

# Not a polar island: yellow fever, Spanish medical research, and the struggle for scientific and political hegemony in late nineteenth century Cuba

*Não se trata de uma ilha  
polar: febre amarela, pesquisa  
médica espanhola, e a luta  
pela hegemonia científica e  
política em Cuba no final do  
século XIX*

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Received for publication in October 2017.  
Approved for publication in October 2017.

<http://dx.doi.org/10.1590/S0104-59702017000500015>

MARTÍNEZ, Francisco Javier. Not a polar island: yellow fever, Spanish medical research, and the struggle for scientific and political hegemony in late nineteenth century Cuba. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro, v.24, n.4, out.-dez. 2017, p.1125-1145.

## Abstract

This paper explores questions related to yellow fever and the political destiny of Cuba in the late nineteenth century. A forgotten therapeutic device to treat the disease invented in that period, the “polar chamber” (*câmara polar*), provides a useful standpoint for reconstructing the tradition of Spanish yellow fever research in Cuba, a topic largely neglected by the medical historiography. The failed history of this device can also illuminate the complex struggle for scientific hegemony between Spanish, Cuban, and US institutions and researchers. Finally, we focus on the politics of the polar chamber by analyzing how this invention intended to provide a particular solution for the complex, threefold struggle for Cuba’s political future.

Keyword: yellow fever; Cuba; nineteenth century; national science; *câmara polar*.

## Resumo

*Este artigo investiga perguntas relativas à febre amarela e ao destino político de Cuba no final do século XIX. Um dispositivo terapêutico usado para tratar a doença foi inventado nesse período – a câmara polar. Ela oferece uma perspectiva útil para reconstituir a tradição da pesquisa espanhola da febre amarela em Cuba, um tópico muito negligenciado pela historiografia médica. A falta de registro histórico deste dispositivo explica, em parte, a complexa luta por hegemonia científica entre instituições e pesquisadores espanhóis, cubanos e norte-americanos. Finalmente, abordamos a política da câmara polar, analisando como esta invenção visava oferecer uma solução especial para a complexa luta tríplice pelo futuro político de Cuba.*

*Palavras-chave: febre amarela; Cuba; século XIX; ciência nacional; câmara polar.*

During the first Pan-American Medical Congress held in Washington DC in September 1893, Pedro Peñuelas, inspector of the Spanish Army Medical Service in Cuba (SAMSC), presented the research done in Havana on a novel therapy for yellow fever: the *cámara polar* (polar chamber). Peñuelas took this opportunity to claim that the SAMSC had “always participated in the research devoted to yellow fever, testing all treatments proposed by the scientific community, and [that] this country’s [Cuba’s] authorities have always sponsored those tests” (Peñuelas, 1895a, p.445). Over a century later, this claim has not yet been assessed by the medical historiography, in which Spain’s neglect of scientific inquiry in its overseas colonies is still commonplace (Bankoff, 2011, p.78). Although the literature on the history of yellow fever in nineteenth century Cuba is extensive (Stepan, 1978; López Sánchez, 1987; Delaporte, 1989; Pruna, 2002; Espinosa, 2009; Palmer, 2010, 2011), interpretations have largely been conditioned by colonialist analyses aiming to clarify the dispute surrounding the verification of the mosquito theory of the Creole physician Carlos J. Finlay by the fourth US Yellow Fever Commission (Benchimol, 2011, p.383). In contrast, almost no study has been devoted to Spanish-led research and sanitary initiatives, even though the island remained under Hispanic rule in that period.

In this paper, we intend to review one such initiative, the *cámara polar*, as a means to propose a more complex view of the medical and political struggles in late nineteenth century Cuba. To achieve this goal, we adopt a national approach, rather than a colonial one. First, we analyze how the polar chamber was framed by a threefold struggle for “national science,” which involved not just Spanish and Cuban institutions and researchers, but American ones, too. Second, this case study helps us to illuminate the struggle for political sovereignty in late nineteenth century Cuba – which we also consider to be framed by triangular nationalist tensions. For this purpose, we do not follow the social-constructionist approach that has become a standard narrative of the history of science in the last decades. In that approach, which intends to give political explanations for the content of a scientific discipline or practice, both realities – politics and science – are regarded as essentially disconnected. By contrast, we assume, with Bruno Latour (2011, p.69), that nature and politics are simultaneously constructed by scientific objects. On this basis, the *cámara polar*, while addressing the “yellow fever question,” was also proposing a solution for the “Cuban question” in general. Both issues were defined by hybridity and entanglement, rather than by clearly polarized dichotomies.

### **A short history of the *cámara polar***

The “distinguished professors” attending Peñuelas’ presentation were probably curious to hear about the *cámara polar*, a device invented in Cuba only three years before by the Spanish doctor Alfredo García García (1855-unknown). García was born and trained as a doctor in the Spanish town of Santiago de Compostela, located in the north-western region of Galicia (Vilanova, 2002, p.254). After joining the Spanish Army Medical Service (SAMS), he was sent to Cuba during the final stages of the Ten Years’ War (1868-1878), but, as soon as the conflict was over, left the army and settled in Santiago de Cuba, the capital of Oriente province (Peñuelas, 1895b, p.798). There, García began studying yellow fever “as every medical professor on this island did,” until one day in early 1890 he produced the first makeshift

model of his future invention. A patient with severe yellow fever symptoms had arrived at Santiago's civil hospital and, after all treatments failed,

[García] put a table on the patient's bed, filled the drawers with ice and salt and closed with sheets the space between table and bed, leaving the patient within that rare device, cold, dark and damp, with melting water falling from all sides that made the dwelling look like a department in Dante's hell (González, 1895, p.5).

The patient allegedly feeling much relieved, the Spanish doctor set to build more sophisticated versions of his device until he registered a patent for it in May 1891 (Beltrán, 1983, p.201). The term *polar* may have been chosen because originally "the inside temperature was kept at zero degrees and even less," though García later realized that 10-12°C sufficed to achieve the desired effects (Peñuelas, 1895b, p.800). Well before that date, the first experimental tests were performed at Santiago's military hospital on eighteen civilian patients, all of whom, save one, were cured (Correo..., 8 Jan. 1891). The following summer García carried out new trials at the same hospital, treating a total of 68 cases in both years, with only four deaths (Peñuelas, 1895b, p.805). When these figures reached the public, the polar chamber became a sensation. The Santiago newspapers launched appeals "for the funds required for the improvement of this device to be raised" (Rochard, Méricourt, 1895, p.269). Additionally, two US mining companies expressed their willingness to purchase García's invention (The Province..., 15 Aug. 1898). Only the Juraguá Iron Company carried out this plan thanks to the active involvement of its physician, Joaquín Castillo Duany, a Creole doctor born in Santiago and trained in the US, who went on to become a pro-independence leader during the last war of independence. On the occasion of an epidemic outbreak at the company's Firmeza camp in late 1891, 37 cases were treated with the polar chamber, though this time with a low rate of success (Castillo Duany, 1895).

García realized that the small number of cases and the inadequate equipment had hindered these first trials. He thus lobbied for larger ones to be performed in Havana, and finally succeeded in the summer of 1892. One was done at the La Purísima Concepción health center of Centro de la Asociación de Dependientes del Comercio (CADC), an important mutual aid society, for which he counted on the assistance of the Spanish Navy doctor José González (Curación..., 18 Sep. 1892). The Spanish doctor Manuel Valdés-Bango León (1893, p.37), a supporter of García's invention who was a university professor and medical director of the Quinta Covadonga hospital at Centro Asturiano (Mena, Cobelo, 1992, p.374), could have helped to get the CADC's permission. More importantly, the Spanish Army Medical Service in Cuba (SAMSC) appointed a commission to conduct research into the use of the polar chamber for the treatment of yellow fever, to carry out a trial in Havana's military hospital, and to produce "a meticulous report with the judgment deserved by Dr. García's system as a means to combat the endemic disease" (Peñuelas, 1895b, p.796-797). This success was probably due to García's contacts in the army, especially Félix Estrada, with whom he had had a "close friendship" since they had studied medicine together in Galicia and had both been sent to Cuba as army doctors (Peñuelas, 1895b, p.804). The commission was appointed on July 30, 1892 (Hoja ... Roure, 1893) by inspector Antonio Pardiñas, a long-time advocate of yellow fever research. Its president, Casimiro Roure, was a close friend and collaborator

of Pardiñas (Martínez-Antonio, 2013, p.461). The other members were SAMSC doctors José Lanzarot, José Clairac and Segundo Bellver, and SAMSC chemist Gastón Alonso Cuadrado. The above-mentioned Estrada was the secretary. Sessions began on August 19, 1892 (Peñuelas, 1895b, p.796).

Each of the four *cámaras polares* built by García for the trial consisted of “a sort of rectangular wooden box, large enough to put a bed inside” and for a nurse to move around the patient (Curación..., 18 Sep. 1892). This box or “small room” (Peñuelas, 1895b, p.828), low-lit and quiet, had one or several small openings “filled with hydrophilic, sublimated, phenicated, borated cotton,” as well as a window through which the patient could be observed and handed food, water, and drugs (Slocker, 1896, p.396). Its ceiling and floor were slightly separated from the walls so that the air circulated constantly between the outside and the inside (Peñuelas, 1895b, p.800). The air inside was cooled down to a constant temperature of 10-12°C by placing large quantities of ice in containers above and below the box. When the warmer air outside entered the chamber, part of it condensed and flowed down the walls and out, while the rest of the moisture suspended in the air was inhaled by the patient (Peñuelas, 1895b, p.828). Once the devices were installed, the trials began.

**ESTADÍSTICA PRESENTADA POR EL DR. GARCÍA.**

*Enfermos tratados por la Cámara Polar en Santiago de Cuba desde el mes de setiembre de 1890, que resultaron curados.*

Names.	Antecedentes.	Profesores que diagnosticaron.
Señor Don Ramiro Herrera y Córdova.	Canónigo de la Catedral	Dr. Guimerá.
Señor Don Pedro Herrera.....	Minero	Hartman, Caminero, Crós, Bisbé, Edo. Guimerá y Gimenez.
Señor Don Pedro Gabriel.....	Turco; edad 7 años..	Ros, Grillo, Guimerá, Bisbé y Gimenez.
Señor Don Antonio Vidal.....	Dependiente	Bisbé, Guimerá, Crós, Grillo y Edo.
Señora Doña Rosa.....	Turca del Monte Libano.	Sin comprobar.
Señor Don Rufino Arguirafena.....	Dependiente	Crós, Rós, Guimerá y Bisbé.
Señor Don Silvestre Camp.....	Criado de servicio	Alvarez, Harnad, Grillo y Bisbé.
Señor Don Manuel Lopez Linares.....	Dependiente	Bisbé y Grillo.
Señor Don Enrique Bardina.....	Dependiente	Sin comprobar.
Señor Don Gaspar Compte Llopis.....	Dependiente	Rosillo, Bisbé y Grillo.
Señor Don Walterio Worzge.....	Comerciante alemán	Castillo y Bisbé.
Señor Don Maximiliano Palacios y Torres.	Dependiente	Rosillo y Grillo.
Señor Don Adolfo de Jü.....	Dependiente	Portnondo, Camps, Grillo y Crós.
Señor Don José Maria Gonzalez.....	Presbítero	Grillo y Camps.
Señor Don Claudio Alvarez Garcia.....	Dependiente	Millares y Roger.
Señor Don Emilio Viña Ratiola.....	Dependiente	Norma, Camps y Harnad.
Señor Don Joaquin Gargallo Silvestre.....	Pobre de solemnidad..	Harnaz, Grillo, Norma y Camps.
Señor Don Luis Martinez.....	Pobre de solemnidad..	Sin comprobar.
Señora Doña Dolores Rueda Martin.....	Pobre de solemnidad..	Fernandez, Toribio, Grillo y Roger.
Señor Don Florindo Pozo Ibañez.....	Dependiente	Norma y Camps.
Señora Doña Lucinda Cesoja.....	Corista italiana	Hartnaut, Carbonell, Ramirez.
Señor Don Manuel Carabell.....	Maquinista	Harniroz y Norma.

Figure 1: Detail of list of patients submitted to the first trials of the polar chamber in Santiago de Cuba (Source: Peñuelas, 1895b.)



They were open to every civil, army, and navy doctor in the city, as Roure believed that “all those who cultivate medical science with a true interest would come over, the question of yellow fever’s cure being so very important for Cuba and for all the American peoples” (Peñuelas, 1895b, p.804). Many prominent physicians accepted his invitation, including Finlay, his lifelong Spanish collaborator Claudio Delgado, the Creoles Juan Santos Fernández – director of the Institute of Histobacteriology and Vaccination (Instituto Histobacteriológico y de Vacunación Antirrábica, IHB) – and Diego Tamayo – a Cuban bacteriologist who worked for some years at the IHB – and many others (Peñuelas, 1895b, p.813).

Despite great expectations, the commission was closed down in May 1893, having produced no positive results. Only nine patients (two of whom died) were treated with the polar chamber (Peñuelas, 1895b, p.814-827). The rigidity of the experiment’s design proved to be detrimental, as García was obliged to supervise all treatments personally. Besides, some patients showed “resistance” to being placed within the chamber, which, according to Estrada, needed to be given “a nicer outlook, removing its sinister and sepulchral appearance” (Peñuelas, 1895b, p.831). Others suffered from “chilblains, rheumatic pains and gangrenous plaques” (Perna, 1909, p.155). Estrada also suggested that a “simpler and cheaper” refrigeration system should be worked out, for it was almost always impossible to get the “twenty to thirty *quintales* [1-3 tons] of ice and six to eight *arrobas* [72-120 kg] of salt [that] might be spent in the treatment of each patient” (p.153). The favorable institutional context also waned. Pardiñas retired in September 1892 (Hoja ... Pardiñas, 1892), and Roure died unexpectedly two months later (Hoja ... Roure, 1893). Although the new inspector, Tomás Casas, endorsed the commission, he opposed its continuation during the summer season (Peñuelas, 1895b, p.807). For all these reasons, Estrada emphasized the study’s severe limitations in his final report of May 10, 1893. No new trials were ever done, but two years later, García’s colleague José González (1895, p.5) published a passionate defense of the chamber. The *cámara polar* could turn out to be one of the many “ridiculous predecessors” of later “amazingly successful” inventions like the steam engine or the dynamo, so he wondered: “Who knows if days as happy as those two [inventions] have had still await the polar chamber?”



Figure 2: A portrait of Dr. Félix Estrada Catoyra (Source: Álbum-Escalafón del Cuerpo de Sanidad Militar del Ejército español. Madrid: Sucesores de Rivadeneyra. p. 54. 1900.)

### **The polar chamber in Spanish medical research on yellow fever**

The Havana polar chamber trials of 1892-1893 followed in the footsteps of a long series of experimental investigations on yellow fever carried out by the army in Cuba. From the 1830s, military physicians became the main actors of Spanish research because the Sanidad Militar progressively became the most important branch of the island’s sanitary administration, together with the quarantine system (Martínez-Antonio, 2012). Strictly speaking, the Spanish Army Medical Service in Cuba (SAMSC) would not exist until a decree of 1855 assimilated

Cuba's hitherto locally managed military hospitals (with their staff) to the SAMS, but the process had already started in the previous decade (Martínez-Antonio, 2006, p.449). By the end of the 1850s, its staff comprised over a hundred medical officers (a third of the total in the army in peninsular and overseas Spain), plus several hundred nurses and auxiliaries. They worked in a large network of military hospitals and infirmaries established in the main towns and garrisons, of which Havana's San Ambrosio Hospital, with 1,000 beds, was the largest and best equipped. There, a Histochemical Cabinet (Gabinete Histoquímico) existed since the 1840s for anatomopathological investigations. In parallel to this, yellow fever acquired an unprecedented centrality as a sanitary problem and object of medical research for the SAMSC, despite its constant presence for centuries on the island (Martínez-Antonio, 2013, p.460). The substantial rise in the number of troops stationed in Cuba to check the growing threats to Spanish rule and to deploy expansionist campaigns in the Caribbean stood behind this centrality.

Spanish military research was framed by the two main trends of European medicine in relation to epidemic diseases: contagionism and anticontagionism. As Peter Baldwin (2005, p.9) has argued, these were actually "two poles in a field of intellectual tension within which any individual position took its stance." This was particularly true for Cuba, where so-called "contingent contagionism" was widespread: the disease was regarded as contagious only if certain atmospheric or telluric conditions concurred (Stepan, 1978, p.401). In any case, the SAMSC's position was generally closer to the anticontagionist view that "high and fluctuating temperatures, high humidity and exposure to intense sunlight weakened the constitutions of Europeans," who were thus more vulnerable to disease, "particularly in areas where there was bad air (malaria)" (Worboys, 1996, p.183). Thus, the physician Ramón Piña affirmed that "the atmosphere is one of the most powerful causes of our evils and sufferings" and that yellow fever was similar to malaria and therefore belonged to the category of "miasmatic fevers," a vision that in Cuba dated back to the works of Julio Jacinto Le Riverend from the 1830s and 1840s (Piña, 1855, p.22; Martínez-Antonio, 2013, p.459). For his colleague Ramón Hernández Poggio (1874, p.5), the Cuban climate, "as unhealthy as [it was] different from our own," altered European bodies and favored the onset of yellow fever, malaria, dysentery, and cholera.

Among the advocates of contagionism in the SAMSC, doctor Marcial de Reina (1868, p.223) believed that yellow fever was contagious "even though the nature of the contagious miasma is unknown, as is that of all other viruses." Homeopathic doctors became important players in contagionism, and should not simply be passed off as "bizarre" (Pruna, 2002, p.99). The middle decades of the century were the golden age of homeopathy in Cuba, and although the historiography has focused mainly on civil practitioners (González Arias, 2015), the SAMSC also endorsed it, especially in the severe yellow fever epidemics that occurred during the tenure of the progressive governors José Gutiérrez de la Concha (1854-1859) and Domingo Dulce (1862-1866). The largest-scale homeopathic trial in Cuba took place in Havana in 1854-55, when nearly 2,500 Spanish soldiers and marines were inoculated with a "vaccine" against yellow fever made from snake poison by the German physician William Lambert von Humboldt. An SAMSC commission headed by the Creole doctor Nicolás José Gutiérrez – director of Havana's military hospital and later the first president of the Royal

Academy of Medical, Physical, and Natural Sciences (Real Academia de Ciencias Médicas, Físicas y Naturales, RACMFN) – concluded that the vaccine was ineffective, so inspector Fernando Bastarache stopped the trial (Pruna, 2002, p.100). However, ten years later, doctors Masnatta and Frascieri – the latter, founder of the Quinta del Rey private clinic – got permission for inoculating dozens of patients at Havana’s military hospital with “tropical dew” (Peñuelas, 1895b, p.810). The procedure was, however, rejected by a mixed RACMFN-university commission (Variedades..., 1865).

After the Ten Years’ War, the focus of SAMSC research moved towards laboratories and experimental sciences more than ever before. Many doctors still insisted on the insalubrity of the Cuban climate as a causal factor, but climate parameters were progressively redefined on physical and chemical grounds, and bodily alterations were analyzed with the new findings of physiology. Anticontagionist doctors still performed clinical trials with all sorts of drugs and procedures. In 1887, for example, Enrique Rebolledo (1887, p.45) administered salicylic acid from the German manufacturer Von Heyden to 450 soldiers of the Santa Clara garrison in central Cuba, with poor prophylactic results. Regarding contagionism, various homeopathic inoculation trials were supported by the SAMSC, with sea water, mutton liver or even black vomit itself (Roure, 1884, p.62-63; Pruna, 2002, p.387-388). However, when a French commission was invited by the Spanish government to visit Havana in 1884 to test the so-called “phenic” treatment devised by Gilbert Deplat, Cuban doctors protested unanimously (Martínez-Antonio, 2013, p.480). From that moment on, homeopathy was displaced by bacteriology, whose main figure in the SAMSC was Casimiro Roure. From 1884 on, Roure

(1884, p.134-135) put contagion center stage by arguing that a person could only get ill by means of “a virus arriving from another yellow fever patient.” Shortly afterwards, he was sent on an official commission to Rio de Janeiro to study the work of the Brazilian doctor José Domingos Freire on the causal agent of yellow fever (Martínez-Antonio, 2013, p.481). Back in Havana, Roure was appointed director of the Histochemical Cabinet – renewed in 1880 and to which inspector Pedro Joli assigned some additional staff and equipment – where he performed the first bacteriological investigations ever done in Cuba, coming close to proposing his own causal agent for the disease (Delgado, 1998).



Figure 3: Frontpage of Casimiro Roure's *Consideraciones sobre la fiebre amarilla* (1884) (Source: Open Knowledge Commons, U.S. National Library of Medicine.)

The *cámara polar* was part of this evolving SAMSC research tradition that inspector Peñuelas endorsed in Washington. Invented by a former army doctor, the chamber was co-opted by the military to become the latest in a series of therapeutic devices tested by SAMSC doctors since the 1860s. These had always combined contagionist and anticontagionist principles, in particular the use of cold in homeopathy with acclimatization practices. It seems that the first device of this type was the “catastatic apparatus” set up by Masnatta and Frascieri in Havana’s military hospital in 1864. They put “large blocks of ice in a special room ... placing them along the walls, above and below the patient’s bed, therefore surrounding him with a cold atmosphere saturated with humidity, as the ice melted inside the room” (Peñuelas, 1895b, p.810). Five years later, Lorenzo Bablot, a French-Cuban doctor trained at the Homeopathic Medicine College of the University of Pennsylvania in 1857 performed his “rational curative treatment” at Havana’s Quinta San Leopoldo (Pruna, 2002, p.100). His treatment consisted of creating an “artificial atmosphere” by using “a sort of camping tent of waterproof canvas,” into which “cold, dry, oxygenated air, with electronization of the gas blend” was pumped (Peñuelas, 1895a, p.447). Bablot’s tent was not very effective for patients, but proved inspirational for Spanish army doctors. Casimiro Roure established “a close friendship” with him and, during the Ten Years’ War, he decided with his colleague Santiago Hernández Buchó “to use cold sheets and baths and to place ice under the bed of patients, following the method of Mr. Bablot” (Peñuelas, 1895b, p.811). Once the war was over, Roure and Buchó conceived a much more sophisticated appliance:

a watertight room coated with a thick layer of potash silicate inside and outside, which absolutely prevented the mix of outside air with the artificial blend meant to be inhaled by the patient ...; the room was fed by two large enough gasometers, one of them containing sterilized air, the other, purified oxygen ... the previously sterilized air and oxygen were cooled by way of serpentine running through an ice depot down to a temperature of 10-15°C ... (Peñuelas, 1895b, p.812).

To design such a complex structure, they turned for help to the Spanish army engineer Rafael Cerero, a member of the Royal Academy (RACMFN) and an expert in physics and electricity (Pruna, 2002, p.487, 509). However, their proposal to build a prototype was rejected in 1878 because Governor Joaquín Jovellar considered the cost excessive “for just a trial” (Peñuelas, 1895b, p.812). Finally, in 1884-1885, Manuel Bango-Valdés – García’s colleague – and the Spanish navy doctor Manuel Espada tested another cold treatment at the Quinta del Rey. They put yellow fever patients “inside a sort of watertight suit filled with ice or ice-cold water,” allegedly inspired by the “ice-bags” used by British Navy doctors in Jamaica (Peñuelas, 1895b). By then, Roure had seemingly abandoned this line of research for his new interest in bacteriology. However, his outstanding involvement in cold therapy for two decades was surely a major factor behind his appointment as president of the *cámara polar* commission, a task that made him the living link between the old and new inventions. The polar chamber replaced the old homeopathic and acclimatization principles with the new findings of physiology and bacteriology, very much as Roure had done in his own research. As Estrada put it, García’s invention differed “either in its theory, or in its practice from all that has hitherto been done with cold in relation to yellow fever” (Peñuelas, 1895b, p.812).



## The struggle for national science in Cuba

Beyond its place in the SAMSC tradition of medical research, the *cámara polar* was part of a larger “yellow fever question” in late nineteenth century Cuba, namely, the struggle for medical and sanitary hegemony, which revolved essentially around that disease. Contrary to mainstream views, we believe this struggle should be analyzed in terms of national, rather than colonial science. National approaches are not new. Pedro M. Pruna (1994, 2002), in his research on the RACMFN, argued that this institution was the earliest sign of the “the role of [Cuban] national forces in the development of a scientific institution within a [Spanish] colonial context” (Pruna, 1994, p.425). It seems that he was inspired by Nancy L. Stepan’s use of George Basalla’s three-stage model of the global “spread of Western science” for the case of the Oswaldo Cruz Institute in Brazil, a successful example of “scientific excellence in the periphery” (Stepan, 1978). More recently, Steven Palmer has followed a similar theoretical standpoint in his groundbreaking work about the Institute of Histobacteriology (IHB) (Palmer, 2011). Unlike Pruna, he explicitly tries to account for the “failure” of “sovereign medical science” in Cuba in contrast with other Latin American countries. For Palmer (2011, p.448) the IHB was a product of a local medical community, whose members were “the vanguard of an emerging Creole civil society” that challenged Spanish colonial rule “by showing that Creoles were capable of professional and scientific self-government, and by creating spaces for Creole assembly and debate.” However, the IHB’s “inability to effect a successful transition from colonial to national science was ... an expression of Cuba’s troubled and curtailed attempt to move from colony to sovereign nation-state” (p.464).

In our opinion, the pioneering insights of Pruna and Palmer should be expanded by considering the Cuban situation as being more complex than a dichotomous, polarized colonial conflict between Spanish and Cuban science, with the USA taking over the role of Spain after 1898. In this sense, we believe that after the end of the Ten Years’ War, a threefold national struggle for scientific hegemony began in Cuba, involving not just Creole and Spanish, but also US researchers and institutions. America’s de facto intervention in Cuba meant, above all, that the SAMSC found itself compelled to admit and collaborate with US initiatives well before 1898. The most important were the yellow fever commissions, to which the Spanish authorities gave full support, including the organization of auxiliary Spanish-Creole commissions. Thanks to this, George M. Sternberg, a renowned bacteriologist with the US Army Medical Department (USAMD), became a leading actor in Cuban yellow fever research. The zenith of his influence was reached during the second commission, of 1888-89, when he famously dismissed the microbial candidates proposed by various European and American researchers at the IHB facilities (Sternberg, 1890). Sternberg enlisted as assistant Emilio Martínez, a doctor of the newly-established Reina Mercedes Hospital, Havana’s largest civil hospital, with whom he finished his task at the Johns Hopkins University Hospital laboratory – where Sternberg had done studies with Cuban materials as early as 1881 (Sternberg, 1920, p.72). The auxiliary commission was composed of Tamayo, Clairac, and SAMSC chemist Manuel Castro.

An earlier, longer-lasting, and less well-known US intervention was the appointment – with the acquiescence of the Spanish authorities – of the physician Daniel M. Burgess as a sanitary

inspector in Havana, first by the National Health Board in 1879, and later by the US Marine Hospital Service in 1883. Burgess was responsible for inspecting the passengers and cargo of all vessels bound for US ports for almost twenty years, making sure that those regarded as potentially carrying yellow fever were disinfected (Burgess, 1911, p.53). This measure was part of the effort to organize a US national quarantine system. But Burgess got involved in the “systematic investigations on the part of the United States government for the prevention of the entrance of yellow fever into this country” (p.96). He procured corpses of deceased yellow fever patients for Sternberg in Cuba and often sent him “reliable pathological material” to Baltimore (Sternberg, 1920, p.111). Eventually, he bought a microscope, with which he engaged in his own amateurish investigations in Havana. Burgess built a large network of local contacts, for he was a member of the Society of Clinical Studies (*Sociedad de Estudios Clínicos, SEC*) and collaborated with several *quintas de salud*. The Spanish doctor and university professor Manuel Castellanos, “one of my oldest and best friends” (Burgess, 1911, p.96), acted as the “second physician with the American Health Inspection authority” in Havana as of 1883 (Rodríguez Expósito, 1965, v.4, p.440).

The last important US intervention was the creation of a Yellow Fever Laboratory in 1889 at the recently established federal quarantine station of Dry Tortugas. As this small group of uninhabited islets was located only a little closer to Key West, Florida, than to Havana, the laboratory could almost be considered a Cuban institution. In fact, Key West-Cayo Hueso was in many ways a Cuban-oriented city, for it hosted the largest community of émigrés in the US and was the epicenter of the revolutionary movement led by José Martí. The Yellow Fever Laboratory was a spinoff of the Hygienic Laboratory set up in August 1887 at the Staten Island Marine Hospital, New York, under the direction of Dr. Joseph James Kinyoun (Harden, 1986, p.9-12). Kinyoun charged his protégé, Henry Geddins, with yellow fever investigations at the Hygienic Laboratory, but as he realized that “the special investigation on the causation of yellow fever cannot well be conducted away from the yellow fever zone” (Annual report..., 1889, p.104), a budget was authorized from the “epidemic fund” to set up the Yellow Fever Laboratory under Geddins’ management. The Cuban focus of the laboratory was soon revealed: Geddins asked for permission to travel to Havana in May 1890 “for the purpose of obtaining pathological material from the hospitals there” (Annual report..., 1889, p.104). He finally received samples from Burgess and Martínez in September, with which “a large amount of work was done and I think the foundation laid for subsequent success in the investigation ordered” (Annual report..., 1891, p.62). Despite this, the laboratory had a short and discontinuous life and never lived up to its expectations. When the Hygienic Laboratory moved to Washington in 1891, yellow fever

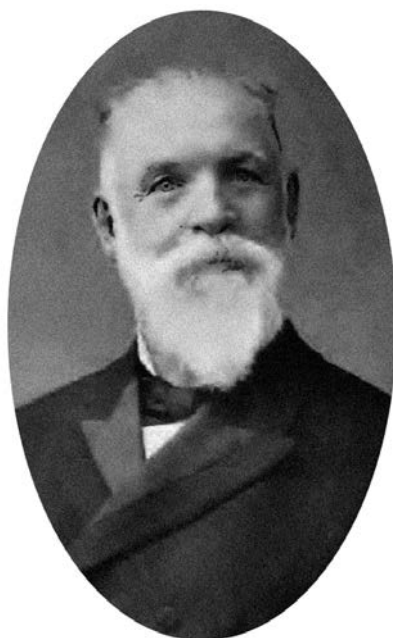


Figure 4: A portrait of Dr. Daniel Maynard Burgess (Source: Daniel M. Burgess. Personal and professional recollections. New York: [s.n.]. p. 3. 1911.)

research was recentralized there, though Geddings remained at Dry Tortugas until 1893. Four years later, accompanied by his colleague Eugene Wasdin, he formed the third US yellow fever commission sent to Cuba by Sternberg to check the findings of the Italian bacteriologist Giuseppe Sanarelli.

Despite all this, the SAMSC continued to be the main official actor involved in medical research on the island, on which American interventions actually depended. SAMSC physicians played a central role in the auxiliary Spanish-Creole commissions of 1879 and 1888-1889 and in the foundation of the Society of Clinical Studies (SEC). The Histochemical Cabinet of Havana's military hospital collaborated in research initiatives with the SEC and the Institute of Histobacteriology (IHB). Estrada suggested in his polar chamber report that it was not the first time that the SEC and the IHB "share with us similar studies in this hospital" (Peñuelas, 1895b, p.830-831). After Roure's pioneering bacteriological investigations of 1885-1886, a more modern laboratory or institute was foreseen, but neither a reform project in 1889 nor a commission by Dr. Eduardo Semprún in 1893 succeeded in creating "the histochemical cabinet we all dream of" (Peñuelas, 1895b, p.831). Two other SAMSC commissions were sent to Latin American countries in parallel to the US commissions to Cuba. Estrada and his colleague Manuel Pizarro visited Mexico in 1884 to study the work of Manuel Carmona (Peñuelas, 1895a, p.810), while Roure and his Puerto Rico-based colleague José Fernández Álvarez were sent to Brazil in 1885. The co-opting of the *cámara polar* was as much a proof of SAMSC's centrality as it showed the extent of US intervention: the results of the 1892-1893 trials were presented in Sternberg's panel at the Washington medical congress "before they were publicly known" in Cuba (Peñuelas, 1895b, p.796).

The US entry on the Cuban stage also led to the scientific empowerment of Creoles. Contrary to what might be expected, the "official" Spanish-US scheme described above was less hegemonic than Spanish institutions alone had previously been. Both actors failed to agree on the terms of their scientific "co-sovereignty" over Cuba, which lacked any international precedents, while they tried to reinforce their position against each other by making concessions to Creoles. This reinforced Creole agency was less channeled through the Royal Academy of Medical, Physical, and Natural Sciences (RACMFN) than through the SEC and the IHB, newly-established institutions led by Carlos J. Finlay and Juan Santos Fernández. While the RACMFN had followed the pattern of Spain's royal academies (*reales academias*), the new centers were modeled along US and international lines. The creation of the SEC in October 1879 – and especially its Permanent Commission for the Study of Yellow Fever, in early 1880 – aimed to continue the work of the first US and auxiliary yellow fever commissions. Finlay began his own investigations on the mosquito as a vector of yellow fever there in close association with Delgado (López Sánchez, 1987, p.149). By 1882, however, this *Comisión* had to interrupt most of its work for lack of funds. The IHB under Juan Santos Hernández, Cuba's top bacteriological laboratory, was directly inspired by the model of the Pasteur Institute in Paris – to which Santos had sent a commission of three Cuban doctors (Tamayo, Francisco I. Vildósola and Pedro Albarrán) – but also owed a debt to US entrepreneurship, as the equipment was purchased in New York (Palmer, 2011, p.454). Although Santos was the founder and sponsor of the center, bacteriological research was done by younger physicians

such as Tamayo, Enrique Acosta, Juan Dávalos, Julio San Martín, and Domingo Madan. The failure to find the yellow fever microbe ultimately oriented their efforts towards other goals.

The dynamism of the new institutions did not mean that the RACMFN ceased to have a central role in Creole research. The academy witnessed heated debates between its members on the causal agent of the disease, such as the ones between Finlay and the French doctor Paul Gibier, and Santos and Tamayo in the late 1880s (Pruna, 2002, p. 404). It was also there that Sternberg publicly presented the first results of his work during the second US commission. However, the RACMFN's authority was gradually undermined by its lack of experimental facilities and staff, limited to those dedicated to the production of the smallpox vaccine (Pruna, 2002, p.348). There were at least two attempts to overcome this situation. In 1887, Finlay and Delgado asked Cuba's governor to create a laboratory for bacteriological research, especially on yellow fever, at the RACMFN, to be "funded and maintained by the national government." They argued that the Spanish authorities should imitate the "imperial government of Brazil and the national governments of Mexico and the USA, which grant generous allowances and establish well-funded prizes to make those investigations possible" (Rodríguez Expósito, 1965, v.1, p.441). The academics endorsed Finlay's demand, with President Nicolás José Gutiérrez taking the lead. The second attempt was launched by Santos Fernández. In the 1890s, when his faction controlled the RACMFN, he did all he could to turn it into the "de facto organizer of scientific research and health policy" in Cuba, under whose aegis the Institute of Histobacteriology (IHB) should be granted "the status of a national research laboratory" (Palmer, 2011, p.458). Both projects were ultimately unsuccessful.

The duplication of hegemonic and subordinated actors in Cuba's "yellow fever question" was not the only change in 1878-1895. The power asymmetry between them narrowed, too. A singular entanglement emerged from this proximity that pushed actors across ethnic, doctrinal, and institutional boundaries. For example, Finlay, Santos Fernández, and Tamayo were members of the RACMFN, and this association, which in 1865 had not had a single Spanish or American member in its ranks, admitted six of each nationality in 1878-1895, including Delgado, Roure, and Sternberg (Pruna, 2002, p. 531-39). All six doctors also belonged to the Society of Clinical Studies (SEC), as did Pardiñas, Clairac, and Burgess. SAMSC doctor Eduardo Semprún joined the IHB, where he investigated anaerobic microbes of the soil and suggested a new treatment for yellow fever (Pla, 1890, p.12). From 1886 to 1888 Roure, Sternberg, Finlay, Delgado, Tamayo, and Martínez did bacteriological research in Cuba and often engaged in public debates over the validity of their respective discoveries. Finlay and Delgado, who developed the mosquito theory of transmission during their two-decade-long association, kept up a regular exchange of correspondence and biological materials with Sternberg on that issue, which the American bacteriologist discussed in some publications (Sternberg, 1890, p.164-66). Havana's military hospital provided the corpses and material that sustained the investigations not just of the SAMSC doctors, but of most Creole and American researchers (Sternberg, 1890, p.9; Pla, 1890, p.12). Finlay, Delgado, Santos Fernández, Tamayo, Semprún, and Martínez, among others, attended the polar chamber trials in 1892 (Peñuelas, 1895b, p.813).

Nationalist narratives have unanimously obscured and rejected this entanglement, which put their "invention of tradition" in question. Of course, the most notorious example of

this was the effacement of Finlay's contribution to the mosquito theory by US researchers. But Finlay's common depiction as a solitary hero frustrated by Spanish colonialism, which deployed in Cuba "the most ill-fated of all policies" (López Sánchez, 1987, p.137), belies the support he demanded and attracted from some Spanish institutions and researchers. It is also questionable to affirm that "nothing was further away" from Creole researchers than Roure's trajectory (Delgado, 1998), for this doctor graduated from Havana University, spent his whole career in Cuba, was admitted to the SEC and the RACMFN, and maintained close relations with Finlay and Fermín Valdés-Domínguez. The first US yellow fever commissions have been depicted as one-sided American initiatives, removing decisive Spanish consent and involvement (Espinosa, 2009), while Spanish historiography, either hagiographic or self-deprecating, has ignored SAMSC's close links with Creole and American institutions and researchers (Massons, 1994). In our opinion, the most innovative and inclusive research on yellow fever in Cuba was actually a result of hybrid, entangled initiatives whose ultimate success was only prevented by an insufficient degree of convergence. It might have been, as Steven Palmer has suggested, that the solution for the yellow fever question would have required the IHB to have dedicated "its immense intellectual, political, and technical resources to explore Finlay's hypothesis" (Palmer, 2011, p.457). It could also be argued that the projects to connect the SEC and the IHB with a new laboratory at the RACMFN would have been equally fertile. We believe, however, that an eventual success would not have been possible just with the convergence of Creole initiatives, but required the transnational fusion of Creole, Spanish, and American elements. Was this really possible?

Ultimately, we argue that the struggle between three "national science" projects – the Creole, Spanish, and American – both allowed for and limited entanglement in Cuban yellow fever research. The multiplicity of national projects sapped the colonial hegemony, but as their center of gravity was located outside Cuba (even for the Creoles), centrifugal forces made full local convergence ultimately impossible. Besides, those projects were articulated around cholera, not yellow fever. This can be seen in one of the Spanish institutions that embodied the "national science" project that aimed to assimilate Cuba: the Military Institute of Anatomopathology (Instituto Anatomopatológico de Sanidad Militar, IASM). This center was created after the Histochemical Cabinet of Madrid's military hospital was assigned larger funds and staff to test Jaime Ferrán's cholera vaccine in the middle of a cholera epidemic in Spain that was seriously affecting the army in 1885. The Cabinet became the IASM in 1888, with the physician Cesáreo Fernández de Losada as its director. In a striking coincidence, an IASM commission composed of Gregorio Andrés y Espala and José Alabern (1888) visited the Pasteur Institute of Paris at almost the same time as the one sent by Santos Fernández from the IHB. But army doctors rejected Pastorian bacteriology, so the IASM never became a research center, but a sort of hygiene institute *avant la lettre*, where priority was given to sanitary campaigns and education. Following the rhythm of metropolitan cholera outbreaks and concerns, the IASM centralized those functions for the whole Spanish empire – the Army Vaccination Institute was attached in 1890, the Army Medical School in 1895 – while the Cuban army was denied the resources that Roure's bacteriological investigations and the *cámara polar* needed.



In the US, the Hygienic Laboratory was the key institution for the “national science” project. Its creation in 1887 was a direct response to the “looming threat” of cholera being imported from Europe (Morens et al., 2012, p.12). Although the Yellow Fever Laboratory spinoff seemed to acknowledge the need to investigate yellow fever and to develop local research institutions in Cuba for that purpose, the move of the laboratory to Washington in 1891 brought it to a close. The relocated Hygienic Laboratory became essentially a part of the “broader public health effort” of the US Marine Hospital Service, with “no effort made to advance research as a separate concern from this larger issue” (Harden, 1986, p.3). Only cholera prompted some investigations: the direct links of Kinyoun with Robert Koch were decisive in this sense (p.13). But public health prevailed: in late 1892, Kinyoun was enlisted to prepare the draft of a new National Quarantine Act right after the cholera scare triggered in New York by immigrants arriving from Hamburg (Morens et al., 2012, p.16). In the end, the IASM and the Hygienic Laboratory advocated “scientific integrationism/annexationism” for Cuba, so that the island became just another Spanish province or US state whose epidemics were managed from central metropolitan institutions. However, these developed slowly, neglected research, and ignored yellow fever – the ultimate paradox, because the very institutions that aimed to nationalize Cuban medical research could only reach that goal if they failed to care for the greatest source of mortality for their fellow nationals.

Finally, the Cuban “national science” project was not so much the potential transnational fusion mentioned above, as a revolutionary project whose “national” features were still in the making. In this period, it still lacked a real institution or real initiatives. Its leaders were Creole doctors in exile or outside the island’s main research institutions, and therefore centripetal. The case of José Martí, in whose extensive writings no mention was made of yellow fever investigations (Delgado, 2007), suggests they did not intend to create a central research laboratory, but focused on social medicine programs. Yellow fever did not worry them because the disease was less dangerous for Creoles and excluded social groups such as Negros. Actually, they regarded it as an important ally in the fight against foreign imperialism – the popular “General Vomit.” Yellow fever would not threaten a future independent Cuban state either, because revolution was not meant to lead to the mass influx of foreign immigrants, but to previously marginal or exiled Creoles and Negros carrying out the development of the nation’s economy and society (Guerra, 2005, p.120). However embryonic this Cuban project was at that time, it contributed to the failed convergence between yellow fever research projects on the island, the polar chamber included.

### **The unpolarized politics of the *cámara polar***

Medical historiography has explored how the yellow fever question was a fundamental aspect of the “Cuban question” – i.e., the struggle for the political destiny of the island. Some decades ago, certain authors emphasized how the disease added to the social and economic disruption created by Spanish colonialism – and also revealed it, especially during epidemics. More recently, interpretations have focused on how yellow fever was constructed to serve socio-political objectives, for example, to justify US imperialism in Cuba. In this paper, however, we do not look into the politics of the *cámara polar* outside its scientific aspects.

We do not ascribe its supporters or its scientific content to a particular political current. Instead, we follow Bruno Latour's invitation to find politics in science itself, "down there in the laboratory ... in front of one's colleagues" (Latour, 1992, p.303). We thus aim to explore how, in its own specific way that differed from the mosquito and germ theories, the *cámara polar* constructed both yellow fever and Cuban politics simultaneously through multiple "translations/displacements" (p.302). We focus on how medical researchers claimed that what they did in the laboratory was "relevant to the practice of people who are outside;" and also on how they chose what was "representative" in yellow fever in order better to understand or fight the disease (p.297, 302).

When the physician Alfredo García laid out the scientific foundations of the *cámara polar* to the SAMSC commission in 1892, he used the concept of "microbe" to redefine the old narrative of "contingent contagionism." According to Charles Rosenberg (1992, p.298), this theory put forward the idea that "inadequate ventilation and light, putrefying organic material, crowding [and] malnutrition" induced pathological metabolic changes in people's bodies, whose subsequent "organic exudates" turned their immediate surroundings into an ever more "malignant microenvironment" that facilitated the transferability of a disease from the sick to the healthy. García substituted the direct action of atmospheric conditions on the body and the body's "exudates" for microbes. As a result, the origin and progress of yellow fever became rooted in what we would call an "infectious microenvironment" – a body whose immediate surroundings showed an overabundance of microbes and atmospheric conditions that favored their multiplication, as well as the toxic effects upon the body of their "pathological products" (ptomaines, leucomaines; Peñuelas, 1895a, p.798). There, "reinfections" introduced microbes into the body in ever larger quantities, the total number determining the severity of the disease (Peñuelas, 1895a, p.798). The progressive microbial "saturation" of the microenvironment had its origins in the patients themselves, who acted as a "permanent foci of infection" by releasing microbes to the outside through their vomit, sweat, and breath (Peñuelas, 1895a, p.798). But it was also due to the Cuban climate, especially the heat, which favored microbial multiplication. Heat also "predisposed" the body to greater damage by toxic products.

On these grounds, the therapeutic strategy of the polar chamber consisted in neutralizing the infectious microenvironment by creating "as antiseptic an atmosphere as possible" around the patient (Peñuelas, 1895a). This was possible thanks to the patient's isolation within the chamber, with a current of air that carried the bacteria released from the body outside, as well as the cold temperature, the low light, and the other conditions within the chamber, which killed microbes and increased bodily resistance to ptomaines and leucomaines (Peñuelas, 1895a). The *cámara polar* did not intend to cure yellow fever, just to prevent its evolution towards an advanced stage, putting the life of the patient at risk. This was no minor goal, because it sought to alter "the natural evolution of the malady, something which sheer pharmacological treatments have not hitherto managed to do" (p.800). If such evolution was blocked, subsequent drug treatments had a better chance of success (p.829). The key of the polar chamber was, then, to use it on patients who had fallen ill very recently and had therefore been infected a small number of times, ideally once. But the *cámara polar* could also help to prevent epidemics. A stable early-stage patient would never act as a "permanent focus of

infection” because his/her body would not release enough microbes to the microenvironment to infect or reinfect others.

The *cámara polar*, thus, “made room” for infectious microenvironments in Cuba, in the sense that Bruno Latour (2011, p.96) argued Pastorian bacteriology had done for microbes in France. But Latour claimed that the germ theory had also helped to integrate urban masses “to enforce social regeneration” in that country (p.96). What was the political effect of the polar chamber? In this respect, as in its scientific foundations, García’s invention followed the path of Casimiro Roure. Roure (1884, p.10) had argued in his 1884 book that, as long as yellow fever persisted in Cuba, “European immigration was not possible; without European immigration, population growth is not possible; without population growth, there are no hands; without hands, there is no agriculture; without agriculture, there is no commerce; and without commerce there is no wealth.” Only its “disappearance, cure or decrease” would consolidate “the preponderance of the white race over the others ... and secure our power and wealth in America” (p.10). These views confirm Stepan’s argument that “yellow fever was of concern to the Spanish authorities in Cuba ... because of the obstacle it posed to white immigration” (Stepan, 1978, p.400). But exactly what group of white immigrants was Roure concerned with? He mentioned agricultural workers as a preferential group, but he did not develop the question. The *cámara polar* makes this clearer. Among the 123 patients treated in Santiago de Cuba and Havana, there were 49 salesmen, forty miners, 11 soldiers, and two factory workers for 80% of the total (Peñuelas, 1895a, p.804-824). Therefore, the chamber was designed to make room for Spanish working class people and soldiers in Cuban society.

Salesmen (*dependientes del comercio*) were the largest group – they would be even larger if we had found statistics of the trial done at the CADC mutual aid society in Havana. *Dependientes* formed a large collective of Spanish white “semi-free” workers of peninsular origin. These young, single men who arrived mainly from Spain’s northern regions (Asturias, Galicia, Cantabria) to work in “grocery stores, hardware stores, butcher shops and all sorts of businesses” endured harsh working and living conditions, for they even slept in the back of the stores where they worked “16 hours a day with no break on Sundays” (Casanovas, 1998, p.73). As a result, they often contracted yellow fever, usually being among the first and worst struck groups in the epidemics that periodically ravaged Cuba. Despite this, Roure noted that when they fell ill, most *dependientes* chose to be assisted “in the very storehouses or shops or in certain private houses run by women who took care of them for a sum” (Roure, 1884, p.116). The reason behind this was the “horror” inspired by conventional treatments (i.e., bloodletting, emetics or both) forced upon them in charity hospitals or private practices. In the shops and houses, salesmen were instead given “big glasses of sweet almond oil, to which lemon juice was added and some jugs of tepid water to induce vomits.” This less aggressive remedy had no other positive effect than preventing them from taking the above-mentioned treatments, but its popularity obliged “not a few” licensed doctors to adopt it to “win over and keep their clientele of the commerce houses” (p.117-118).

The creation of the first *casas de salud* by mutual aid societies which *dependientes* had begun to join from the late 1870s did much to bring them within reach of standard treatments, but the oil was still widely used. In this context, the *cámara polar* seemed to be particularly suited to allow those societies to integrate *dependientes* in conventional healthcare once

and for all. On the one hand, the chamber was compatible with the continuing use of the traditional remedy, because it just focused on containing yellow fever, on keeping patients in an early stage of the disease. If this was achieved, the disease would either spontaneously resolve itself, or respond much better to any eventual treatment – sweet almond oil included! On the other hand, the chamber did not oblige salesmen to modify their working or living habits. If the evolution of the disease was blocked, the bodies of the patients would release much fewer microbes. As a consequence, the microenvironments of the shops – especially favorable for the progress of the disease because of the accumulation of microbes, the heat and the lack of light and ventilation; and for its diffusion, because of the close contact between the shopkeepers and the customers and their continuous coming and going – became somewhat less infectious. The chances that isolated yellow fever cases would evolve into an epidemic outbreak by microenvironmental transmission in stores would be much lower if the *cámara polar* prevented the salesmen from becoming permanent foci of infection.

The therapeutic success of the chamber would have thus led *dependientes* to join mutual aid societies in greater numbers. As Rubén Lahullier (2006, p.183) has pointed out, “the integration of medical care into the associative projects of the late 1880s became one of the main tools to procure a large membership.” The competition between the societies’ health centers (*casas de salud*) was therefore very intense, eventually engaging in marketing strategies that ranged from lower prices to state-of-the-art medical equipment. The polar chamber could have been a decisive technological advantage, and that was surely a reason why the CADC gave permission for a trial in 1892. The consolidation of the mutual aid societies would have offered *dependientes*, in turn, a way for stronger socio-political integration. Despite their large number, they had long been social outsiders, playing a role in Cuban politics only in exceptional occasions in which they were manipulated by Spanish integralism – for example, when they operated within the paramilitary units of volunteers during the Ten Years’ War or when the new electoral law of 1890 allowed the adscription of their vote to the integralist party, Unión Constitucional, without their consent (Casanovas, 1998, p.79, 243). But continuing marginalization between 1878 and 1895 also led many of them to “uphold republican and anarchist ideas” and even to sympathize with Cuban separatists (p.243, 269).

Mutual aid societies aimed to end this situation. Their ultimate inspiration was found in ideals of harmonious coexistence between the bourgeoisie and the workers. According to them, each class should accept its respective place in society for the common good, the bourgeoisie being expected to promote the creation of educational, cultural or economic associations and the workers to join them and eventually become bourgeois themselves. In Cuba, these ideals were promoted by the various social and political constituents of the autonomist movement. For example, as Delphine Sappez (2015, p.78) has recently argued, the Liberal Autonomist Party (Partido Liberal Autonomista, PLA) sought from the mid-1880s to expand its social base, “conscious that it was necessary that it came to represent all the layers of society in order to achieve its ideal of justice and regeneration.” Various autonomist actors also supported workers’ membership of Freemasons’ lodges and cultural associations, and their participation in the *Círculo Autonomista de Obreros*. The creation of mutual aid societies and their *casas de salud* pursued similar aspirations which, in the end, aimed to prevent workers (*dependientes* in particular) from either remaining in the grip of Spanish



Figura 5: View of the *casa de salud* La Purísima Concepción of Havana's Asociación de Dependientes del Comercio, unknown date (Source: Google images)

integralism, or subscribing to anarchism or separatism. The rich merchants opposed the CADC because of the “greater freedom to which those who supported that Association would necessarily aspire” (Lahullier, 2006, p.177), while anarchists criticized the associations for pursuing “social containment” (Casanovas, 1998, p.208).

The polar chamber, through its eventual contribution to the expansion of mutual aid societies, especially the CADC, would have favored the social integration of *dependientes* and reinforced the hybrid initiatives of autonomism. That would have been its specific contribution to an unpolarized solution of the Cuban question. Analogously to what we said in the previous section, we think that after the Ten Years' War this question was framed by a threefold struggle between Spanish, Cuban, and US projects. Either Cuba became an independent nation, or it was to be integrated as a province of Spain or as a state of the US. If the most abundant and innovative research on yellow fever was done in middle ground between the three “national science” projects, we argue that the most constructive and peaceful proposals for the “Cuban question” were located between those polarized national extremes too. The *cámara polar* promoted autonomism, as did Finlay's mosquito theory and the IHB, each in its own way. Not surprisingly, their leading figures subscribed to autonomist political goals. Roure, for example, was a member of the provisional board of the National Liberal Party (Partido Liberal Nacional) in 1878 (Los partidos..., 5 Sep. 1878), while Juan Santos Fernández's laboratory “must be located in the context of an autonomist creole political project” (Palmer, 2011, p.468).



## Final considerations

The *cámara polar* was a “failed” invention. Its scientific foundations were never accepted, and unsuccessful trials jugulated its future as a viable therapy. However, when the world-famous Nobel Prize-winning parasitologist Sir Ronald Ross used a “cold chamber” to investigate “the effect of cold on yellow fever” (Gordon-Thomson, Ross, 1911, p.678) – what he called “cryotherapy” – García’s invention was regarded as potentially effective. Patients had just been exposed to “too much cold” and humidity, when “the first essential in cold-air treatment is proper comfort and protection for the patient” (p.678). This recognition came too late, however, for either the medical or the political goals of the chamber in Cuba, the latter aiming to provide tools for mutual aid societies to acquire greater development with which to advance the social integration of Spanish immigrant workers and autonomist projects for Cuban society. Examining this “failed” history of the polar chamber is useful, nevertheless, to reveal a much more complex view of the yellow fever and Cuban “questions” in the late nineteenth century than is usually provided. If Cuba was not the right island for the polar chamber, it was not a polarized society either, no matter how much the entangled, intermediate nature of most research and political proposals has been obscured by nationalist historiographies.

## ACKNOWLEDGMENTS

This paper was prepared with the support of CIDEHUS, UID/HIS/00057/2013 (POCI-01-0145-FEDER-007702) and the FCT project IF//00835/2014CP1232/CT0002.

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