



"Columbia's Easter Bonnet." *Puck*, April 6, 1901. (General Research Division, New York Public Library, Astor, Lenox and Tilden Foundations)

COLONIAL CRUCIBLE

*Empire in the Making of the
Modern American State*

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Heiser believed that this was a public health initiative that pleased nearly everyone—one of the few. “The city liked it because of the income, the dealers because of the cheap rents, the housewives because of the wide choice of foods,” and the public health authorities because of the enhanced sanitary control. During the worst of the cholera epidemics, the authorities required everyone entering market buildings to disinfect their hands.²⁴

CONCLUSION

The imposition of American imperial rule brought a roughshod urgency to tackle the larger problems of what the Americans saw as “public health.” At its best, a small set of public officials was able to make a substantial difference in sanitary regulation, infrastructure development, and the training of Filipinos to participate in and carry on the work. The decision at the outset not to create a segregated American cantonment meant that most of these interventions yielded more or less beneficial results for much of urban society not just or primarily the foreigners. Experience in Manila also yielded benefits for American cities. In particular, Victor Heiser was called on during his Manila service to consult with Seattle and other American ports on the practical public health matter of rat and plague control. And, at the aesthetic level, William E. Parsons brought to California a distinctive Spanish-Philippine-American take on public and residential architecture. In Daniel Burnham’s case, what the city structure gained from his cosmopolitan experience and perspective is more readily apparent than what he may have learned and later applied in the United States.

Like Heiser and Parsons, James Case found a great opportunity in the imperial enterprise to gain professional experience by taking on important problems—in his case in engineering and public works. Case moved on within imperial channels first to Havana and then to war-torn France, further applying and developing his skills. Heiser also moved on in the colonial world but in his case through the auspices of the private Rockefeller Foundation.

None of this is said with an eye to defending imperialism, since it has no defense, but is presented to show some of the connections and some of the opportunities for socially useful work, such as solving urban sanitation and provisioning problems. Without such solutions, the megacity that is modern Manila could hardly have emerged.

“The World Was My Garden”

Tropical Botany and Cosmopolitanism in American Science, 1898–1935

STUART MCCOOK

IN THE SECOND HALF OF THE NINETEENTH CENTURY, the United States created a large domestic agricultural research infrastructure. Through the Morrill Land-Grant Act (1862), and the Hatch Act (1887), the federal government created and funded a national network of state agricultural colleges and experiment stations. In 1888, the U.S. Department of Agriculture (USDA) established an Office of Experiment Stations (OES) in part to act as a clearinghouse for the research conducted by the state experiment stations. In 1900, the USDA consolidated its extensive agricultural and botanical research divisions into the Bureau of Plant Industry. The U.S. National Herbarium, housed at the Smithsonian Institution, contained one of the continent’s largest collections of botanical specimens.¹ Surprisingly, however, before 1898 these public research institutions conducted no significant research on tropical plants even though the United States was by that point one of the world’s largest consumers of tropical crops.

This indifference to tropical research came to an abrupt end in 1898 when U.S. imperial expansion—both formal and informal—created a large demand for experts in the study of tropical plants. American officials and business people alike wanted to make sense of the complex and unfamiliar tropical landscapes newly under their control; they also wanted to make these landscapes as productive and profitable as possible. The work of tropical plant scientists in this period, therefore, fell into two major areas. One group of scientists—the botanists—were primarily concerned with collecting, classifying, and mapping tropical plants. Botanists focused mainly on wild plants in their native habitats. The second group—the agricultural scientists—devoted their attention to cultivated plants in agricultural ecosystems. The main purpose of their research was to solve agricultural problems, particularly issues of how to sustain and increase agricultural production.

After 1898, federal research agencies in Washington, D.C.—especially the USDA, the U.S. National Herbarium, and later the National Research Council—developed new research initiatives in tropical botany and agriculture. In addition, the new territories, protectorates, and nations created in the wake of American expansion established agricultural and botanical research centers. Most of these were modeled on the state or federal research centers in the United States. The federal agencies in Washington provided most of the staff for these institutions. American expansion thus created a new career path for American plant scientists. Young graduates from the state agricultural colleges would find work at a government laboratory in Washington. From Washington, they obtained jobs at one of the new research centers in the tropics. Few of them had any experience with tropical botany and agriculture, so they learned on the job. Once they had developed some experience and expertise, many moved to other institutions in the tropics, sometimes with intervals at institutions in the United States. Most ultimately returned to research or teaching positions in the United States after a decade or two in the tropics. These scientists helped consolidate tropical botany and agricultural research at home. American expansion thus transformed the plant sciences in the United States from a nationalist and parochial enterprise into one that was cosmopolitan and global.

SURVEYING TROPICAL FLORA: PLANT HUNTERS AND AGRICULTURAL EXPLORERS

For American scientists, the newly acquired tropical territories were botanically terra incognita. American plant hunters and agricultural explorers began collecting plants across the tropics. Botanical surveys were the botanical counterparts to the censuses and surveys that the U.S. government had conducted in most of its new tropical possessions. They were designed to make unfamiliar tropical plants and landscapes legible and manageable for Americans both for scientific and for commercial purposes. The research also helped translate local vernacular botanical knowledge into more “universal” botanical Latin and English.

In the early decades of the twentieth century, the U.S. government became a leading publisher of both pure and applied botanical research in publications such as *Contributions from the U.S. National Herbarium*, the *USDA Yearbook of Agriculture*, and other USDA bulletins and circulars. Many of the earliest U.S. publications on tropical botany were written by Orator Fuller Cook, one of the few American botanists who had any experience in the tropics before 1898. A graduate of Syracuse University, Cook worked as a special agent for the State Colonization Society in Liberia, from 1891 to 1898, before joining the USDA as a “botanist for tropical agriculture” and later as a “biomist in charge of acclimatization and adaptation investigations.” A prolific researcher and writer, he wrote important botanical studies on the economic plants of the tropics. In one brief

period, for example, he produced studies on shade in coffee culture (1901), the economic plants of Puerto Rico (1902), the Central American rubber tree (1903), the food plants of ancient America (1903), cotton culture in Guatemala (1904), and the nomenclature of royal palms (1904).²

In addition to narrow studies on particular groups of plants or areas, American botanists also published comprehensive regional floras of the tropical regions where they worked. For example, the botanist E. D. Merrill—an employee of the Philippine Bureau of Agriculture and Forestry and a former USDA agrostologist—published *Flora of Manila* in 1912. It was based in part on his extensive field researches in the Philippine archipelago. It also translated and incorporated the work of naturalists from the Spanish colonial period such as Manuel Blanco’s *Flora de Filipinas* (1837).³ In the Americas, the botanist Paul Standley—a graduate of New Mexico State College and an employee of the U.S. National Herbarium—wrote several important floras for Central America. Between 1909 and 1928, Standley spent much of his time conducting botanical research in Central America, producing many research papers and full floras of the Panama Canal Zone, Panama as a whole, and the Lacanja Valley, Honduras (home to the United Fruit Company’s agricultural research center). Later, after he left the U.S. National Herbarium, he also wrote national floras of Costa Rica and Guatemala. Like Merrill’s work in the Philippines, Standley’s work in Central America was partly based on extensive original research and partly on a synthesis of the work of earlier researchers.⁴

American botanists in this period were also engaged in plant hunting—exploring the globe for useful plants that could be acclimatized in the continental United States. Scientists at the USDA believed that carefully planned introductions could greatly enhance the United States’ agricultural potential. This position was argued most forcefully by David Fairchild who ran the USDA’s Office for Seed and Plant Introduction (OSPI) from 1903 to 1928. Fairchild practiced what he preached, and his long tenure at the USDA was interrupted by frequent and lengthy expeditions to the tropics.⁵ The OSPI employed many American botanists as agricultural explorers. Perhaps the best-known was Fairchild’s fellow-Kansan Wilson Popenoe, who worked for the office as an explorer from 1913 to 1925. In these years, Popenoe traveled to Brazil to study the navel orange, to Florida and Cuba to study the mango, and to Guatemala to study the avocado. Popenoe also made shorter trips to the Pacific, visiting Hawai’i, the Philippines, and several other countries. His job at the Bureau of Plant Industry had, in a few short years, taken him virtually everywhere in the formal and informal American empire in the tropics. Based on this research, Popenoe published the *Manual of Tropical and Subtropical Fruits* in 1920. This book symbolized the new pan-tropical scope of American plant sciences; it transcended any particular country or continent, taking as its subject the entire tropics. This book remained

the definitive work on the topic for several decades; it was reissued as late as the 1970s.⁶

In the 1920s, however, ecological cosmopolitanism gradually fell out of favor in the United States as botanical nativists—who sought to preserve the country's native vegetation as much as possible and protect it from "foreign" invaders—gradually gained the upper hand in shaping disease legislation. In 1918, as the nation retreated from its colonial adventures, the USDA passed restrictive regulations for plant quarantines, effectively ending the era of botanical cosmopolitanism in the United States. The importance of acclimatization in botanical research declined sharply. In spite of this, the flow of dried herbarium species continued virtually unabated, and the United States remained an important center for the description and classification of tropical plants (especially from the neotropics). It consolidated this position during World War I, when exchanges between European herbaria and the tropical world ground to a virtual standstill. While European herbaria did recover after the war, by that point American herbaria had decisively gained the upper hand.⁷

After World War I, as growing botanical nativism limited opportunities for botanical research in the USDA, the National Research Council's Division of Botany and Agriculture assumed a greater role in promoting tropical plant research. In the 1920s, academic biologists in the United States organized the Institute for Research in Tropical America to coordinate the efforts of biologists working on the American tropics. In 1922, the institute's executive committee—which included biologists from Harvard University, the Smithsonian Institution, the New York Academy of Sciences, the Philadelphia Academy of Sciences, and the University of Michigan—decided to organize a research station in Panama.⁸ The station was to be managed by the institute and supported by "the museums and colleges of America," which were supposed to collaborate with small grants. The following year, a committee of American scientists convinced the Canal Zone's governor to set aside Barro Colorado Island, "a beautiful area of virgin, tropical rainforest about six miles square . . . as a forest reservation to be used in connection with a biological station." Thomas Barbour, then the curator of reptiles at Harvard's Museum of Comparative Zoology, oversaw the construction work.⁹ The entomologist James Zetek, formerly an entomologist with the USDA and the Isthmian Canal Commission, was appointed the laboratory's resident custodian.¹⁰

The station became a popular summer destination for American academic biologists almost immediately. It helped form and define an American community of academic researchers in tropical biology, including such eminent scientists as David Fairchild (who was still formally attached to the Bureau of Plant Industry), Thomas Barbour, Frank Chapman, and Warder Allee. At Barro Colorado Island American tropical botanists began to move beyond their traditional work of collecting and classifying plants, conducting pioneering work in tropical

ecology.¹¹ While various agencies of the U.S. government provided logistical support and support in kind for the laboratory, the government never made any significant financial contribution to the station's operating expenses. The station's finances—and its very existence—remained precarious until 1946 when it was incorporated into the Smithsonian Institution.

EXPORTING AMERICAN AGRICULTURAL RESEARCH TO THE TROPICS

Besides collecting and acclimatizing tropical plants, Americans also built agricultural research institutions in the tropics. These were often modeled on state and federal agricultural centers in the United States. American agricultural research in the tropics sought to "rationalize" tropical agriculture by applying American ideas and practices to tropical landscapes. Although the process of exporting American models to the tropics was fraught with difficulties, it created a global network of tropical agricultural researchers.

In 1900, the U.S. Congress authorized the establishment of federal experiment stations at Mayagüez in Puerto Rico and near Honolulu in Hawai'i; later it opened research stations in Guam and the U.S. Virgin Islands. The new national government of Cuba and the insular regime in the Philippines also created agricultural research institutions along the American model. In Cuba, the USDA helped organize the Estación Experimental Agronómica near Havana in 1904; its first director was the Louisiana sugarcane researcher Franklin Sumner Earle. The American government in the Philippines established a range of biological, medical, and agricultural research institutions after 1899; in 1905 the government consolidated them into a central Bureau of Science in Manila. In 1909, the government established a Philippine College of Agriculture at Los Baños, staffed entirely by American scientists. Private individuals and groups also sought to bring the purported benefits of American agricultural science to the tropics. The Hawaiian Sugar Planters Association (HSPA)—dominated by planters from the United States—hired its first scientist in 1895. By 1939, the HSPA experiment station had grown to a staff of fifty scientists. Similarly, the Puerto Rico Sugar Planters Association founded an experiment station at Río Piedras in 1910. While the HSPA station prospered, its Puerto Rican counterpart stagnated. In 1914, Puerto Rico's insular government acquired the station and rebaptized it the Insular Experiment Station. In Cuba, the Boston-born sugar planter Edwin F. Atkins established a botanical garden at his sugar mill near Cienfuegos, Cuba, in 1904. Somewhat later, in the 1920s, the Cuba Sugar Club established an agricultural experiment station of its own. American corporations also spread the influence of American agricultural ideals and practices beyond the United States' formal tropical territories and protectorates. In 1930, for example, the United Fruit Company founded a banana research station and botanical garden at Tela, in the Lancetilla Valley of Honduras.¹²

These tropical research institutions opened a new career path for American agricultural scientists, creating a generation of American experts in tropical agriculture. American scientists regularly moved from one part of the tropics to another, between public and private institutions, and between the tropics and the mainland. Most of them, at one point or another, passed through either the USDA or the Smithsonian Institution. The career of the scientist Otis Warren Barrett is a good example of the career trajectories opened by American expansion. After receiving his bachelor's degree from the University of Vermont in 1896, Barrett worked for the West India Improvement Company and the Mexican Comisión Geográfico-Exploradora. He then moved to the federal experiment station at Mayagüez in Puerto Rico, after which he worked as a "plant introducer" for the USDA in Washington, D.C. He left the USDA to become director of agriculture for Mozambique. Later he worked as the chief horticulturalist for the Bureau of Agriculture in the Philippines, as a horticulturist in the Panama Canal Zone, as an agricultural adviser for the Liberian government, as director of agriculture for the Department of Agriculture and Labor in Puerto Rico, and finally as a horticulturalist in Hawai'i.¹³ Barrett's career was not unusual; dozens of other American agricultural scientists followed similar paths through the new centers for tropical research. Barrett illustrates the tremendous demand for experts in tropical agriculture across the tropics in the early decades of the twentieth century.

Agricultural research at most of these tropical institutions focused on the main export crops—sugar above all—destined for U.S. markets. At first, the USDA had wanted the experiment stations in Puerto Rico and Hawai'i to promote "democratic farming." In this view, the stations would conduct research that would benefit small farmers and would help diversify the islands' economies while also helping the United States become "self-sufficient" in tropical crops. Both stations conducted extensive work on coffee, pineapples, and other tropical cash crops. None of this research, however, could stem the gradual dominance of sugar on these islands. Most research in tropical agriculture in this period, then, was devoted to making the existing agricultural systems more efficient and productive. Agricultural scientists at these institutions focused on acclimatizing new varieties and hybrids of the main crops from abroad. American scientists and institutions in the tropics began to participate in a global intertropical exchange of seeds and plants. For example, experiment stations in Cuba and Puerto Rico exchanged sugarcane varieties and hybrids with research centers in the Dutch East Indies and with British and French institutions in Asia, Africa, and the Caribbean Basin.

American researchers in the tropics also had to contend with new environmental problems in their tropical crops. Ironically, many of these agricultural problems were the result of the explosive expansion of American demand for

tropical commodities, which had led, in turn, to the rapid expansion of crop cultivation and the virtually unrestricted global movement of seeds and plants.¹⁴ Soil scientists confronted the emergent problems of chronic soil exhaustion and soil erosion. Plant pathologists were mobilized to address the growing range of diseases and pests that plagued these crops. In 1903, the coffee rust fungus (*Hemileia vastatrix*) was accidentally taken from Java to Puerto Rico in a shipment of coffee plants. Fortunately, the shipment was inspected by the botanist Otis Barrett—then working at the Mayagüez experiment station—and he recognized the fungus and destroyed the infected plants before the disease could escape into the coffee farms. He narrowly averted a crisis that could have engulfed the hemisphere.¹⁵ Other crop diseases could not be eradicated so easily. The Panama Disease of bananas swept through Central America and the Caribbean during the first two decades of the twentieth century, causing massive losses. American scientists in Cuba, Panama, Puerto Rico, Jamaica, and the USDA in Washington collaborated in identifying the pathogen that caused the disease (*Fusarium oxysporum* f. *cubense*). In 1917, a viral disease of sugar—the *matizado*, or yellow-stripe disease—was accidentally transferred from Java to Puerto Rico and caused losses of up to 100 percent on some Puerto Rican sugar farms. It soon spread to Cuba's vast sugar farms. Again, American scientists working in laboratories and the field in Puerto Rico, Cuba, and Washington, D.C., collectively identified the pathogen and developed means to limit its impact by introducing and breeding disease-resistant hybrids.¹⁶

The collective efforts to control the Panama Disease and the *matizado* show that, although American tropical researchers worked for a wide range of research institutions in different polities, in practice they functioned as a strikingly cohesive research network. This network was centered at the USDA in Washington, where many researchers had spent at least part of their careers. Key figures at the USDA connected these scientists. Erwin F. Smith acted as mentor to several leading tropical researchers, including John R. Johnston, who later became director of research for the United Fruit Company. The USDA biologist E. W. Brandes conducted critical lab work on banana and sugar diseases at the USDA laboratories in suburban Washington, coordinating his work with American field researchers across the tropics. Most American agricultural researchers in this network had learned about tropical agriculture while working at one or more of the agricultural experiment stations in Cuba or Puerto Rico.

Throughout the 1920s and early 1930s, the National Research Council (NRC) developed several initiatives to organize and institutionalize this network. In 1924, the NRC's Committee on Phytopathology established the Tropical Plant Research Foundation (TPRF). Its goals were explicitly practical. Under the leadership of the plant pathologist William Orton, the TPRF became an intellectual broker, providing American scientific expertise to businesses, organizations, and

governments interested in promoting tropical agriculture. The foundation operated a sugar experiment station in Cuba on behalf of the Cuba Sugar Club. It did consulting work for the governments of Peru and Colombia. It also sponsored two monumental research projects, which resulted in the publication of Robert Allison and Hugh Bennett's *The Soils of Cuba* (1928) and Tom Gill's *The Tropical Forests of the Caribbean* (1931). These were both pioneering and innovative works of basic scientific research that were also of immense economic importance. As with the institute on Barro Colorado Island, however, the TPRF's financial support remained uncertain. It depended almost exclusively on contracts and contributions from outside institutions rather than on appropriations from the U.S. government. When global markets for tropical commodities crashed in the late 1920s, these outside organizations curtailed their support for the foundation. Its director, William Orton, died suddenly in 1930, and the foundation declared bankruptcy in 1931.¹⁷

The NRC's Division of Biology and Agriculture was also involved in organizing a graduate school of tropical agriculture in Puerto Rico. Since the early 1920s, the division had considered establishing such a school "under the stars and stripes" but had made little headway. In 1927, Carlos Chardón—a plant pathologist and director of Puerto Rico's Department of Agriculture—made plans to establish a school in Puerto Rico in collaboration with Cornell University. Cornell would have been responsible for raising most of the operating funds. After an inspection visit, the NRC decided to support the project, concluding that "a Graduate School of Tropical Agriculture in Puerto Rico will make another step toward a Pan-American University in a place of mutual sympathy." Cornell's fund-raising efforts stalled in the aftermath of the 1929 stock market crash, and plans for the graduate school were suspended indefinitely.¹⁸

CONCLUSIONS: TROPICAL PLANTS AND AMERICAN COSMOPOLITANISM

The rapid expansion of American tropical botany had first been sparked by formal imperial expansion—a desire on the part of Americans to understand and manage the new tropical landscapes under their control. Nonetheless, the federal government only provided limited financial and bureaucratic support for this expansion. Federal agencies such as the USDA informally coordinated a network of scientists and an array of territorial and national institutions. Only the federal experiment stations in Hawai'i and Puerto Rico were centrally controlled and financed. The federal government's main role was to mobilize an ad hoc array of private, corporate, and public support in the tropical plant sciences and to provide a central clearinghouse for the research. The expansion of the tropical plant sciences was ultimately financed—directly or indirectly—by growing demand for and rising prices of tropical commodities. When the tropical export booms slowed after World War I and ended during the Great Depression, funding for

these institutions was sharply curtailed. Career paths for American researchers in the tropics were also constrained in the face of emergent ecological nativism in the United States, which limited the demand for plant hunters and agricultural explorers. An emergent sense of nationalism in the tropics also began to curtail opportunities for American researchers in the tropics. Research institutions in Cuba, Puerto Rico, and the Philippines began to employ their own nationals wherever they could. As early as 1910, the Cuban government had tried to completely Cubanize the staff of the Estación Experimental Agronómica, although it ultimately relented and allowed some American scientists to continue working there.

Nonetheless, the experience of empire in the early twentieth century had transformed the plant sciences in the United States. Many of the leading American tropical researchers returned to the United States, sometimes entering government service but also engaging in academic and corporate research. For example, when E. D. Merrill left the Philippines in 1923, he worked as director of the California Botanical Garden (1927–29), the New York Botanical Garden (1930–35), and the Arnold Arboretum at Harvard University (beginning in 1935). He played a central role in promoting tropical research at each of these institutions. In 1928, the botanist Paul Standley left the USDA for the Field Museum of Natural History in Chicago; as a result, the systematic botany of the Americas became one of the museum's specialties. After retiring from the USDA, David Fairchild moved to the outskirts of Miami, where with a friend he established a private tropical botanical garden. The Fairchild Tropical Botanic Garden is now a major center for research in tropical botany.¹⁹ Ultimately, the experience of American scientists on the peripheries of empire transformed the institutions of the metropolis. As a result of empire, American botanical and agricultural research became cosmopolitan.

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McCook—"THE WORLD WAS MY GARDEN"

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WARREN—SCIENTIFIC SUPERMAN

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