy's assertion of the legitimization of supposed development programs, Crozier's notion of sensationalism, and Livingstone's concepts of moral hygiene or moral climatology, it is evident that the average traveler, along with the elite physician and scientist, interacted with a vast commodity culture that upheld climatic etiologies in practice.⁶¹

The color of tropical clothing prior to the early twentieth century was a relatively simple matter. According to tropical practitioner David Kerr Cross, "colour influences the absorption of heat, and it is well known that white garments absorb heat least of all."⁶² Lighter colors were known to absorb less heat, so it made sense to wear white rather than black clothing; however, as racial theories developed, questions arose over why inhabitants of tropical climates had darker skin in locations where heat was most intense. These questions were addressed most notably through the work of Charles Edward Woodruff, a brigade surgeon in the U.S. Army. In 1905, Woodruff published *The Effects of Tropical Light on White Men*, arguing that debilitating photochemical effects of the sun's rays—actinic rays—damaged the "nerve protoplasm" of "white" skin even if it were clothed in protective wool, or cotton. Woodruff devised a theory blending anthropology, biology, physics, and history, "managing to refine and renew the lingering concerns about the tropical climate in several important ways."⁶³ Woodruff's book was widely distributed and read but was not warmly received in British scientific and medical circles, where it was criticized for its overall lack of experimental data.⁶⁴

The theory of actinic radiation was not exclusive to Woodruff, and his version was considered unscientific compared with current research of

61. See Ryan Johnson, "Commodity Culture: Tropical Health and Hygiene in the British Empire," *Endeavour*, 2008, 32: 71–74.

62. David Kerr Cross, *Health in Africa: A Medical Handbook for European Travellers and Residents* (London: James Nesbitt & Co., 1897), p. 4.

63. Kennedy, "Perils of the Midday Sun" (n. 50), pp. 118–40, quotation on p. 122.

64. Tropical climatologist George M. Giles wrote a particularly scathing review of Woodruff's text in the *Journal of Tropical Medicine*. Giles wrote: "As a matter of fact, the work is one that hardly lends itself to review . . . What one looked to find, but which is entirely wanting in this book, is definite experimental investigation . . . let me express to Major Woodruff my regret in being unable to find myself in agreement with his conclusions." George M. Giles, "Book Review," *J. Trop. Med.*, 1905, 8: 268–69, quotation on p. 269.

the day. Nonetheless, Dane Kennedy maintains that Woodruff's work was a major factor in precipitating British production of tropical clothing in relation to actinic rays. Kennedy states, "Perhaps the most striking evidence that Woodruff's theory had achieved attention and respect came from Sambon, who announced in 1907 that he had developed a fabric composed of a weave of white and colored . . . thread which he dubbed 'Solaro'" and "whatever his motives (doubtless not solely a selfless spirit of scientific inquiry), Sambon's embrace of actinic theory represented a remarkable reversal of his previous declarations about the microbic origins of tropical ills."⁶⁵ Indeed, it appeared that Sambon had undergone a remarkable reversal, but closer investigation suggests that it was neither a reversal nor that remarkable. What was remarkable was his ability to keep secret his role in developing Solaro clothing well before the appearance of Woodruff's text and that he waited until 1907 to declare his involvement.

Sambon began designing Solaro after performing experiments with Edward C. C. Baly, a specialist in spectroscopy at University College, London. Sambon noted that "In examining the skin of dark-coloured races we found evidence of strong absorption by the pigment therein."⁶⁶ The experiments confirmed "the theory that pigmentation affords efficient and natural protection against the ultra-violet rays present in sunlight, especially in tropical regions."⁶⁷ Sambon did not acknowledge participating in these experiments or developing Solaro until February 1907, when he published an account in the *Journal of Tropical Medicine*. Deceptive as this was, production had occurred much earlier. An article devoted to the fabric and an advertisement by the manufacturer had appeared in the April 1905 edition of the journal *Climate*. The article described how Solaro provided protection from the chemical rays of the sun, and the advertisement displayed a testimonial to its effectiveness written by Patrick Manson dated September 1904.⁶⁸

The article declared, "We now direct attention to an entirely new form of woollen material which has been introduced by Messrs. Ellis & Johns, at the suggestion of a medical man who is well known in connection with tropical medicine. This material has been designed in order to protect the body from the actinic rays of the sun."⁶⁹ Most of Baly's own publications

65. Kennedy, "Perils of the Midday Sun" (n. 50), pp. 118–40, quotation on p. 123.

66. Louis Westerna Sambon, "Tropical Clothing," *J. Trop. Med.*, 1907, 10: 67–69, quotation on p. 68.

67. *Ibid.*

68. Advertisement column, "Solaro" (n. 48), p. xviii.

69. Charles F. Harford-Battersby, "A New Form of Tropical Clothing," *Climate*, 1905, 5: 260–61.

on the ultraviolet spectrum appeared between 1904 and 1905, suggesting that Sambon had approached him sometime before this period.⁷⁰ And by early 1905, Solaro advertisements were already promising protection from the chemical rays of the sun, with contracts for the purchase of Solaro “sealed at the Colonial Office for all officers.”⁷¹ In 1907, Sambon might have been prompted to reveal his role in developing Solaro to help bolster its acceptance. He probably came forward because actinic theory—not Woodruff’s version of it—had attained a measure of acceptance in elite scientific and medical circles, and his endorsement would have helped maintain its legitimacy in Britain. With Woodruff as an unlikely candidate, Sambon’s inspiration for Solaro probably derived from the work of a German scientist.⁷²

In 1900, the *Journal of Tropical Medicine* published a paper titled, “On the Action of Light Upon the Human Body in Relation to Dress” by German Jos Ritter von Schmaedel. It was first presented to the Anthropological Society of Munich in July 1900 and considered the chemical action of light and its prolonged effect on “white” skin. Schmaedel, “Basing his opinion on his wide photo-chemical experience,” argued that, “If the amount of the chemical action of light is too great or too long continued a disturbance of balance sets in, which may at length, if too great, jeopardises the existence of the organism.”⁷³ Schmaedel acknowledged that his theory “had yet been sufficiently investigated,” but he felt that nature had provided his speculations with enough proof: “In any case it is a matter of fact that the white man who proceeds to the Tropics suffers greatly from the intensity of the sunlight, and that he is not in a condition to live there continuously unharmed.”⁷⁴ According to the paper in the *Journal of Tropical Medicine*, Schmaedel had been developing his argument since at least 1887, when he had read another paper in Munich, “Why are Negroes Black?,” in which he pointed to the “remarkable fact” that “those races which inhabit zones in which the intensity of the light is exceedingly great, are all provided with a pigment in their skins, which, in consequence of

70. F. G. Donnan, “Edward Charles Cyril Baly, 1871–1948,” *Obituary Notices of the Fellows of the Royal Society*, 1948, 6: 6–21.

71. Advertisement column, “Solaro” (n. 48), p. xviii.

72. Sambon could have also derived inspiration from the work of British army officer Francis N. Maude; however, it is likely that Maude was also aware of work on actinic radiation deriving from the German context and used this as the basis for his own work on tropical clothing. See Andrew Duncan, “The Prophylaxis of Sunstroke,” *J. Trop. Med.*, 1902, 5: 321–22; and Duncan, “The Actinic Theory of Sunstroke,” *J. Trop. Med.*, 1907, 10: 83.

73. Jos Ritter von Schmaedel, “On the Action of Light Upon the Human Body in Relation to Dress,” trans. R. W. Felkin, *J. Trop. Med.*, 1900, 3: 31–33, quotation on p. 31.

74. *Ibid.*, p. 32.

its colour, acts . . . as an exceedingly effective protection to a too great penetration of the active chemical light waves."⁷⁵

Continuing his thesis in 1900, he went into greater detail on the role of pigmentation, concluding, "Nature acts exactly like the photographer when he seeks to protect his sensitive plates from the chemical action of the light. She surrounds the organism with a kind of dark room in order to paralyse too great an action of light."⁷⁶ In relation to this example, Schmaedel directed attention to the problem of current European clothing in tropical climates. "A white man who wears in the Tropics light white or blue clothes, has the advantage by their means of reflecting the heat rays, but he exposes himself to the full force of the chemical rays of light, which can pass completely through, and his health will be in a relatively short time highly endangered, as he has no sufficient protection in the pigments of his skin"; therefore, "the white races should construct a system of dress with the definite object of protecting the organism from the injurious influences, as mentioned above," a system whose outer surface is "of a single plain colour or mixed colour . . . which would reflect the heat-light waves, whereas the inner surface should consist of a single or mixed or broché colour which would neutralise the chemically active light waves."⁷⁷ According to Schmaedel, adopting such a method would place white Europeans on "an even footing" with "the natives who are protected by the pigment in their skins from the strong and injurious attacks of the tropical sun."⁷⁸ With the partitioning of Africa recently concluded, Schmaedel insisted that "Nothing more need be said as to the importance of this in the exploration, civilisation, and ruling of tropical countries."⁷⁹

Declaring an earnest belief in the harmful effects of actinic radiation, Schmaedel took out a patent in Germany "*not* with a view of making money" but to ensure that a complete tropical outfit would be made correctly.⁸⁰ When Sambon approached Baly to work on the development of Solaro clothing, he was probably aware of Schmaedel's work and his patented clothing. Using a similar reference to photography in 1907, Sambon noted:

Now that we know that the noxious element of the tropical sun is the actinic light, and Nature has protected the native by means of a colour-screen analogous to that which is used by photographers for the preservation of their

75. Ibid.

76. Ibid.

77. Ibid.

78. Ibid., p. 33.

79. Ibid.

80. Ibid (*italics in original*).

sensitised plates, the white man should be able to adjust himself to the meteorological conditions of the Tropics almost as perfectly as the native . . . With this object in view, I endeavoured to produce a fabric composed of white and black, white and red, or white and orange threads woven in such a way as to present a wrap or upper surface of white colour and a weft or under surface of black, red or orange.⁸¹

Chemical rays of the sun were now considered alongside heat, humidity, and chills, reinvigorating debate among physicians and scientists over the role of climate in tropical disease. Sambon's involvement in this climatic renaissance appears especially paradoxical, because he was known for attacking any form of climatic etiology. For instance, in 1898, Sambon declared:

Those who believe that the heat of the tropics is noxious to Europeans, uphold their contention by stating that it induces disease, and they mention anaemia, hepatitis, and sunstroke. At one time, undoubtedly, these diseases were attributed to the direct and sole agency of solar heat . . . now they have been inscribed deeply on the tablets of bacteriology, and certainly the demonstration that disease belongs to the domain of parasitism is the greatest advance that medical science had ever made.⁸²

The fact that Sambon had allied himself so closely with microbic theories explaining most, if not all, tropical diseases—he even put forward a microbic theory of heatstroke—probably explains his delay in publicly declaring his involvement in developing Solaro as well as why the article in *Climate* referred to him simply as a medical man who was well known in connection with tropical medicine.

Sambon expressed his opposition to climatic theories at a time when the London School of Tropical Medicine and the *Journal of Tropical Medicine* were newly established. Both were grounded in parasitology and microbiology, and with a significant professional and economic stake in their success, his support and motives were obvious.

By 1907, the journal and school had achieved a measure of respect and control over the discipline of tropical medicine in Britain, and once the idea of chemical rays held a degree of scientific integrity, Sambon and the *Journal of Tropical Medicine* acknowledged the possibility that climate directly caused some tropical disease. Sambon might have been reluctant in the early days of the school and journal to compromise his position, but, like most tropical travelers, he adhered to rules and regimen in practice that demonstrated beliefs in climatic disease. In his professional discourse,

81. Sambon, "Tropical Clothing" (n. 66), p. 68.

82. Sambon, "Acclimatization of Europeans in Tropical Lands" (n. 53), p. 590.

he might have denied or discounted climatic theories, but photographs from his own travels show that he was just as quick to don specialized clothing.⁸³ Therefore, rather than seeing Sambon's involvement with Solaro as a remarkable reversal, we should think of it as confessional. Beyond simple financial motivation, engagement with a commodity culture in which beliefs in the deadly effects of a tropical climate were upheld in practice explains why Sambon and the *Journal of Tropical Medicine* would design and promote Solaro clothing.

In the end, despite the praise and endorsement it received in Britain, Solaro clothing was ultimately shown to be ineffective. James M. Phelan, an American physician in the Philippines, conducted experiments on five hundred U.S. soldiers who wore the clothing and showed that it did nothing to improve health; in fact, as Warwick Anderson points out, Solaro was extremely uncomfortable and probably detrimental to health.⁸⁴ Nonetheless, despite Solaro's and similar clothing's uselessness in tropical climates, Sambon's role in the development of such clothing further demonstrates that there was no simple transition from disease theories advocating the direct impact of the climate to those advocating the impact of parasites and other microbes.

Tropical Clothing and Colonial Identity

When writing about European clothing worn in the tropical colonies, historians have generally argued that it served the purpose of maintaining strict separations between colonizer and colonized—identifying and legitimating the rule of a few over many. Writing on the importance of dress in relation to British colonial identity, Helen Callaway has considered its symbolism in the exercise of imperial domination, arguing that "Dress became a visual marker for distinctions of race, gender, and social rank."⁸⁵ Callaway maintains that the "servants of empire" were more self-conscious of their identity as colonial citizens than they were of their identity as metropolitan citizens, explaining their strict adoption of formal dress "with only a few modifications to meet the threat of the sun and the onslaught of mosquitoes."⁸⁶ Although such arguments are valuable, they

83. See D. C. Rees, "A Holiday in the Mosquito-Proof House in the Roman Campagna," *J. Trop. Med.*, 1900, 3: 62–63.

84. Anderson, *The Cultivation of Whiteness* (n. 5), p. 153.

85. Helen Callaway, "Dressing for Dinner in the Bush: Rituals of Self Definition and British Imperial Authority," in *Dress and Gender: Making and Meaning in Cultural Contexts*, ed. Ruth Barnes and Joanne B. Eicher (New York: Berg, 1993), pp. 232–47, quotation on p. 233.

86. *Ibid.*, p. 243.

underestimate the practical concerns of these servants of empire and the importance they ascribed to clothing for the supposed preservation of their health. Like much of the outfit associated with the preservation of white European health in tropical climates, clothing provided material form to the rules and belief patterns of those who purchased and used it. As noted above, it was one of the first considerations taken before embarking on a long ocean-liner journey and was believed to be a primary tool in the maintenance of health. According to the editors of the *Journal of Tropical Medicine*, "The question of the clothing best suited to the white man in tropical regions is one of great importance as regards healthiness, comfort, and efficiency."⁸⁷

Elizabeth Collingham has addressed this preoccupation with tropical clothing in India, showing how it "highlighted the vulnerability of the European and in doing so constructed the Anglo-Indian's body as an occidental body which was perceived to be highly sensitive to a non-temperate climate and in need of a host of protective mechanisms."⁸⁸ Collingham argues that tropical clothing reminded the British of the vulnerability of their bodies but instilled in them a sense of intellectual superiority. Racial theories in the late Victorian period provided the framework for developing shirts, jackets, and undergarments based on "black" skin but tailored to remind the British of their role as supposed rulers and authority figures.⁸⁹ Tropical clothing did, in many ways, provide a sense of superiority over "othered" local inhabitants; however, this one-dimensional portrayal of tropical attire neglects the fact that British travelers wearing such clothing became tropical and colonial "others" in the process.

Furthermore, Collingham states that in India, "the adoption of signifiers of Britishness and the medical occidentalization of the Anglo-Indian, combined to draw in the boundaries which marked the extent of Indian influence on the Anglo-Indian body and, as a result, a web of Britishness was woven around the body."⁹⁰ While in many ways tropical clothing was a signifier of Britishness "woven" around the body, it was not the stereotypical Britishness of the late Victorian period, and although at first glance it would appear that boundaries were being built around a British body, they do not appear as complete as Collingham suggests. Tropical cloth-

87. Editors, "Clothing in the Tropics" (n. 12), p. 136.

88. Elizabeth M. Collingham, *Imperial Bodies: The Physical Experience of the Raj 1800–1947* (Oxford: Polity Press, 2001), p. 91.

89. See George W. Stocking, Jr., *Victorian Anthropology* (London: The Free Press, 1987); and Henrika Kuklick, *The Savage Within: The History of British Social Anthropology 1885–1945* (Cambridge: Cambridge University Press, 1991).

90. Collingham, *Imperial Bodies* (n. 88), p. 92.

ing set the British apart from locals in some respects, but it also separated them from their own locality. Woven into the fabric of tropical clothing were signifiers that reveal ongoing processes of interaction between white Europeans, local peoples, and practice.

It must not be implied that sportsmen, explorers, missionaries, administrators, and other British travelers believed that they were "going native" while wearing tropical clothing designed to mimic "black" skin. They acknowledged the biological inferiority of their bodies in tropical climates and believed that their intellectual superiority was proven by their ability to manufacture the protection that had been given by nature. The primary goal of tropical clothing was to prevent climatic disease, degeneration, and reversion to a state of "savagery" while at the same time conferring certain attributes of the "savage." Such a paradox played out on the body unmasks the close connections that still existed between colonizers and colonized, rather than a growing divide between the two. Local people and practice were still informing ideas of health and hygiene in significant ways, but they were easily downplayed as unimportant after such observations had been recast through Western science and medicine. Nonetheless, wearing clothing imbued with qualities inherent in local peoples reminded white Europeans that they were no longer the same men and women they had been when adorned in everyday clothing in Britain. As Christopher Breward has argued, in contrast with clothing worn by the city clerk in London, it provided "glimpses of a colonial other-life."⁹¹

The glimpses tropical clothing provided were often framed around adventure and danger as well as life far from the safe and "civil" surroundings of metropolitan Britain. Crozier has argued that the "appearance of sensationalism in health advice for Africa was intimately connected to the presentation of (masculine) heroism"; tropical clothing was often an explicit signifier of this.⁹² Burberrys, for instance, produced several metropolitan advertisements that portrayed masculine scenes of exploration and life in tropical landscapes (Figure 1). In contrast with the "natives" naturalized as laborers in the advertisement, the white European men are engaged in masculine "colonial" activities and poses.⁹³ Also demonstrating

91. Christopher Breward, "Sartorial Spectacle: Clothing and Masculine Identities in the Imperial City, 1860–1914," in *Imperial Cities: Landscape, Display, and Identity*, ed. Felix Driver and David Gilbert (Manchester: Manchester University Press, 1999), pp. 238–53, quotation on p. 250.

92. Anna Crozier, "Sensationalising Africa" (n. 9), p. 395.

93. Anandi Ramamurthy has demonstrated that in many late Victorian and early Edwardian advertisements for such goods as coffee, soap, sugar, and tea, "black people were naturalized as laborers for the white man. To show the black man or even black child working was

BURBERRYS
 WEATHERPROOFS
 SELF-VENTILATING and HEALTHFUL.
 THE ONLY SAFE WEAR FOR TROPICAL CLIMES

Write for Patterns and Catalogue.

PONCHO
 TENT

VELDT COAT.

BURBERRY-PROOFS are worn at home and in every part of the world in place of ordinary clothing, and supplant mackintosh as a sure protection from mist, snow, sleet, and rain.

BURBERRYS "Gabardine Coat and Riding Breeches will generally outlast three of other and perhaps more expensive material."

SLIP-ON, the finest Colonists' Over Garment extant.

30, 31, HAYMARKET, LONDON, and BASINGSTOKE.

Figure 1. Burberrys' gabardine clothing: "The Only Safe Wear for Tropical Climes." Source: Advertisement column, *Climate*, 1905, 5: xv. Reprinted with permission of Burberrys.

this stress on the heroic and masculine is John Murray's advice on tropical clothing in his 1895 popular treatise, *How to Live in Tropical Africa*.

not seen as a symbol of exploitation, since it 'appeared' to be their 'natural' place." Anandi Ramamurthy, *Imperial Persuaders: Images of Africa and Asia in British Advertising* (Manchester: Manchester University Press, 2003), p. 19. For a discussion of colonial masculinity, see Mrinalini Sinha, *Colonial Masculinity: The "Manly Englishman" and the "Effeminate Bengali" in the Late Nineteenth Century* (Manchester: Manchester University Press, 1995); Graham Dawson, *Soldier Heroes: British Adventure, Empire, and the Imagining of Masculinities* (London: Routledge, 1994); and Catherine Hall, *White, Male, and Middle Class: Explorations in Feminism and History* (London: Routledge, 1992).

Figure 2. S. W. Silver & Co., "Typical Explorer's Suit." Source: John Murray, *How to Live in Tropical Africa: A Guide to Tropical Hygiene and Sanitation* (London: The African World, 1895), p. 223. Reprinted with permission of S. W. Silver & Co.

Murray suggested beginning with a tropical suit inspired by the infamous explorer Henry Morton Stanley. The suit, "with his [Stanley's] accustomed sagacity, grasps the essentials of proper tropical clothing: lightness, looseness, securing ventilation; thinness, securing porousness of fabric; protection of head, loins, abdomen, lower abdominal organs, and nerves."⁹⁴ The smock-frock type suit, with pith helmet, woolen knickerbockers, and colonial leather waist belt—for carrying ammunition and weapons—portrayed the ideal British explorer inspired by the image of the tropical soldier; "if a man can wear flannel at all with comfort . . . this suit of Stanley's is excellent . . . smart, becoming and soldierly"⁹⁵ (Figure 2). As the advertisement for Silver & Co.'s "typical explorer's suit" demonstrates, tropical clothing for men was modeled after the colonial soldier and explorer, helping to construct an identity that was vastly different from when it was located inside the aggressively defended boundaries of metropolitan Britain. Further reinforcing the identity of British men as

94. John Murray, *How to Live in Tropical Africa: A Guide to Tropical Hygiene and Sanitation* (London: The African World, 1895), p. 221.

95. *Ibid.*, p. 223.

masculine colonial adventurers and explorers was the manner in which women's tropical clothing was discussed in contrast.

Alison Blunt, in her fascinating study of Mary Kingsley's travels in West Africa, notes how guidebooks and "hints to travelers" for women often placed an "emphasis on appearance and the responsibility for packing necessities from home."⁹⁶ One of the few guidebooks devoted solely to advice for women in the tropics was S. Leigh Hunt's and Alexander Kenny's *Tropical Trials: A Handbook for Women in the Tropics*. Before considering appropriate tropical attire, Hunt and Kenny cautioned their readers that "Many and varied are the difficulties which beset a woman, when she first exchanges her European home and its surroundings for the vicissitudes of life in the tropics."⁹⁷ Although she was supposedly surrounded by danger in the tropics, a woman still had to consider "the probability of . . . having to go much into society."⁹⁸ Therefore, they advised women to take "*a most liberal supply* of tulle, net, lace, ruffles, frillings, white and coloured collars and cuffs, artificial flowers, ribbons, and all the little 'et ceteras.'"⁹⁹ In terms of dress, they suggested that "For morning and hot weather, you should take a good supply of pretty and fashionably made washing prints, cottons, sateen's, &c."¹⁰⁰ Overall, Hunt and Kenny advised that "except in the matter of material, women wear pretty much what they wear at home."¹⁰¹ This was the case because, unlike men, "There are but few occasions when it is really necessary for women to expose themselves to the influence of a tropical sun."¹⁰²

Women's clothing was composed of the same material as men's and had the same function in the supposed preservation of health; however, sartorially it was exactly the same as metropolitan dress at any time of the day. Women's tropical attire, therefore, relegated them to the domestic sphere. As Hunt and Kenny's manual suggests, women were expected to create tropical domestic spaces that resembled home—themselves included—for their conquering heroes returning from the deadly tropical environment. However, the degree to which women adhered to these roles and expectations is a matter of debate. While many women—such

96. Alison Blunt, *Travel, Gender, and Imperialism: Mary Kingsley and West Africa* (London: Guilford Press, 1994), p. 68.

97. S. Leigh Hunt and Alexander S. Kenny, *Tropical Trials: A Handbook for Women in the Tropics* (London: W. H. Allen & Co., 1883), p. 1.

98. *Ibid.*, p. 9.

99. *Ibid.*, p. 18 (*italics in original*).

100. *Ibid.*, p. 10.

101. *Ibid.*

102. *Ibid.*, p. 14.

as Mary Kingsley herself—maintained strict codes of dress that adhered to metropolitan standards, others were just as quick to shed their confining and uncomfortable clothing or to don more masculine attire. And, although women were, in some cases, bound to the domestic arena, they were also just as active outside the home, traveling, working, and documenting the tropical landscape extensively.¹⁰³ As Durba Ghosh states, "Histories of European women in the colonies have complicated conventional understandings of white women as powerless, sheltered, and lazy, by showing that white women contributed necessary labour—domestic, moral, educational, and medical—to imperial enterprises."¹⁰⁴

Despite obvious sartorial differences, women's clothing, like men's, still conveyed as much a sense of otherness as it did sameness with metropolitan Britain. Through tropical clothing's material composition and the role this material was thought to play in the preservation of white European health, British men and women believed that they were protected in the same manner in which "black" skin protected local inhabitants. "Black" skin, the very characteristic that most obviously marked difference between colonizers and colonized and which was a source of so much racist commentary in the late nineteenth and early twentieth centuries, was also the very quality that British men and women sought to imitate while living in the tropical colonies.

The image of the stiff colonial administrator, always clad in irritating and uncomfortable woolen garments, striving for some semblance of life back home is an archaic and inaccurate portrayal of the British in tropical climates. Instead of simply reinforcing values and roles associated with metropolitan Britain during the late Victorian and early Edwardian period, tropical attire provided an identity intimately linked to tropical places and people. Covered in cloth mimicking the qualities of "black" skin, British travelers believed that they were partially adapted to the landscape they were trying to "civilize" and dominate. While wearing such clothing, the British were more than displaced and vulnerable occidental others trying desperately to bolster and fix their race, class, and Britishness. Their clothing, whether sartorially or at the level of material, identified them as adventurers, explorers, and pioneers, changing with

103. See Helen Callaway, *Gender, Culture, and Empire: European Women in Colonial Nigeria* (Urbana: University of Illinois Press, 1987); Margaret Strobel and Nupur Chaudhuri, eds., *Western Women and Imperialism: Complicity and Resistance* (Bloomington: Indiana University Press, 1992); and Mary Procida, *Married to the Empire: Gender, Politics, and Imperialism in India, 1883–1947* (Manchester: University of Manchester Press, 2002).

104. Durba Ghosh, "Gender and Colonialism: Expansion or Marginalization," *Hist. J.*, 2004, 47: 737–55, quotation on p. 739.

their new environments and, through Western ingenuity, acquiring those qualities of local men and women that would supposedly keep them alive. For them, successful tropical colonization depended on the mind and spirit of Britain, wrapped in the skin of the “tropics.”

RYAN JOHNSON recently completed his Ph.D. at the University of Oxford, Wellcome Unit for the History of Medicine, 45–47 Banbury Road, Oxford, OX2 6PE, United Kingdom (e-mail: ryan.johnson@sant.ox.ac.uk). In his thesis, “Networks of Imperial Tropical Medicine: Ideas and Practices of Health and Hygiene in the British Empire, 1895–1914,” he argues for the importance of bringing back the “imperial” to the study of medicine in colonial localities. He demonstrates that what was most “imperial” about tropical medicine during this period was not its practice, but the hopes and aspirations embedded within it. Along with tropical clothing, he has published on other aspects of commodity culture and imperial tropical medicine, including Burroughs Wellcome & Co. Tabloid brand medicine chests and the 1900 London Livingstone Exhibition.