Defying Colonialism, Conquering Yellow Fever: The Partnership of American and Cuban Physicians in the War Against Yellow Fever, 1878-1901

I. Introduction

In late September 1900, an American physician and researcher lay dying in Camp Colombia on the outskirts of Havana surrounded by Cuban and American doctors. The experience of dying from yellow fever was not a pleasant one.[1] Acute cases of yellow fever began with a pounding headache and muscle pains, and patients often prayed that the symptoms were simply due to heat or dehydration. Next, came a raging fever, with temperatures as high as 105 F, often accompanied with a loss of consciousness. Subsequent stages included jaundice which reflected widespread organ failure; at which point, a patient could still hope for a full recovery. Finally, the most distinct sign of yellow fever, the patient vomited black coagulated blood (for which the Spanish derived their name for the disease *el vomito negro*). For Jesse Lazear, a spry thirty-four years of age, onset of fever symptoms was swift, and he quickly became delirious, experiencing convulsions—he was dead within twelve days of exposure.[2] As his colleague Dr. James Carroll said of Lazear's death, "such is yellow fever."[3] However, Lazear was unlike most other yellow fever victims—he intentionally infected himself with the disease.

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[1] For the experience of yellow fever, see Molly Caldwell Crosby, *The American Plague: The Untold Story of Yellow Fever, the Epidemic That Shaped Our History* (New York: Berkley Books, 2006), 4–5; Jonathan Leonard, "Carlos Finlay's Life and the Death of Yellow Jack," *Bulletin of the Pan American Health Organization* 23, no. 4 (1989): 438; Gerald N. Grob, *The Deadly Truth: A History of Disease in America* (Cambridge, MA: Harvard University Press, 2002), 75; Kathryn Olivarius, *Necropolis: Disease, Power, and Capitalism in the Cotton Kingdom* (Cambridge: Belknap Press: An Imprint of Harvard University Press, 2022), 4–5; Howard A. Kelly, *Walter Reed and Yellow Fever* (New York: McClure, Phillips, 1907), 82; Mariola Espinosa, *Epidemic Invasions: Yellow Fever and the Limits of Cuban Independence, 1878-1930* (Chicago: University of Chicago Press, 2009), 2.

[2] "Finds Cause of Yellow Fever: Dr. Walter Reed, U. S. A., Gives Result of Careful Study Made in Cuba," *Chicago Daily Tribune*, October 28, 1900.

[3] James Carroll, "A Brief Review of the Etiology of Yellow Fever," New York Medical Journal, February 6, 1904, quoted in John C. (John Conrad). Hemmeter, *Master Minds in Medicine; An Analysis of Human Genius as the Instrument in the Evolution of Great Constructive Ideas in the History of Medicine, Together with a System of Historic Methodology* (New York: Medical Life Press, 1927), 305.

This essay examines the collaboration of both Cuban and American physicians in the face of imperial efforts. In doing so, it builds on and challenges traditional constructions of power in the rich historiography of American colonialist intervention in Cuba. In the late nineteenth century, as germ theory took hold, eradication of deadly infectious disease seemed within reach. Yellow fever, however, remained a mystery and continued to plague communities. Out of this context emerged a U.S. military and government-backed campaign to identify and eliminate yellow fever. Unsurprisingly, the United States government turned to Cuba, where the disease was endemic, instructing the Yellow Fever Commission to work there.[4] By the late nineteenth century, yellow fever was overwhelmingly seen as "a product of Cuba, Mexico, and other tropical countries."[5] By proxy identifying and eliminating yellow fever in Cuba guaranteed safety for the United States. The ultimate success of the commission was due in part to the foundation of yellow fever research already being conducted in Cuba by Cuban physicians.

The race to identify yellow fever etiology was an incredibly collaborative project with key doctors from both Cuba and the United States playing important roles. However, the wider colonial projects of the Spanish-American War (1898) and later the American occupation of Cuba (1898-1902) have largely influenced the historiography of turn-of-the-century yellow fever research. Even within the Yellow Fever Commission, the presence of the U.S. military as a driving force makes it convenient to characterize the entire project as imperialistic. Despite these colonial underpinnings, Cuban and American doctors largely viewed each other as equals and collaborated to identify yellow fever etiology and eradicate the pestilence. There was

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[4] The earliest documented cases of yellow fever in Cuba came in 1620; Vincent J. Cirillo, *Bullets and Bacilli: The Spanish-American War and Military Medicine* (New Brunswick: Rutgers University Press, 2004), 91; John R. Pierce and Jim Writer, *Yellow Jack: How Yellow Fever Ravaged America and Walter Reed Discovered Its Deadly Secrets* (Hoboken, NJ: J. Wiley, 2005), 14.

[5] Margaret Humphreys, *Yellow Fever and the South* (Baltimore: Johns Hopkins University Press, 1992), 12; John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990), 164.

undoubtedly colonialism at play in the U.S. occupation of Cuba and the yellow fever research that followed. This essay questions historiographic understandings of U.S.-Cuban power dynamics by suggesting that yellow fever research and later eradication efforts were not simply a colonial project by the United States to assert scientific dominance over Cuba. Rather they were a uniquely cooperative and successful example of transnational public health.

II. Historiography

Lazear's experiments as a member of the Yellow Fever Commission captured the attention of contemporary historians and have continued to entice scholars since. Although few have written about the contrasting collaboration of the yellow fever research team and the American imperial presence in Cuba, my argument draws on a rich historiography documenting the intersection of colonialism and public health. In her book *Imperial Hygiene: A Critical History of Colonialism, Nationalism, and Public Health*, Alison Bashford situates public health at the center of nationalism, arguing that it served as a form of governance for colonial powers.[6] Scholars like Mariola Espinosa and Alexandra Stern have agreed with Bashford and expanded on her work by highlighting the link between imperialism and health. Espinosa argues compellingly that the United States invaded Cuba in part on the grounds of what she calls "colonial public health," a process by which the economic and social interests of the colonizer are protected often through sanitary measures.[7] Stern claims that yellow fever research in Cuba not only "coincided" with but was driven by what she deemed American "colonial and imperial projects" to assert domination in Latin America.[8] Bashford, Espinosa, and Stern have all influenced this

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[6] Alison Bashford, *Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health* (Basingstoke: Palgrave Macmillan, 2014).

[7] Espinosa, *Epidemic Invasions*, 5.

[8] Alexandra Minna Stern, "Yellow Fever Crusade: US Colonialism, Tropical Medicine, and the International Politics of Mosquito Control, 1900–1920," in *Medicine at the Border: Disease, Globalization and Security, 1850 to the Present*, ed. Alison Bashford (London: Palgrave Macmillan UK, 2007), 41, 43.

conceptualization of the American imperial presence in Cuba and its public health incitement. In John Mckiernan-González's recent book about health at the U.S.-Mexico border, he explores how American public health measures at border crossings were enforced by U.S. military units—a parallel to the army's involvement in yellow fever abatement.[9] Mckiernan-González's monograph highlights the centrality of the U.S. army to both colonial and public health endeavors. This work also augments the scholarship of historians like Steven Palmer who highlight the cooperation between American colonial institutions and local physicians; in the case of Palmer, collaboration between the Rockefeller Foundation and Costa Rican doctors.[10] Ultimately, my focus on the cooperation between Cuban and American physicians despite the U.S. military presence fills a gap in the existing historiography while simultaneously building on the relevant work of other scholars.

III. Yellow Fever Panic in the U.S. South

Yellow fever was commonplace in the American South by the late nineteenth century. In 1853, a yellow fever outbreak killed roughly ten percent of the New Orleans population, decimating the city.[11] Despite being the worst epidemic in the city's history, yellow fever was, as Jo Ann Carrigan, a historian of public health, has written, "an almost annual summer visitor" for much of the nineteenth century.[12] Various attempts to identify yellow fever death rates have found vastly different results, ranging from a twenty percent mortality rate to a fifty-five percent

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[9] John Mckiernan-González, *Fevered Measures: Public Health and Race at the Texas-Mexico Border, 1848–1942* (Durham: Duke University Press, 2012).
[10] Steven Palmer, *From Popular Medicine to Medical Populism: Doctors, Healers, and Public Power in Costa Rica, 1800–1940* (Duke University Press Books, 2003).
[11] John Duffy, *Sword of Pestilence; the New Orleans Yellow Fever Epidemic of 1853.* (Baton Rouge: Louisiana State Univ. Press, 1966), 172.
[12] Jo Ann Carrigan, "Impact of Epidemic Yellow Fever on Life in Louisiana," *Louisiana History: The Journal of the Louisiana Historical Association* 4, no. 1 (1963): 5.

mortality rate.[13] Regardless, the disease killed and was dreaded across the American South. In addition to claiming lives, yellow fever generated panic in Southerners and effectively crippled the economy. Historian Kathryn Olivarius describes the eerie prelude to the annual yellow fever exodus from cities like New Orleans: "It was disquieting that everyone in [the] congregation renewed their baptismal vows and embraced at the end of the service as if for the last time."[14] Olivarius's description suggests that American Southerners reflected on their own mortality in the face of yellow fever and found it necessary to flee the region if they were able to avoid the disease. This mass exodus coupled with labor diverted towards caring for the sick and burying the dead meant that the 1878 yellow fever epidemic may have cost New Orleans alone one hundred million dollars.[15] Espinosa outlines this impact succinctly, writing that "yellow fever had to be understood in order for the U.S. South to prosper."[16] Thus, yellow fever fundamentally reshaped social and economic life when it arrived in the American South, and its eradication became a project of national interest.

In 1878, a particularly deadly epidemic swept the South and reinvigorated American desires to eradicate the disease. Roughly twenty thousand people died in the span of a few months in the American South alone, with six times that number being infected.[17] Following the 1878 epidemic, politicians, newspapers, medical professionals, and the general public began urging American congressional action to meaningfully respond to the pestilence.[18] In response,

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[13] Sheldon Watts, *Epidemics and History: Disease, Power and Imperialism*, 1st edition (New Haven: Yale University Press, 1999), 213.
[14] Olivarius, *Necropolis*, 2.
[15] Carrigan, "Impact of Epidemic Yellow Fever on Life in Louisiana," 11; Hemmeter, *Master Minds in Medicine*, 298–99.
[16] Espinosa, *Epidemic Invasions*, 15.
[17] Edward J. Blum, "The Crucible of Disease: Trauma, Memory, and National Reconciliation during the Yellow Fever Epidemic of 1878," *The Journal of Southern History* 69, no. 4 (2003): 792.
[18] Duffy, *The Sanitarians*, 156.

Congress authorized the nascent American Public Health Association and the short-lived National Board of Health to convene an investigatory commission in 1879.[19] The commission found little consensus on etiology and ultimately agreed that the only reliable method for preventing disease was through quarantine—an unpopular practice at the time.[20] Interestingly, even this early board was transnational, with both American and Cuban physicians cooperating to address the scourge of yellow fever. Following the 1878 epidemic, Congress initiated research on the disease, marking the beginning of nearly two decades of legislative and military action to eradicate yellow fever.

IV. Germ Theory and New Yellow Fever Speculation

The years following the 1878 yellow fever epidemic were marked by the widespread embrace of Louis Pasteur and Robert Koch's germ theory and with it renewed hope in the possibility of eradicating the pestilence. As John Pierce and Jim Writer have argued, the late nineteenth century was when "medicine transformed itself from an art to a science."[21] Physicians and the general public moved away from the old miasmatic and humoral theories towards the new idea of germs as disease-causing agents. With germ theory came new unspoken experimental standards which required a higher burden of proof for researchers to meet for their work to be accepted by the medical community.[22] As more diseases were studied and better understood, yellow fever remained largely a mystery, with few physicians able to meet the new burden of proof.

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[19] John H. Ellis, *Yellow Fever and Public Health in the New South: Origins, Philosophy, and Theology* (Lexington: University Press of Kentucky, 1992), 61; Duffy, *The Sanitarians*, 156.
[20] Pierce and Writer, *Yellow Jack*, 71.
[21] Pierce and Writer, 4.
[22] Margaret Warner, "Hunting the Yellow Fever Germ: The Principle and Practice of Etiological Proof in Late 19th-Century America," *Bulletin of the History of Medicine*, 1985, 381.

New yellow fever theories generated excitement given the stagnation in understanding yellow fever compared with other infectious diseases in the late nineteenth-century. Despite developments in medical science, physicians and researchers had made little progress towards eradicating yellow fever. In the latter decades of the nineteenth century, physicians around the world proposed potential etiologies—most notably, in 1897, Giuseppe Sanarelli, an Italian bacteriologist working in Uruguay, proposed a specific bacterium as the potential causative agent of yellow fever.[23] Although Sanarelli's theory was later disproved by the Yellow Fever Commission, the excitement it generated points towards a renewed desire to understand and banish yellow fever.

Despite new theories like Sanarelli's, medical consensus remained largely unchanged throughout the nineteenth century. Most physicians agreed that yellow fever was a "filth disease" caused by fomites—essentially, clothing and bed clothes of an infected person.[24] As such, the solution to yellow fever seemed to be through tackling filth writ large. In Mexico, efforts to eliminate yellow fever through increased sanitation were spearheaded by the Mexico City Epidemics Commission in the 1880s.[25] These sanitary measures did not result in a significant decline in yellow fever cases, and physicians remained at a loss for how to handle the pestilence.

V. Dr. Finlay's Mosquito Theory

Then, in 1881, a Cuban doctor proposed an alternative yellow fever theory which would eventually halt the disease trajectory. Carlos J. Finlay, a Cuban-born son of immigrants, was

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[23] Susan E. Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, The Henry E. Sigerist Series in the History of Medicine (Baltimore: Johns Hopkins University Press, 1997), 22.
[24] Kelly, *Walter Reed and Yellow Fever*, 94; Cirillo, *Bullets and Bacilli*, 114.
[25] Claudia Agostoni, *Monuments of Progress: Modernization and Public Health in Mexico City, 1876-1910* (Calgary: University of Calgary Press, 2003), 69.

educated in France and Germany before attending Jefferson Medical College in Philadelphia.[26] Following the 1878 epidemic, Finlay had been selected to work with the earliest iteration of the American Yellow Fever Commission where he met future Surgeon General George Sternberg.[27] The two began collaborating on yellow fever research and became fast friends.[28] Finlay was well known in American circles—educated in Philadelphia and often selected to represent Cuba at various international health forums including the 1881 International Sanitary Conference.[29] It was at this conference that he presented the preconditions for a case of yellow fever that he had developed, suggesting the possibility of an arthropod vector. Later that year, at the Royal Academy of Havana, Finlay outlined his claim in full: "Let us consider by what means the mosquito might transmit the yellow fever."[30] Noting a correlation between the warm weather, spawning mosquitoes, and cases of yellow fever, Finlay argued that the insect acted as an intermediary, allowing the disease to spread.[31] Finlay went on to outline his research process in coming to this conclusion and correctly identified the female *Aedes aegypti* as the specific species of mosquito responsible for the spread.[32] Finlay's mosquito-vector theory explained some of the abnormalities of the spread of yellow fever including why nurses working with

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[26] Juan A. Del Regato and Jefferson Medical College. Alumni Association., *Carlos Finlay and the Carrier of Death: The Cycle of Successful Scientific Discovery*, Jefferson Medical College Alumni Bulletin 1968 (Philadelphia: Jefferson Medical College, 1971), 1–2.
[27] Pierce and Writer, *Yellow Jack*, 77.
[28] Harold M. Malkin, "The Trials and Tribulations of George Miller Sternberg (1838-1915)—America's First Bacteriologist," *Perspectives in Biology and Medicine* 36, no. 4 (1993): 671–72.
[29] Pierce and Writer, *Yellow Jack*, 77; Nancy Stepan, "The Interplay Between Socio-Economic Factors and Medical Science: Yellow Fever Research, Cuba and the United States," *Social Studies of Science* 8, no. 4 (November 1, 1978): 399.
[30] Carlos J. Finlay, "The Mosquito Hypothetically Considered as the Agent of Transmission of Yellow Fever," (Royal Academy of Havana, Havana, Cuba, August 11, 1881), quoted in Kelly, *Walter Reed and Yellow Fever*, 114.
[31] L. O. Howard, *Mosquitoes; How They Live; How They Carry Disease; How They Are Classified; How They May Be Destroyed* (New York: McClure, Phillips & co., 1901), 121.
[32] Daniel A Rodríguez, *The Right to Live in Health: Medical Politics in Postindependence Havana* (Chapel Hill: The University of North Carolina Press, 2020), 56.

sickened yellow fever patients were not more likely to develop the disease and why the disease was regionally and temporally fastidious.

Despite the promise of his idea, Finlay's mosquito-vector theory was largely overlooked until 1900. Many historians have claimed it was prejudice against Latin American scientific research which kept Finlay's theory from gaining traction for roughly twenty years.[33] As an American-educated physician who was well known in American medical circles, it is unlikely that this alone is responsible for the overlook. Rather, valid criticisms of Finlay's research methods—namely, the lack of a control group—were largely to blame for the lag. Finlay continued researching between 1881 and 1900, experimenting with exposure to infected mosquitoes, but he was unable to produce a definitive case of yellow fever.[34] However, Finlay's primary goal was not to confirm the etiology of yellow fever but rather to determine a means of inoculation through mosquito bites.[35] Regardless, as one physician wrote, Finlay's research was "performed in such a loose manner that it was not proper to attach much importance to them."[36] The aforementioned new scientific research standards likely marred perceptions of Finlay's research and its credibility. Additionally, Finlay's theory was one of the earliest insect-vector etiologies. When, in the 1890s, bacteriologists Theobald Smith and Ronald Ross proposed similar entomological etiologies for Texas cattle fever (ticks) and malaria (mosquitoes) respectively, Finlay's theory began gaining more traction.[37] Finlay continued to research, present, and defend his theory at various medical conferences in Latin America and the United

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[33] Espinosa, *Epidemic Invasions*, 58.

[34] Scholars largely disagree about whether Finlay did indeed produce a case of yellow fever.

[35] Cirillo, *Bullets and Bacilli*, 116; Finlay believed that there was a minimum threshold at which a mosquito could bite a nonimmune person and produce an extremely mild yellow fever case along with lifelong immunity. Reed's team later disproved this possibility, but the theory itself was used in creating the yellow fever vaccine.

[36] Hemmeter, *Master Minds in Medicine*, 302.

[37] Humphreys, *Yellow Fever and the South*, 35.

States through the end of the nineteenth century.[38] In doing so, Finlay laid the groundwork for further collaboration with the many physicians he met.

VI. American Intervention in Cuba

While Finlay was testing out his mosquito vector theory, American public opinion shifted to support U.S. intervention in Cuba. Initially, these calls were based on humanitarian concerns. In the final decades of colonial rule, the Spanish imperial military instituted the *reconcentracíon* program, which attempted to move rural Cubans "reconcentrating" them in cities and exacerbating the existing health risks for poor Cubans.[39] Spanish violence towards Cubans increased writ large in the final decade of the nineteenth century, which also concerned Americans.[40] In addition to these humanitarian worries, many Americans had a vested financial stake in the stability of Cuba as U.S. capital assets in the country were worth roughly fifty million dollars.[41] Cuba's strategic location and access to the Gulf of Mexico also influenced the decision to invade.[42] The United States had already attempted to buy Cuba from Spain on multiple occasions, but by 1898, the country was ready to go to war over control of Cuba.[43] The causes of the U.S. invasion and occupation were multifaceted. Ostensibly the ultimate invasion was triggered by the explosion of the *USS Maine* in Havana harbor, but other geopolitical, social,

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[38] Steven Palmer, "A Cuban Scientist Between Empires: Peripheral Vision on Race and Tropical Medicine," *Canadian Journal of Latin American and Caribbean Studies* 35, no. 69 (2010): 95.

[39] Rodríguez, *The Right to Live in Health*, 19–20; Matthew Smallman-Raynor and Andrew D. Cliff, "The Spatial Dynamics of Epidemic Diseases in War and Peace: Cuba and the Insurrection against Spain, 1895-98," *Transactions of the Institute of British Geographers* 24, no. 3 (1999): 335..

[40] Joan Casanovas, *Bread, or Bullets!: Urban Labor and Spanish Colonialism in Cuba, 1850-1898* (Pittsburgh: Univ of Pittsburgh Press, 1999), 228; Harvey Rosenfeld, *Diary of a Dirty Little War: The Spanish-American War of 1898* (Westport: Praeger, 2000), 3.

[41] Cirillo, *Bullets and Bacilli*, 6.

[42] Cirillo, 6.

[43] Adam Burns, *American Imperialism: The Territorial Expansion of the United States, 1783-2013* (Edinburgh: Edinburgh University Press, 2017), 66.

and even public health concerns were driving that invasion. At its core the U.S. invasion was a clear instance of American imperialism.

As early as 1884, Americans were making explicit calls to occupy or annex Cuba on the grounds of public health. One Republican presidential candidate campaigned that year on the promise that he would acquire Cuba and eradicate yellow fever for the good of the American South.[44] By the late 1890s, calls had grown even more urgent with one Texas newspaper writing, "If annexing Cuba will result in eradicating yellow fever and quarantine, by all means let us annex it at once."[45] Americans were linking yellow fever with Cuba and urging their government to act accordingly in order to protect American lives and assets from the wrath of the disease. According to Espinosa, public health served as a crucial facet of the "civilizing mission" that most colonial endeavors were grounded in, and the American federal government, bowing to public pressure, determined in late 1897 that intervention in Cuba was necessary for the health of the American populous.[46] The U.S. public was confident that American physicians could solve the problem of yellow fever and thus pushed for invasion.[47] In this sense, colonialism and the efforts to understand and eradicate yellow fever were inextricably linked; colonialist ideology portrayed American physicians as superior to Cuban medicine and thus suggested that American medicine would solve the yellow fever problem once and for all.

In accordance with public opinion, the United States went to war with Cuba in April 1898 following the explosion of the *Maine*. In his book *An Army for Empire: The United States Army in the Spanish-American War*, Graham Cosmos claims that the war was an attempt to "challenge

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[44] "Annexation of Cuba," *Chicago Daily Tribune*, June 19, 1884.
[45] "Editorial," *Houston Daily Post*, October 13, 1897.
[46] Espinosa, *Epidemic Invasions*, 6, 29.
[47] John Mckiernan-González, *Fevered Measures: Public Health and Race at the Texas-Mexico Border, 1848–1942* (Durham: Duke University Press, 2012), 60.

European imperialism in the Far East and Latin America."[48] But imperialism came at a cost. Despite only lasting a few months, roughly seven times more Americans died of disease than in combat in the Spanish-American War.[49] Among those were many yellow fever deaths. The toll that yellow fever and other diseases had already taken on the Spanish army—a quarter of all Spanish soldiers were said to be ill at any given moment during the war—was one of the reasons the United States likely won the Spanish-American War in the first place.[50] Even during the war, American soldiers attempted to respond to yellow fever among troops; on July 11, 1898, General Nelson Miles ordered the entire army camp at Siboney and the surrounding village to be evacuated and then burned in an effort to halt the rapid spread of the disease there.[51] These efforts were unsuccessful, and the widespread disease and death during the short war pushed American military institutions to address diseases like yellow fever in Cuba following the war's end.

Perhaps what most motivated American efforts was the incidence of yellow fever among American soldiers stationed in Cuba. Yellow fever and malaria cases in army regiments crippled the American military effort during the war and continued to hamper army action following the war.[52] As more troops arrived, concern with yellow fever grew. By 1899, the United States stationed over forty thousand troops to maintain control over the island of Cuba, already considered the "crown jewel of America's small new empire."[53] Although other diseases like dysentery and typhoid were more common among soldiers, yellow fever inspired unparalleled

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[48] Graham A. Cosmas, *An Army for Empire: The United States Army in the Spanish-American War* (College Station: Texas A&M University Press, 1998), 29.
[49] Cirillo, *Bullets and Bacilli*, 1.
[50] Cosmas, *An Army for Empire*, 71; Ivan Musicant, *Empire by Default: The Spanish-American War and the Dawn of the American Century.* (Holt Paperbacks, 2009), 56.
[51] Cosmas, *An Army for Empire*, 257; Cirillo, *Bullets and Bacilli*, 92.
[52] Musicant, *Empire by Default*, 487.
[53] Pierce and Writer, *Yellow Jack*, 3, 111.

fear and was not remedied through sanitary measures.[54] As such, action was warranted and even demanded from soldiers.

VII. The Yellow Fever Commission

With troops in Cuba for the foreseeable future, the trouble of yellow fever became a greater priority for American military medicine. In 1900, following the uptick in yellow fever cases among U.S. troops stationed in Cuba, Surgeon General Sternberg, an old friend of Finlay's from the 1879 commission, tasked Walter Reed with identifying the means of spread of the disease.[55] Reed, a rising star in military medicine who remains the youngest graduate of the University of Virginia Medical School, was believed to be up to the task.[56] Alongside Reed, the official members of the Yellow Fever Commission were James Carroll, Jesse Lazear, and Aristides Agramonte—the first two were non-immune American physicians with the latter being an immune Cuban physician.[57] Even the makeup of the commission suggests a willingness from American physicians to work with their Cuban counterparts in order to handle the problem of yellow fever. In creating the commission, Sternberg tasked the group with finding the cause of yellow fever and preventing it, a tall order for a disease that had stymied researchers for most of the nineteenth century.[58] The work they would accomplish in Havana, like Finlay's earlier discovery, would radically reshape the future of yellow fever.

Not long after beginning their work, the commission met with Finlay. In late June 1900, Walter Reed and James Carroll, sailed for Havana from New York on the *Sedgwick* to meet the

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[54] Pierce and Writer, 105.
[55] Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, 19.
[56] Pierce and Writer, *Yellow Jack*, 88.
[57] Kelly, *Walter Reed and Yellow Fever*, 123.
[58] "Memorandum, George Miller Sternberg to Walter Reed," May 29, 1900, in John R. Pierce and James V. Writer, *Military Medicine*, vol. 166 (Ft. Belvoir: Defense Technical Information Center, 2001), 20.

rest of the commission.[59] Initially, they were primarily concerned with testing the merits of Sanarelli's proposed bacilli.[60] After quickly disproving it, the Yellow Fever Commission sought a new theory. Sternberg suggested that they explore the insect vector further, perhaps encouraged by the work of his old friend Finlay.[61] In August 1900, Lazear, Carroll, and Reed met with Finlay to learn more about his theories. At the meeting, Finlay supplied the commission with some of his prized mosquito eggs to aid in their research.[62]

VIII. Proving Finlay's Theory

Using the mosquitoes given to them by Finlay, Lazear and Carroll, began experimenting with the most convenient subjects—their own bodies.[63] Lazear, who had special training in entomology from time spent at the University of Rome, handled the bulk of mosquito-related duties from caring for the eggs to devising a method for targeted bites.[64] Agramonte also aided in the process although, like most Cubans, he was immune to the disease from a mild case in childhood, and thus unable to experiment on himself.[65] Lazear, who as previously mentioned died from the disease, along with Carroll both exposed themselves to infected mosquitoes and experienced yellow fever in the name of science.[66] This early work reflected broader trends in nineteenth-century medical research: autoexperimentation. Many physicians used their own

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[59] Pierce and Writer, *Yellow Jack*, 3.
[60] François Delaporte, *The History of Yellow Fever: An Essay on the Birth of Tropical Medicine* (Cambridge: MIT Press, 1991), 83.
[61] Delaporte, 90.
[62] For descriptions of the Yellow Fever Commission's visit with Finlay, see William Bennett Bean and Heirs of Hippocrates Library., *Walter Reed: A Biography*, Special ed (New York: The Heirs of Hippocrates Library, 1994), 127; Leonard, "Carlos Finlay's Life and the Death of Yellow Jack," 448–49; Watts, *Epidemics and History*, 255.
[63] Reed had left briefly to attend to business in Washington D.C. and would not return until after Lazear's death.
[64] Cirillo, *Bullets and Bacilli*, 113.
[65] Aristides Agramonte, "The Inside History of a Great Medical Discovery," *The Scientific Monthly*, December 1915.
[66] Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, 20; Agramonte had been exposed to the disease as a child in Cuba and thus had immunity.

bodies to better understand the experience of disease. In the Peruvian Andes a medical student named Daniel Carríon intentionally infected himself with the vector borne disease that would later bear his name.[67] Carríon, like Lazear, later died from his autoexperimentation. Historian Susan Lederer deemed the early work of Agramonte, Carroll, and Lazear the "most famous self-experiment in the twentieth century."[68] In spite of the loss of Lazear, this early self-experimentation strengthened the commission's belief in Finlay's theory.

Following the successful yet sorrowful series of autoexperimentations, the research team, now only Agramonte, Carroll, and Reed, began experimenting on other subjects. The commission met again with Finlay and continued to correspond with him throughout the research process, according to Finlay's son.[69] Combining tactics from Finlay's research and Lazear and Carroll's yellow fever experiences, the commission exposed some American soldiers, with consent but not compensation, to infected mosquitoes and others to infected bedclothes to rule out the fomite theory.[70] However, this quickly became an untenable subject base since widespread yellow fever amongst American soldiers threatened their hold on the country. Native Cubans were almost entirely immune to the disease due to mild cases in childhood, so the researchers then transitioned to using Spanish immigrants as their subjects. In conjunction with the Spanish consul, these immigrants were offered "one hundred dollars in gold… and an additional hundred dollars if [they] contracted yellow fever" by the research team.[71] The physicians obtained explicit consent from these Spanish immigrants, but the financial incentive

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[67] Marcos Cueto, "Nationalism, Carrión's Disease and Medical Geography in the Peruvian Andes," *History and Philosophy of the Life Sciences* 25, no. 3 (2003): 320.
[68] Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, 19.
[69] Carlos E. (Carlos Eduardo) Finlay, *Carlos Finlay and Yellow Fever,* (New York, 1940), 98; José López Sánchez, *Carlos J. Finlay: His Life and His Work* (Havana: Editorial José Martí, 1999), 373.
[70] Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, 20.
[71] Lederer, 21.

coupled with the high likelihood of being exposed to the disease naturally meant that many Spanish immigrants were almost eager to participate.[72] Both Agramonte and Carroll played a crucial role in these experiments because they were immune to the disease and could be safely exposed to fomites and infected mosquitoes. The Yellow Fever Commission—comprised of both American and Cuban members—had created an experiment to test Finlay's mosquito theory in a controlled environment.

The devised research setup was successful. According to Reed, the Yellow Fever Commission generated seven cases of yellow fever, all from the infected mosquito cohort.[73] Along with Jesse Lazear, three volunteers (an American nurse and two Spanish men) ultimately perished from their exposure to infected yellow fever mosquitoes in the name of science.[74] Both Lazear and Clara Maas, the nurse, were viewed as martyrs in the United States, but the Spanish volunteers remained largely unknown. When yellow fever cases arose, Cuban doctors, including Finlay and other locals like Dr. Díaz Albertini and Dr. Juan Guiteras played crucial roles in confirming cases of the disease, since they were considered "expert[s] in the diagnosis of yellow fever."[75] According to José López Sánchez, American physicians, often lacked practical experience working with yellow fever and frequently misdiagnosed the disease or incorrectly cited yellow fever as the cause of an entirely different pestilence.[76] Finlay and his Cuban colleagues thus lent credibility to the American doctors on the commission by confirming that their research had indeed generated cases of yellow fever.

IX. Yellow Fever Commission Findings

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[72] Lederer, 21.
[73] Walter Reed, *The Etiology of Yellow Fever* (Havana, Cuba: Dept. de Sanidad, 1901), 26.
[74] Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*, 131.
[75] Reed, *The Etiology of Yellow Fever*, 8; Albert E. Truby, *Memoir of Walter Reed: The Yellow Fever Episode* (New York: P.B. Hoeber, Inc., 1943), 161.
[76] López Sánchez, *Carlos J. Finlay*, 361.

The discoveries of the Yellow Fever Commission were swiftly acknowledged. Finlay's son remembered him bestowing "the warmest praise" on the commission members for their research achievements.[77] Finlay's support of the initial research and later the findings suggest a productive working relationship, underscoring the cooperation which made the discovery possible. According to historian Margaret Humphreys, the findings of the commission were rapidly accepted with physicians having "almost unanimous support for the mosquito as the sole carrier of yellow fever."[78] Even three decades later, the accolades of the team were praised by American physicians like John Hemmeter:

> A scientific and medical discovery so far-reaching in the blessings it bestows upon the human race, that it is not exceeded in this respect by any other discovery in the history of medicine, has been made by… Major Walter Reed, Major James Caroll, Dr. Jesse Lazear…[and] Dr. Aristides Agramonte.[79]

The recognition of three American doctors and one Cuban doctor, working cooperatively, to banish a pestilence which had long impacted both their countries stands in stark contrast with the one-sided power dynamics of colonialism. Agramonte contributed to the efforts of the Yellow Fever Commission alongside the American doctors. Reed also gave explicit credit to Finlay for proposing "the theory of the propagation of yellow fever by means of the mosquito" in a 1901 publication of the commission's findings.[80] The process of confirming yellow fever was conducted in conjunction with Cuban physicians rather than by an entirely colonial force.

X. Disease Eradication Efforts and National Memory

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[77] Finlay, *Carlos Finlay and Yellow Fever,* 108.
[78] Humphreys, *Yellow Fever and the South*, 41.
[79] Hemmeter, *Master Minds in Medicine*, 297.
[80] Walter Reed et al., *Yellow Fever: A Compilation of Various Publications: Results of the Work of Maj. Walter Reed, Medical Corps, United States Army, and the Yellow Fever Commission* (Washington, D.C: Government Printing Office, 1911), 95.

Once the team had confirmed the etiology of yellow fever, American public health and government officials began implementing measures to prevent the disease in Cuba. In Havana, it was the United States Army Medical Corps, led by Major William Gorgas, who instituted anti-mosquito policies which ultimately rid the city of yellow fever.[81] In this sense, the use of the U.S. army reflected the continued context of colonialism despite the cooperation that existed within the research field. Gorgas, the chief sanitary officer in Cuba, and the Army Medical Corps began fumigating any buildings linked to yellow fever cases, spraying kerosene into any pools of standing water, and adding mosquito netting to doors and windows.[82] As Finlay had argued two decades prior, mosquito control methods were effective in preventing cases of yellow fever. In 1901, articles in the *Chicago Daily Tribune* and the *New York Times* celebrated the "victory" of yellow fever with no cases in Santiago, Cuba, citing Finlay's theory proven by the Yellow Fever Commission as the cause.[83] The anti-mosquito measures also reduced malaria on the island.[84] Following 1905, yellow fever never plagued Cuba nor the United States again.

In the years following the Yellow Fever Commission's success, press coverage of the research group largely recognized the transnational nature of the physicians. As seen above, major news outlets celebrated the identification of a mosquito vector, recognizing Finlay's contributions. When articles failed to mention the participation of Finlay and Agramonte, Cubans fought to recognize the efforts and contributions of their fellow countrymen. As one 1911 Cuban health official wrote in response to an American publication, the article "does not even mention

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[81] Duffy, *The Sanitarians*, 240.
[82] Cirillo, *Bullets and Bacilli*, 118.
[83] "War on Yellow Fever in Cuba: Army Officers Win a Victory After Battle Lasting Two Years," *Chicago Daily Tribune*, August 29, 1901; "The Fight Against Yellow Fever in Cuba: What Has Been Accomplished by Two Years of American Rule," *New York Times*, August 29, 1901.
[84] George K. Strode, *Yellow Fever* (New York: McGraw-Hill, 1951), 11.

the names of Finlay, Agramonte, and Guiteras."[85] In doing so, they reasserted the crucial role that Cubans physicians played alongside their American counterparts. By 1911, the *New York Times* had published an article recognizing Finlay's contributions to the Yellow Fever Commission and giving him "full credit" for the introduction of his theory.[86] *The Washington Post* similarly credited Finlay as a crucial member of the commission in a 1933 article celebrating the centennial of his birth: "Science had never found a way of diagnosing yellow fever until Dr. Finlay."[87] American media recognized the contributions of both Cuban and American physicians to the Yellow Fever Commission research in the early twentieth century.

Despite the widespread contemporary cooperation in the Havana research, the American historical memory of this research project has undoubtedly been tainted by mid-twentieth century nationalism and later U.S.-Cuban relations following the Cuban Revolution of 1956. In *Victories of Army Medicine*, Edgar Hume characterized the studies as being conducted "by Americans," while simultaneously acknowledging the native Cubans like Finlay and Agramonte who played pivotal roles in the research.[88] Given the timing of this publication during the Second World War, Hume's claims may have been influenced by the surge in American nationalism. According to Espinosa, Americans were eager to claim full and sole victory in the war against yellow fever, specifically giving Reed the glory for the discovery.[89] Changing relations between the two countries reshaped memory, particularly in the United States.

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[85] "Comentario: La Conquista Científica de la Fiebre Amarilla," *Sanidad y Beneficencia* 5, no. 1 (1911): 256, quoted in Espinosa, 111.
[86] "Dr. Finlay Gets Full Credit Now: Havana Physician Who Solved the Yellow Fever Problem Is Extolled Here and Abroad.," *New York Times*, September 3, 1911.
[87] "Carlos Finlay's Memory to Be Honored Here: Doctors to Observe 100th Anniversary of Yellow Fever Expert.," *The Washington Post*, November 26, 1933.
[88] Edgar Erskine Hume, *Victories of Army Medicine: Scientific Accomplishments of the Medical Department of the United States Army* (Philadelphia [etc.]: J.B. Lippincott Company, 1943), 94.
[89] Espinosa, *Epidemic Invasions*, 109–10.

Both Reed and Finlay were remembered as national heroes in their respective countries. Finlay was nominated for the Nobel Prize by different physicians seven times (1905-1907 and 1912-1915), but never received the honor.[90] Then in 1915, Cuba created the Finlay Institute for Investigations in Tropical Medicine to honor Finlay's memory and work. Similarly, in 1909, Congressional legislation approved the opening of the Walter Reed Army Medical Center which paid tribute to Reed's legacy in military medicine. A Cuban ambassador even presented Reed's daughter with the Carlos J. Finlay Order of Merit in honor of his work in Cuba in 1954.[91] This gesture underscores the understanding that the eradication of yellow fever was, as Espinola has called it, "a shared enterprise" between both countries.[92] A painting by Esteban Valderrama in the mid-twentieth century depicts this collaboration showing Finlay welcoming all four members of the commission to his office while his son looks on (Figure 1). By portraying the Cuban and American physicians as equals, even highlighting Finlay's knowledge of yellow fever as he is portrayed mid-explanation holding his precious mosquito eggs, Valderrama further underlines the importance of both parties in their ultimate success. In short, Cuba and the United States recognized the contributions of their respective countrymen, but also acknowledged the broader cooperation that was necessary to succeed.

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[90] Cirillo, *Bullets and Bacilli*, 120.
[91] Marie D. Smith Staff Reporter, "Cuba Honors Yellow Fever Test Heroes," *The Washington Post and Times Herald*, April 30, 1954.
[92] Espinosa, *Epidemic Invasions*, 113.

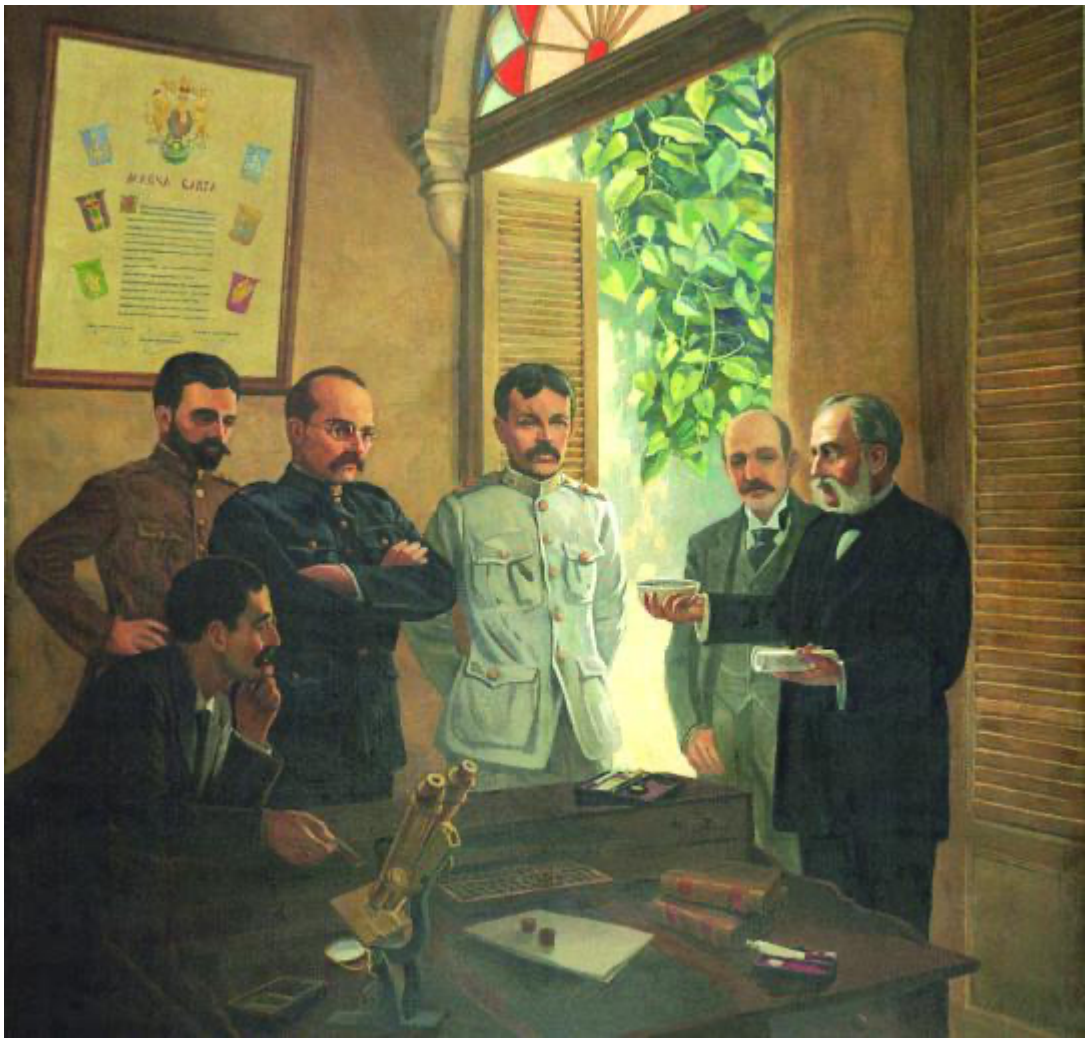

Figure 1. Carlos Finlay meets with the Yellow Fever Commission in his office (Courtesy of Museo Nacional, Havana)

XI. Conclusion

It is simplistic to characterize the war against yellow fever as an entirely colonialist endeavor despite the reality of the U.S. military presence in Cuba. Carlos Finlay, Walter Reed, Jesse Lazear, James Carroll, and Aristides Agramonte made lasting contributions to medicine as equal partners. Their work changed the course of the public health response to yellow fever and marked a collaborative effort by American and Cuban physicians to tackle the scourge of the disease together.

Despite the collaborative legacy of the Yellow Fever Commission, their findings were used to further colonialism elsewhere. In *Launching Global Health: The Caribbean Odyssey of the Rockefeller Foundation*, Steven Palmer argues that the success of the yellow fever eradication efforts in Havana reinvigorated American attempts to apply "sanitary science" elsewhere in Latin America.[93] In this sense, one can argue that the success of the collaborative efforts of Cuban and American physicians in the face of colonialism ironically inspired further colonialism. The discovery of yellow fever etiology aided in continued U.S. imperialism with the construction of the Panama Canal.[94] Knowledge of yellow fever spread, and prevention strategies allowed the U.S. Army to better protect its troops abroad while simultaneously touting the guise of disease eradication in places like the Panama Canal Zone.

Colonialism also continued in Cuba as the United States limited Cuban sovereignty with the 1903 Platt Amendment, which allowed further American intervention including on the grounds of public health outbreaks. Ostensibly to protect Cuban independence, the Platt Amendment mandated that Cuba make significant progress towards eradicating yellow fever and gave the U.S. government the right to intervene in internal affairs. The institution of the Platt Amendment marks in many ways the devolution of transnational cooperation on public health grounds between the two countries. While its memory has been altered by U.S.-Cuban relations in the last century, the Yellow Fever Commission remains a rare example of genuine collaboration in the history of American colonialism in Cuba.

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[93] Steven Paul Palmer, *Launching Global Health: The Caribbean Odyssey of the Rockefeller Foundation*, Conversations in Medicine and Society (Ann Arbor: University of Michigan Press, 2010), 59.
[94] Cirillo, *Bullets and Bacilli*, 119.

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