

Colonial Botany

Science, Commerce, and Politics in the
Early Modern World

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Chapter 9

How Derivative Was Humboldt?

Microcosmic Nature Narratives in Early Modern Spanish America and the (Other) Origins of Humboldt's Ecological Sensibilities

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In this chapter I offer an example of how a more generous understanding of the Atlantic can yield new readings of the past, altering time-honored narratives. Alexander von Humboldt (1769–1859) has long been hailed as a founding father of the science of ecology and a genius. He has been credited with single-handedly creating a new discipline that relied on painstaking measurement to identify hitherto uncharted regularities in the mechanism of the planet as a whole. Humboldt, for example, demonstrated that individual species were part of larger plant communities and that these communities were distributed geographically according to environmental variables such as elevation above sea level, temperature, and soil composition (see figure 9.1). After a lengthy visit to Spanish America (1799–1804), Humboldt went on to publish some thirty volumes on subjects ranging from botany to the political economy of Cuba and Mexico, consolidating his reputation as one of the leading nineteenth-century scientists.¹

Heroic narratives are today out of favor, and historians no longer portray Humboldt as a lone genius. Janet Browne, for example, has situated Humboldt's ecological thinking within the larger history of the discipline of biogeography and shown that Humboldt drew on the ideas of contemporary German scholars such as Johann Forster (1729–98), Georg Forster (1754–94), and Karl Ludwig Willdenow (1765–1812). But for all her efforts to historicize figures such as Humboldt and to show his indebtedness to other Europeans, Browne remains wedded to the notion that exotic places are worth mentioning solely as backdrops to the exploits of European naturalists; she thus has no place in her study for the discourses and ideas circulating in Spanish America that could have influenced Humboldt.² In contrast, the British historian David Brading has shown that Humboldt's works on the political economy of



Fig. 9.1. Alexander von Humboldt's cross-sectional map of the Andes, in which correlations between plant communities, soil composition, and heights are shown. From Alexander von Humboldt, *Essai sur la géographie des plantes* (Paris, 1805).

Mexico and Cuba were possible only because he drew on the reflections of scholars in New Spain and on decades of data collection by colonial bureaucrats.³ I have demonstrated that Humboldt's antiquarian scholarship on Mesoamerican societies grew out of his encounter with rich empirical and interpretative traditions in Mexico.⁴ Here I propose a new narrative for the history of biodistribution that takes seriously the intellectual milieu Humboldt encountered in Spanish America and that takes into account the discourses about space and nature formulated in Spanish America during the seventeenth and eighteenth centuries.

The Euro-Creole Origins of Biodistribution

A generation ago the Catalan geographer Pablo Vila maintained that "geo-botany was born of the encounter between two sages," namely, Humboldt and the late eighteenth-century Colombian naturalist Francisco José de Caldas (1768–1816). Pointing to the remarkable similarities between Humboldt's research program and that of Caldas, Vila forcefully argued for the "Euro-Creole" origins of the new science.⁵ Caldas was a self-taught naturalist and astronomer who, after having dazzled Humboldt, became one of the leading naturalists in José Celestino Mut-

the Andes as a microcosmic space, a natural laboratory for testing theories of biodistribution. Although Humboldt might have arrived in Spanish America with a scientific agenda already framed by the writings of Karl Willdenow and the Forsters, he encountered a local intelligentsia obsessed with describing the rich ecological variations within their polities. Humboldt learned to read the Andes as a natural laboratory for the study of the geography of plant communities in part because local Spanish American scholars had for decades (if not centuries) been developing this idea.

The Microcosm and Paradise

Over the two hundred years before Humboldt's arrival, a tradition of natural history writing had arisen in Spanish America that considered the Andes a providentially designed space, a land seemingly endowed with all the climates of the world and thus potentially capable of housing or producing any natural product. This tradition resulted from the meeting of Indian and European conceptions of space. On arrival the Spaniards encountered civilizations in the Andes that from a European perspective exhibited curious patterns of settlement. Instead of relying primarily on markets to access "exotic" commodities, Andeans sought to control faraway resources by sending migrants to occupy distant ecological niches. Andean groups were fissiparous communities deployed in "vertical archipelagos." Spaniards soon learned to take advantage of these peculiar spatial arrangements for purposes of labor mobilization and commercial agriculture.¹⁰

The immensely rich diversity of ecological niches encountered by the Spaniards in the Andes prompted colonial scholars to associate the region with the biblical paradise. Paradise, it was thought, had once contained all the fauna and flora of the earth. In an effort to re-create this primitive space, naturalists in the Renaissance established botanical gardens. As John M. Prest has argued, the so-called discovery of America set off a vogue for collecting exotic plants in hopes of reviving paradise.¹¹

In the early modern period, mountains were second only to botanical gardens as sites for envisioning paradise. As late as the eighteenth century, Carolus Linnaeus (1707–78) imagined paradise as a tall equatorial peak with a multitude of climates. The many microclimates of this mountain had once sustained all the fauna and flora of the world. As the oceans receded, however, species began to colonize distant geographical regions from the tropics to the Arctic as they sought environments that resembled the niches in paradise for which they had originally been designed. Linnaeus used the ancient construct of paradise as an equatorial mountain to explain biodistribution.¹²

Steep equatorial mountains with microclimates that reproduce those of the rest of the world, however, were not bygone primeval spaces. They could be found in America. Columbus was perhaps the first to think that the lands he had just discovered had been home to the garden of Eden. Like his contemporaries, Christopher Columbus thought that paradise was at the top of an extremely tall mountain, the nipple of a breast-shaped peak that reached beyond the sublunary sphere. To be perfect, paradise had to transcend the laws of physics, and in classical cosmology heavenly matter in the celestial sphere was not subject to change. Only above the spheres of earth, water, air, and fire could the generation and transmutation of the elements be avoided.¹³

Spaniards did not find in the New World peaks so tall as to be impervious to the laws of matter in the sublunary sphere. Nevertheless, they found in Andean mountains a way to explain why the Torrid Zone was in fact temperate even though the ancients had predicted it to be uninhabited owing to the scorching heat of the equatorial sun. Naturalists such as José de Acosta (1540–1600) held the Andes in awe as they discovered that climate was as much a function of elevation above sea level as of temperature. The equatorial mountain ranges Acosta encountered contained within relatively small vertical spaces all the climates of the terrestrial sphere. Spanish naturalists seem to have ascribed paradisiacal properties to the Andes (and the New World generally) as they sought to identify the meteorological mechanisms that kept the scorching tropics temperate.¹⁴

The first author to make this connection explicit was Antonio de León Pinelo (1590–1660). León Pinelo's *Paraiso en el Nuevo Mundo*, written between 1645 and 1650 but not published until the mid-twentieth century, sought to prove that paradise had once been located on the eastern slopes of the Andes (see figure 9.3). León Pinelo's work grew out of his dissatisfaction with all extant literature attempting to pin down the original position of the garden of Eden. Ancient learned consensus held that paradise had been situated somewhere in the Middle East or Asia. The new philological and geographical knowledge of the Renaissance gave novel twists to these age-old speculations. León Pinelo dismissed both new and old theories and argued that the correct reading of Genesis placed paradise in the Andes.

To prove this, León Pinelo engaged in high-flying philological speculation. He demonstrated that the Amazon, Magdalena, Orinoco, and Plate Rivers had the properties ascribed in Gen. 2:6–15 to the four rivers of paradise, namely the Gihon, Tigris/Heidekel, Euphrates/Perath, and Pishon. He showed that the reference in Gen. 3:24 to an angel with a flaming sword guarding the entrance to the garden was simply a metaphor for Andean volcanoes surrounding Eden. He also argued that the



Fig. 9.4. The passion flower with all the different instruments used in Christ's Passion. From John Parkinson, *Paradisi in sole paradisus terrestris* (London, 1629). León Pinelo was clearly drawing on a well-established tradition of theological scholarship concerning this flower. This tradition begins in 1609 with the publication of works by Donato Rasciotti (*Copia del fiore et frutto che nasce nelle Indie Occidentali, qual di nuovo è stato presentato all Santità di NSP Paolo V* [1609]) and Simone Parlasca (*Il fiore della Granadiglia, ovvero della passione di nostro signore Gesu Christo; spiegato, e lodato con discorsi, e varie rime* [Bologna: Bartolomeo Cocchi, 1609]).



Fig. 9.5. A monster in Peru. From Antonio de León Pinelo, *El paraíso en el Nuevo Mundo*, ed. Raul Porras Barrenechea, 2 vols. (Lima: Imprenta Torres Aguirre, 1943), vol. 2, 116.

its many microclimates made Peru hospitable to all crops and products. Whereas the plants of America were not easily acclimatized in Europe, all European crops yielded immense harvests in Peru.¹⁶

The Political Economy of Paradise

León Pinelo's natural history was chiefly concerned with cataloging wonders and curiosities, not with thinking broadly about ways in which the microcosmic attributes of Andean space could be used to generate wealth. His forceful, patriotic argument seemed disconnected from a discourse on the economy. It fell to eighteenth-century intellectuals to undertake this task. To capture this transition we may consider similar developments in Europe. Lisbet Koerner has shown that Linnaeus's tax-

onomy and natural history were intimately linked to cameralist (statist) discourses seeking to transform Sweden into a self-sufficient economy. Linnaeus sent students abroad to collect flora in the hope of weaning the polity from its dependency on imports. According to this utopian view, naturalists would provide, through careful acclimatization of plants in botanical gardens, all the raw materials needed for the kingdom of Sweden to become autarkic. Given Linnaeus's views on biodiversity, the effort consisted not merely in reproducing paradise but in making it economically viable.¹⁷

Spanish Americans who lived in the Andes did not have to send naturalists abroad to create wealth. They simply turned to the microcosm next door. Unlike Linnaeus, however, Spanish American intellectuals did not seek to make their national economies autarkic. They sought instead to transform their kingdoms into commercial emporiums by using the microcosmic ecological attributes of the Andes, namely, by supplying the consumers of the world with all they needed. A flurry of utopian debates on how to harness the untapped wealth of the Andes greeted Humboldt on his arrival in the kingdoms of New Granada and Peru. To understand these debates, we need first to understand the institutional and cultural context in which they took place.

Having been soundly defeated by the British in the Seven Years' War (1756–63), the Spanish Bourbons sought to introduce aggressive economic, administrative, and cultural reforms in every corner of their far-flung empire. Like their British-American cousins who felt entitled to their "English freedoms," Spanish American settlers had enjoyed unparalleled degrees of autonomy and self-rule until the post-Seven Years' War reforms. Spanish American societies were kingdoms, not colonies, autonomous polities in the loosely held composite monarchy that was the Iberian Catholic monarchy. These "kingdoms" (hierarchical polities organized on the principles of socioracial estates and corporate privileges) enjoyed numerous forms of local political representation (from city councils to cathedral chapters) that came under attack with the Bourbon reforms.

Determined to transform these kingdoms into colonies, the Spanish Bourbons turned to the new sciences. The Spanish Empire had long been losing territories along with status and prestige in the New World to other European powers. Some Spanish intellectuals maintained that the loss of territories began with losses in the struggle over naming, surveying, and remembering. The writing of histories of "discovery" and colonization and the launching of cartographic and botanical expeditions therefore became priorities for the state, and many such expeditions visited the New World. Naturalists sought to benefit the economy by identifying new products (dyes, spices, woods, gums, pharmaceuti-

cals) or alternatives to already profitable staples from Asia. Spanish botanical expeditions to the Andes, for example, put a premium on finding species of cloves and cinnamon to challenge British and Dutch monopolies in the East Indies.¹⁸ The logic behind sending botanical expeditions to the New World was best expressed in 1777 by the architect of these policies, the physician Casimiro Gómez Ortega (1740–1818), who promised José de Gálvez (1720–87), minister of the Indies, that "twelve naturalists . . . spread over our possessions will produce as result of their pilgrimages a profit incomparably greater than could an army of 100,000 strong fighting to add a few provinces to the Spanish empire."¹⁹

One of these expeditions was organized to survey and give names to the resources of New Granada, a territory that had been recently transformed by the Spanish Bourbons into a viceroyalty (kingdom) with its administrative center in Bogotá, in the hopes of bringing an end to the immensely profitable British and Dutch illegal trade off the coast of Venezuela. José Celestino Mutis was the head of the expedition, and his ideas typify the spirit of the enterprise; they also capture how quickly notions of the Andes as a microcosm were grafted onto the original Spanish expeditionary project.

Mutis arrived in Bogotá in 1761 as part of the viceroy's entourage. He quickly set out to explore the land, and when he heard about the official campaign to send botanical expeditions to the New World he requested his efforts be acknowledged. In 1783 he found himself in charge of the so-called "Botanical Expedition of the New Kingdom of Granada."²⁰ Spanish merchants had long benefited from their monopoly over the trade in quinine. In a century in which "fevers" were at the center of medical thought in Europe, the febrifuge virtues of quinine made it extremely profitable. Quinine came from the bark of a tree found in a small area of Loja on the eastern slopes of the Equatorial Andes. Mutis, however, was determined to find quinine-producing cinchona trees on the Andean slopes of Colombia as well. Mutis eventually found new species in Colombia, although they were different from the trees of Loja. He simply assumed that similar areas (elevation above sea level, temperature, distance from the equator) should produce similar trees.²¹

Many of the efforts of the expedition under Mutis were fueled by the assumption that similar environments engendered similar botanical species and that the Andes were a treasure-trove of microclimates. Thus, in 1785 Mutis alleged to have found in Colombia a substitute for Asian tea. Mutis launched a campaign to convince Spanish authorities that his Colombian product was as good if not better than the tea Europeans had been importing from China. Behind these efforts lay the idea that the Colombian Andes were providentially designed with microclimates capable of furnishing the world with any product. "Countless are the

natural productions with which Divine Providence has endowed this New Kingdom of Granada," Mutis argued in a letter sent to José Moñino y Redondo (1728–1808), count of Floridablanca, the Spanish state minister whose recent illness the new Colombian tea would likely cure. The striking organic potential of New Granada, Mutis maintained, was due to the fact that this kingdom "was like a center of the Americas in which similar or equivalent productions to those found in the immense space of the Old and New Worlds have been gathered."²²

The members of the expedition led by Mutis did their utmost to spread the news of the fantastic economic potential of New Granada. For example, around 1790 the Creole lawyer Pedro Fermín de Vargas (1791–1830), a member of the first phase of Mutis's expedition (1783–91), portrayed New Granada as a land of unparalleled commercial potential. According to Vargas, this kingdom enjoyed a privileged geographical location where it was possible "to find almost all the climates of the globe." Colombia was a microcosm owing to the multitude of ecological niches created by the Andes and to the endless agricultural cycle of its equatorial climate. It was also a potential economic leader of the world. If an enlightened ruler were to build roads, and to protect and increase the population to accelerate the "circulatory rhythms" of the country, Colombia, according to Vargas, would be poised to supply the world with cinnamon, cloves, tea, betel pepper leaves (a stimulant that is chewed in Southeast Asia and that could have been replaced with coca leaves), and indigo of even better quality than equivalent Asian merchandise. The coastal plains of Cartagena and Santa Marta alone would provide the cotton needed by all factories of the world.²³

Other members of the expedition used the pages of *Papel Periódico de la Ciudad de Santafé de Bogotá* (1791–97), a periodical created by fiat of the viceroy in order to stimulate a colonial public sphere and to spread the optimistic message that the key to the future prosperity of the kingdom lay in its microcosmic qualities. The future director of the Royal Botanical Garden at Madrid, Francisco Antonio Zea (1770–1822), led the charge for this message in 1790. Under the pseudonym Hebephilo, Zea called on the youth of Bogotá to become republican patriots, interested solely in the greater good of society. Such virtuous citizens armed with the tools of the new sciences would one day witness New Granada becoming a trade emporium, for it was a privileged land, "a favorite of Nature. For here Nature has shown herself in all her magnificence; here [she] has revealed even to the blind and the ignorant the bright pageant of her marvels."²⁴ A few days later a reader of *Papel Periódico* made Zea's views explicit by clarifying the reasons to be hopeful. "Nueva Granada," the reader argued, "is surrounded by the most beautiful and most diverse variety of climates, which are located at very little distance from

one another." Moreover, according to this reader, the land could produce any type of natural commodity in the world, including balms, gums, medicinal plants, cotton, wheat, legumes, fruits, cattle hides, wool, birds, precious stones, reptiles, metals, coveted mercury for amalgamation, and even East Indian cinnamon and cloves. Only idleness, ignorance, and lack of republican virtue, the reader posited, could keep the new kingdom of Granada from fulfilling its unlimited economic potential.²⁵

It is not surprising, therefore, that when Humboldt arrived in New Granada with rigorous new techniques to measure and chart biodistribution, Caldas embraced them almost overnight, producing studies and maps before Humboldt had the chance to publish his own. It was this prompt embrace that led Vila to suggest that biodistribution was an idea created by both Humboldt and Caldas. Yet this was not so. Caldas's charts and maps were simply spatial representations of much older ideas.

Like Mutis, Vargas, and Zea, Caldas was deeply committed to the notion that New Granada was a microcosm providentially designed to enjoy unlimited economic potential. "From the bosom of New Granada," Caldas insisted, "all the perfumes of Asia, African ivory, European industrial commodities, northern furs, whales from the South Sea, [in short] everything produced on the surface of our world [can be obtained]."²⁶ The microcosmic attributes of the Andes prompted Caldas to present New Granada as a natural laboratory to study correlations between behavior, race, and climate.²⁷ In addition to being a microcosm New Granada was geographically designed to be a trade emporium, a new Tyre or Alexandria. It was located at the center of the world and equipped with navigable rivers to carry staples from the interior to the coast as well as ports facing both the Atlantic and the Pacific. "Nueva Granada," Caldas maintained, "appears destined for greatness by its geographical position for universal commerce."²⁸ This type of logic led another member of Mutis's expedition, the naturalist Jorge Tadeo Lozano (1771–1816), compiler of a yet unpublished "Fauna of Cundinamarca," to predict in 1806 that his *patria* was poised to become in "a few centuries a vast empire that . . . will equal the most powerful in Europe."²⁹

These ideas also surfaced in Peru, another place that witnessed botanical studies sponsored by the Spanish Crown. Hipólito Unanue (1755–1833), editor of a periodical in Lima, *El Mercurio Peruano* (1791–95), and a physician committed to reform, typifies scholars in Peru who gave León Pinelo's old ideas a new twist. Like Caldas, Unanue thought that Peru was destined to become a trade emporium. In addition to the microcosmic qualities of the Andes, Unanue focused on the physical features of the land, pointing to Peru's yet unfulfilled potential. "It

seemed," Unanue argued, "that after having created the deserts of Africa, the fragrant and lush forests of Asia, and the temperate and cold climates of Europe, God made an effort to bring together in Peru all the productions he had dispersed in the other three continents. In this manner God has sought to create [in Peru] a temple for himself worthy of his immensity, [a temple] majestically surrounded by all the treasures hidden in this kingdom."³⁰ Peru was, in short, "the most magnificent work Nature has ever created upon the earth."³¹ God had revealed a predilection for Peru in the subtleties of its physical structure. For instance, Peru had been chosen by God to keep the balance of the planet. The massive weight of the Andean mountains was responsible for tilting the earth's axis and thus for the very existence of Europe, which otherwise would have remained under water.³² Like Mutis, Unanue speculated that certain local products were suitable substitutes for popular products whose monopoly was in the hands of Spain's European rivals. Coca, whose sharp, acrid particles stimulated circulation and digestion, could one day replace tea and coffee in the global economy.³³ Enjoying such unparalleled physical properties, Peru was poised to supply the world with all it needed.

Curiously, these ideas about the microcosm found audiences throughout the Spanish American lands, including the mountainous areas of Mexico and flat plateaus such as those of Buenos Aires. For example, Creoles in Buenos Aires, who had long called the pampas a "desert," useful only for wild-cattle grazing, also imagined the kingdom of La Plata as a microcosm. In their imagination La Plata became a land of multiple ecological niches poised, like ancient Tyre, to be "the center of all the commercial circulation of the world" and, like ancient Alexandria, "a port communicating the East and the West." In his 1799 inaugural address to the Nautical Academy, financed by the Consulado of Buenos Aires to train qualified sailors for a merchant navy, Pedro Antonio Cerviño (d. 1816) called attention to the Argentine capital's privileged central position in the world. "Our location [on the globe] is a most felicitous one," Cerviño maintained, "[because] North America, Europe, Asia, and the Pacific Ocean are all equidistant to us. This marvelous location assures us an immense commercial traffic. [We] will become the warehouse of the universe."³⁴ In 1801 Francisco Antonio Caballe, editor of the short-lived periodical of Buenos Aires, *Telégrafo Mercantil*, presented the viceroyalty of La Plata as a land capable of supplying the world with hides, tallow, wheat, cocoa, quinine, indigo, copper, henequen, "all sorts of resins and drugs, not to mention precious and abundant gold and silver . . . [as well as the equally precious] saltpeter, pearls, and seashells that can be found in the spacious Chaco." Caballe concluded, "without recourse to hyperbole," that "round the

globe there is not any other land as rich, holding as many variety of products . . . and [thus] as suitable for establishing strong and powerful commercial institutions" as the viceroyalty of La Plata.³⁵ By 1802 it had become a truism among Creoles that their kingdom was "like a sea, [in which] we lose ourselves in the horizon . . . a land of wondrous mountains with the best wood in the universe," a land "located [right] at the center of the commercial world and deliciously situated at the margins of a mighty river"—in short, a land "with the greatest productive power in the globe."³⁶

Mexico also found an avid audience for these kinds of microcosmic narratives. Juan Manuel de San Vicente, for example, argued in 1768 that Mexico, like Babylon, was "the world writ small (an *epitome*)"; its markets demonstrated the abundance of "this second Terrestrial paradise."³⁷ The physician Juan Manuel Venegas in 1788 offered cures for all sorts of diseases with prescriptions based on Mexican plants. For Venegas, New Spain was "the purse of Omnipotence; an Eden capable of providing Europe not only with precious metals, but also with many of the noblest vegetables, roots, woods, fruits, gums, and balms."³⁸ And José Mariano Moziño (1757–1820), one of many late eighteenth-century Creole naturalists intent on writing a *materia medica* based on local plants and Nahua herbal lore, was convinced that "every single medicinal substance [in the world], with the exception of some three or four, can be abundantly supplied by our land. [Mexico] produces, if not the same medicinal botanical species, others that are of equivalent or perhaps of superior efficacy."³⁹

Conclusion

Natural history and botany played significant economic and ideological roles in the early modern world. In the first phase of colonization of the New World, Europeans single-mindedly pursued mineral riches. From Hernán Cortes to Walter Raleigh, conquistadors and explorers saw the New World both as an obstacle on the way to Asia and as an endless source of gold and silver. This was all to change by the seventeenth century. The emergence of a fledgling mass-consumption society in northern Europe set off a plantation boom on the Atlantic shores of the Americas, based on the ruthless exploitation of slave and indentured labor. The new wealth of the Americas suddenly turned "green." As the other contributors to this volume make clear, growing, harvesting, and distributing sugar, tobacco, coffee, indigo, rice, and quinine, to name only a few food staples and drugs, became sources of fabulous new wealth for both governments and merchants. The Iberian Catholic monarchy, however, proved slow to adjust to this new era: Under Philip III

(r. 1598–1621) and Philip IV (r. 1621–65), the Portuguese footholds in the Indian Ocean and the China Seas were picked off one by one by the Dutch, who transformed the loose multiethnic, maritime trading networks of Southeast Asia into monopolies to control the production and distribution of nutmeg, cloves, and pepper. The Catholic monarchy could not stem the northern European barrage in the New World either. It was only in the late eighteenth century that, under the command of a new Bourbon dynasty, the Spanish monarchy began to compete in the new global agricultural-botanical markets. By then it was simply too late. The possessions of Spain in the New World had already become independent kingdoms, with traditions of self-rule and historical identities resistant to easy colonial subordination. The well-intentioned plans of botanists to use the New World to grow cloves, cinnamon, and other spices to break the Dutch and British monopolies proved to be a mirage.

But if the great Bourbon botanical plans never materialized, the cultural transformation they brought about was profound. In societies that had long considered themselves kingdoms, the new botany became new cultural capital, allowing local intellectuals to develop providential idioms and discourses highlighting the untapped economic potentials of each polity. Projects designed to turn local societies into subordinate appendages of a new, revitalized modern empire unwittingly offered ideological tools that allowed those communities to think of themselves, literally, as middle kingdoms. Like their contemporary Qing counterparts in China, Creole intellectuals came to think of local polities as the center(s) of the world. The old microcosmic narratives initially deployed to prove that America had been the original location of paradise were suddenly redeployed to rethink the future of local kingdoms under duress.

The encounter with the Andes and the long-standing tradition of thinking about local kingdoms as microcosms could not have failed to impress Humboldt. His trip to Spanish America was not planned in advance: he had actually been trying to go to Egypt. He did not voyage to South America deliberately looking to prove the Forsters' and Willdenow's speculations on biodistribution true; his encounter with the Andes was serendipitous. Prompted by the ceaseless rhetoric about the microcosmic virtues of the Andes, Humboldt began to think of these mountains as a laboratory for testing theories of biodistribution. Historians have managed to write histories of biogeography without acknowledging that crucial components of Humboldt's ideas did not emerge in Europe. Humboldt arrived in a Spanish America humming with discourses of nature in which each *patria* was cast as a microcosm wondrously poised to become a trade emporium. Humboldt learned to read the Andes as a natural laboratory for studying the geography of plant

communities only because local scholars had for years been toying with this idea. Bringing a Pan-Atlantic perspective to bear on seemingly esoteric subjects such as the origins of the science of biogeography can yield strikingly rich harvests that challenge narratives of subjects that have managed to remain firmly Eurocentric in an age of transnational and global historiographies.

Legorreta, ed., *Plantas y luces en México: La Real Expedición Científica a Nueva España, 1787–1803* [Barcelona: Serbal, 1984], 30).

16. José Antonio Alzate, "Botánica," in *Linneo en México*, ed. Moreno, 4.
17. José Hipólito Unanue, "Una idea general del Perú," in José Hipólito Unanue, *Obras científicas y literarias*, 2 vols. (Lima: CEM, 1975), vol. 2, 296.
18. On this controversy, see Jorge Cañizares-Esguerra, *How to Write the History of the New World* (Stanford, Calif.: Stanford University Press, 2001).
19. These theses were defended by Vicente Cervantes's students in public exercises. See "Ejercicios públicos de botánica que tendrán en esta Real y Pontificia Universidad el Bachiller don José Vicente de la Peña, Don Francisco Giles y Arellano y Don José Timoteo Arsinas, dirigiéndolos don Vicente Cervantes, . . . el jueves 11 de Diciembre a las tres de la tarde," in *Linneo en México*, ed. Moreno, 49–52.
20. Cited in José L. Maldonado Polo, *Las huellas de la razón: La expedición científica de Centroamérica (1795–1803)* (Madrid: CSIC, 2001), 289.
21. See Robert J. Shafer, *The Economic Societies in the Spanish World: 1763–1821* (Syracuse, N.Y.: Syracuse University Press, 1958).
22. José Antonio Goycochea, "Introduction to the Notes," in José Mariano Moliño, *Tratado del Xiquilite y Añil de Guatemala*, annotated by J. A. Goycochea (1799; San Salvador: Ministerio de Educación, Dirección de Publicaciones, 1976), 36. His complete reply implied that even though there was agreement on the means—the practices and the methods—only those characteristics specified could guarantee the maintenance of uniqueness.
23. *Ibid.*, 40.
24. José Mociño, *Flora de Guatemala de José Mociño*, ed. José L. Maldonado Polo (Madrid: CSIC, 1996), 141.
25. Hipólito Ruiz, *Relación histórica del Viaje que hizo a los Reynos del Peru y Chile . . .*, 2 vols. (Madrid: RACEFN, 1952), vol. 1, 349.
26. *Ibid.*, 113.
27. Juan J. Izquierdo, *Montaña y los orígenes del movimiento social y científico de México D.F.* (Mexico: Ciencia, 1955).
28. Gonzalo Hernández de Alba, *Quinas amargas: El sabio Mutis y la discusión naturalista del siglo XVIII* (Bogotá: Academia de Historia, 1996). See also Jorge Cañizares-Esguerra's chapter in this volume.
29. Antonio Lafuente, "Enlightenment in an Imperial Context: Local Science in the Late-Eighteenth-Century Hispanic World," in *Nature and Empire: Science and the Colonial Enterprise*, ed. Roy MacLeod, special issue of *Osiris* 15 (2000): 155–73.
30. Luis Urteaga, *La tierra esquilada: Las ideas sobre la conservación de la naturaleza en la cultura española del siglo XVIII* (Madrid: Serbal-CSIC, 1987).
31. M^a Luisa Laviana, "Los intentos de controlar la explotación forestal en Guayaquil: Pugna entre el cabildo y el gobierno colonial," in *Ciencia, vida y espacio en Iberoamérica*, ed. José L. Peset, 3 vols. (Madrid: CSIC, 1989), vol. 2, 406–7.
32. Consuelo Naranjo, "Los reconocimientos madereros en Cuba (1780–1810)," in *El bosque ilustrado: Estudios sobre la política forestal española en América*, ed. Manuel Lucena Giraldo (Madrid: ICONA, 1991), 110.
33. Reproduced in Manuel Rubio Sánchez, *Historia del añil o xiquilite en Centro América*, 2 vols. (San Salvador: Ministerio de Educación, 1976), vol. 1, 127.
34. On the work of Caldas and his relation with Humboldt, see Jorge Cañizares-Esguerra's chapter in this volume.
35. Unanue was emphatic on this point: "In this part of the Torrid Zone which runs along the coast of Peru from the Equator to the Tropic of Capricorn,

- we see rising to the east the enormous hills of the Andes range, from whose foothills rise in ranks, one after the other, all the climates of the Universe" (José Hipólito Unanue, "Observaciones sobre el clima de Lima," in *Obras científicas*, vol. 1, 12). Francisco José de Caldas wrote, "It is enough to descend 5000 varas [14,000 feet] to go from the moss of the pole to equatorial jungle. Two inches more on the barometer change the face of the empire of flora" (Francisco José de Caldas, "Del influjo del clima sobre los seres organizados," in *Francisco José de Caldas: Un peregrino de las ciencias*, ed. Jeanne Chenu [Madrid: Historia 16, 1992], 311).
36. Caldas, "Del influjo del clima," 311.
 37. Francisco José de Caldas, "Estado de la geografía del Virreinato de Santa Fé," in *Francisco José de Caldas*, ed. Chenu, 295.
 38. Unanue, "Observaciones," 12.
 39. *Ibid.*, 54.
 40. *Ibid.*, 66.
 41. José Hipólito Unanue, "Disertación sobre la Coca," in *Obras científicas*, vol. 2.
 42. Caldas, "Del influjo del clima," 301.

Chapter 9. How Derivative Was Humboldt?

1. Douglass Botting, *Humboldt and the Cosmos* (New York: Harper & Row, 1973); L. Kellner, *Alexander von Humboldt* (New York: Oxford University Press, 1963).
2. Janet Browne, *The Secular Ark: Studies in the History of Biogeography* (New Haven: Yale University Press, 1983).
3. David Brading, *First America, the Spanish Monarchy, Creole Patriots, and the Liberal State, 1492–1867* (Cambridge: Cambridge University Press, 1991), 526–32.
4. See Jorge Cañizares-Esguerra, *How to Write the History of the New World. Histories, Epistemologies, and Identities in the Eighteenth-Century Atlantic World* (Stanford, Calif.: Stanford University Press, 2001).
5. Pablo Vila, "Caldas y los orígenes eurocriollos de la geobotánica," *Revista de la Academia Colombiana de Ciencias* 11 (1960): 16–20.
6. On Caldas, see John Wilton Appel, *Francisco José de Caldas: A Scientist at Work in New Granada* (Philadelphia: American Philosophical Society, 1994). On Mutis, see Marcelo Frías Núñez, *Tras el Dorado vegetal: José Celestino Mutis y la Real Expedición Botánica del Nuevo Reino de Granada (1783–1808)* (Seville: Diputación Provincial de Sevilla, 1994).
7. All these unpublished maps and memoirs by Caldas are kept at the Archive of the Royal Botanical Garden in Madrid, División III, Serie Botánica, Fondo Mutis. The full title of Humboldt's essay is *Essai sur la géographie des plantes: Accompagné d'un tableau physique des régions équinoxiales, fondé sur des mesures exécutées, depuis le dixième degré de latitude boréale jusqu'au dixième degré de latitude australe, pendant les années 1799, 1800, 1801, 1802 et 1803* (Paris: Levrault, Schoell et Compagnie, 1805).
8. Letters by Caldas to Santiago Arroyo, 20 July, 21 September, and 6 October, 1801, in *Francisco José de Caldas: Un peregrino de las ciencias*, ed. Jeanne Chenu (Madrid: Historia 16, 1992) [hereafter *FJC*], 107, 131, 133.
9. For a recent example of this type of patriotic literature, see Jorge Arias de Greif, "Encuentro de Humboldt con la ciencia en la España Americana: Transferencias en dos sentidos," in *El Regreso de Humboldt: Exposición en el Museo de la*

Ciudad de Quito Junio-Agosto del 2001, ed. Frank Holl (Quito: Municipio de Quito, 2001), 33–41.

10. John Murra, *Formaciones económicas y políticas del mundo andino* (Lima: Instituto de Estudios Peruanos, 1975).

11. John M. Prest, *The Garden of Eden. The Botanic Garden and the Re-creation of Paradise* (New Haven: Yale University Press, 1981).

12. Carl Linnaeus, "On the Increase of the Habitable Earth," in *Select Dissertations from the Amoenitates Academicæ*, trans. F. J. Brand, 2 vols. (1781; New York: Arno Press, 1977), vol. 1, 71–127.

13. Christopher Columbus, "Tercer Viage," in *The Four Voyages of Columbus: A History in Eight Documents, Including Five by Christopher Columbus in the Original Spanish with English Translations*, ed. and trans. Cecil Jane, 2 vols. (New York: Dover, 1988), vol. 2, 29–47. On paradise in the supralunar sphere, see Charles S. Singleton, "Stars over Eden," *Annual Report of the Dante Society* 75 (1975): 1–18.

14. José de Acosta, *Historia natural y moral de las Indias*, ed. José Alcina Franch (Madrid: Historia 16, 1987), book II, passim, esp. chaps. 12, 14; book III, chaps. 19–20.

15. On marvels and curiosities in the early modern period, see Lorraine Daston and Katherine Park, *Wonders and the Order of Nature, 1150–1750* (New York: Zone Books, 1998).

16. For his views of the Andes as a privileged space, see Antonio de León Pínelo, *El paraíso en el Nuevo Mundo*, ed. Raul Porras Barrenechea, 2 vols. (Lima: Comité del IV Centenario del Descubrimiento del Amazonas, 1943), vol. 1, 307–13, 383–96.

17. Lisbet Koerner, *Linnaeus: Nature and Nation* (Cambridge: Harvard University Press, 1999).

18. Antonio Lafuente and A. Mazuecos, *Los Caballeros del punto fijo* (Barcelona and Madrid: Ediciones del Serbal and CSIC, 1987); Arthur R. Steele, *Flowers for the King* (Durham, N.C.: Duke University Press, 1964); Antonio González Bueno, ed., *Expedición botánica al virreinato del Perú (1777–1788)* (Barcelona: Lunewerg Editores, 1988); Francisco Javier Puerto Sarmiento, *La ibusión quebrada: Botánica, sanidad y política* (Barcelona: Ediciones del Serbal, 1988); Xavier Lozoya, *Plantas y Luces en México* (Barcelona: Ediciones del Serbal, 1984); Iris H. W. Engstrand, *Spanish Scientists in the New World: The Eighteenth-Century Expeditions* (Seattle: University of Washington Press, 1981); Juan Pimentel, *La física de la monarquía* (Madrid: Doce Calles, 1998); Frías Núñez, *Tras el dorado vegetal*.

19. Quoted in Francisco Javier Puerto Sarmiento, *Ciencia de cámara: Casimiro Gómez Ortega (1741–1818): El científico cortesano* (Madrid: Consejo Superior de Investigaciones Científicas, 1992), 155–56.

20. On this expedition, see Frías Núñez, *Tras el dorado vegetal*.

21. See Mutis's article on quinine in *Diario de Madrid*, 11 November 1880, no. 315; the article is reproduced in *Flora de la Real Expedición Botánica del Nuevo Reino de Granada*, 47 vols. (Madrid: Ediciones de Cultura Hispánica, 1954–), vol. 44, 42–43.

22. José Celestino Mutis, "Te de Bogotá," in *Escritos científicos de Don José Celestino Mutis*, ed. Guillermo Hernández de Alba, 2 vols. (Bogotá: Instituto Colombiano de Cultura Hispánica, 1983), vol. 1, 177. On this project, see Marcelo Frías Núñez, "El té de Bogotá: Un intento de alternativa al té de China," in *Nouveau Monde et renouveau de l'histoire naturelle*, ed. Marie-Cécile Bénassy-Berling, 3 vols. (Paris: Presses de la Sorbonne Nouvelle, 1986–94), vol. 3, 201–19.

23. Pedro Fermín de Vargas, "Memoria sobre la población del reino de

Nueva Granada" (c. 1790), in *Pensamientos políticos y memoria sobre la población del Nuevo Reino de Granada* (Bogotá: Biblioteca Popular de Cultura Colombiana, 1944), 6 (quotation).

24. Francisco Antonio Zea, "Avisos de Hebephilos a los jóvenes de los dos colegios sobre la inutilidad de sus estudios presentes, necesidad de reformarlos, elección y buen gusto en los que deben abrazar," *Papel periódico de la ciudad de Santafé de Bogotá*, no. 9, 8 April 1791, 68.

25. Sabio patriota, "Al señor autor del periódico," *Papel periódico*, no. 11, 22 April 1791, 81. Many other articles emphasized the same theme of New Granada as microcosm of the world; for example, see Observador amigo del país, "Discurso," *ibid.*, 86; Luis de Atigarraga, "Disertación sobre la agricultura dirigida a los habitantes del Nuevo Reyno de Granada," *ibid.*, no. 56, 9 March 1792, 36–37; Diego Martín Tanco, "Discurso por el cual se manifiestan los medios de aumentar la población de este reyno," *ibid.*, no. 76, 27 July 1792, 197; "Idea del nuevo Reyno de Granada," *ibid.*, no. 256, 12 August 1796, 1537–38.

26. Francisco José de Caldas, "Estado de la geografía en el virreinato de Santa Fe de Bogotá con relación a la economía y al comercio (1808)," *FJC*, 276.

27. Francisco José de Caldas, "Influjo del clima sobre los seres organizados (1808)," in *Obras completas* (Bogotá: Universidad de Colombia, 1966), 112 and Caldas, "Ensayo sobre el estado de la geografía," *FJC*, 275.

28. Caldas, "Estado de la geografía en el virreinato," *FJC*, 276–77.

29. Tadeo Lozano quoted in Gonzalo Hernández de Alba, *Quinas Amargas; El sabio Mutis y la discusión naturalista del siglo XVIII* (Bogotá: Academia de Historia de Bogotá and Tercer Mundo Editores, 1991), 148.

30. Hipólito Unanue, "Geografía física del Perú," *Mercurio Peruano*, no. 4 (1792): 11; see also *ibid.*, 16. Peru as a temple of God has its facade to the north: its dome is the celestial vault at the equator; its columns are the mountains; and its perpetual lamps are the volcanoes.

31. Unanue, "Geografía física," 21. Like Caldas, Unanue thought that the Andes were a privileged laboratory to study the influence of climate on humans. See *Observaciones sobre el clima de Lima y su influencia en los seres organizados en especial el hombre*, in *Los ideólogos: Hipólito Unanue*, ed. Jorge Arias-Schreiber Pezet, 8 vols. (Lima, 1974), vol. 8, 47–171.

32. Unanue, "Geografía física," 22–26. For a detailed analysis of Unanue's views, see Jorge Cañizares-Esguerra, "La utopía de Hipólito Unanue: Comercio, naturaleza, y religión en el Perú," in *Saberes andinos: Ciencia y tecnología en Bolivia, Ecuador y Perú*, ed. Marcos Cueto (Lima: Instituto de Estudios Peruanos, 1995), 91–108.

33. Hipólito Unanue, "Disertación sobre el aspecto, cultivo, comercio y virtudes de la famosa planta del Perú nombrada Coca," *Mercurio Peruano*, no. 11 (1794): 241–45.

34. Pedro Antonio Cerviño, "El tridente de neptuno es el cetro del mundo: Discurso inaugural de la Academia Náutica, del 25 noviembre de 1799," reproduced in José Carlos Chiaramonte, *La Ilustración en el Río de la Plata: Cultura eclesíastica y cultura laica durante el Virreinato* (Buenos Aires: Punto Sur Editores, 1989), 295.

35. Francisco Antonio Caballe, "Continua la idea general del comercio de las provincias del Río de la Plata," *Telégrafo Mercantil, Rural, Político-económico, e Historiográfico del Río de la Plata*, vol. 4 (11 April 1801), cited in Chiaramonte, *Ilustración*, 227, 229 (on the privileged central position of Buenos Aires).

36. Francisco Antonio Caballe, "Comercio," *Seminario de Agricultura*, vol. 4 (13 October 1802), Chiaramonte, *Ilustración*, 266–67; Francisco Antonio Ca-

balle, "Agricultura," *Seminario de Agricultura*, vol. 1 (1 September 1802), Chiaramonte, *Ilustración*, 254.

37. Juan Manuel de San Vicente, *Exacta descripción de la magnífica corte mexicana, cabeza del nuevo americano mundo* (Cadiz, 1768); reproduced in *Anales del Museo Nacional de Antropología de México*, 3ra época, vol. 5 (1913), 32, 34.

38. Juan Manuel Venegas, *Compendio de la medicina o medicina práctica* (Mexico City, 1788), advertencia (n.p.).

39. José Mariano Moziño, quoted in E. Trabulse, *Historia de la ciencia en México (versión abreviada)* (Mexico City: Fondo de Culture Económica 1994), 116–17.

Chapter 10. The Conquest of Spice and the Dutch Colonial Imaginary

1. Kristof Glamman, *Dutch-Asiatic Trade, 1620–1740* (Oxford: Clarendon Press, 1989). See also Kees Zandvliet, *The Dutch Encounter with Asia 1600–1950* (Zwolle: Waanders, 2002).

2. For a directory to primary documents, see John Landwehr, *VOC: A Bibliography of Publications Relating to the Dutch East India Company, 1602–1800* (Utrecht: HES, 1991). For the catalog of the exhibition commemorating the company's four-hundredth anniversary, see Leo Akveld and Els M. Jacobs, eds., *The Colourful World of the VOC* (The Hague: Thoth Publishers Bussum, 2002).

3. "Punten en Artikelen in Form van Generale Instructie," Amsterdam, 26 April 1650, in *Verzameling van Instructien, Ordonnancien en Reglementen voor de Regering van Nederlandsch Indië, 1609–1836*, ed. P. Myer (Batavia, 1848), 71–116, cited in translation by Charles Ralph Boxer in his *The Dutch Seaborne Empire: 1600–1800* (London: Hutchinson, 1965), 95.

4. On still lifes in Dutch household inventories, see Julie Berger Hochstrasser, "Imag(in)ing Prosperity: Still Life and Material Culture in the Seventeenth-century Dutch Household," in *Wooncultuur in de Nederlanden/The Art of Home in the Netherlands 1500–1800, Netherlands Yearbook for History of Art*, vol. 51, ed. Jan de Jong, Bart Ramakers, Herman Roodenburg, Frits Scholten, and Mariët Westermann (Zwolle: Waanders Uitgevers, 2000).

5. Johan van Beverwyck, *Schat der Gesontheit* (Dordrecht: Hendrick van Esch, 1636), 135–36; republished numerous times over the course of the century.

6. For a more comprehensive account of this and other examples, see Julie Berger Hochstrasser, "Life and Still Life: A Cultural Inquiry into Seventeenth-Century Dutch Still-Life Painting" (Ph.D. thesis, University of California, Berkeley, 1995), chap. 1.

7. For example, Floris van Schooten, Frans Halsmuseum, Haarlem, and Floris van Dijck, signed and dated 1622, private collection, Amsterdam; reproduced in N. R. A. Vroom, *A Modest Message as Intimated by the Painters of the Monochrome Banquetje*, trans. Peter Gidman, 2 vols. (Schiedam, the Netherlands: Interbook International, 1980). Claesz. alone painted more than twenty-one banquetjes with pepper signed and dated between 1624 and 1657—roughly spanning the period of high and even peak prices for pepper on the market and (interestingly) ceasing when the prices bottomed out. A particularly grand early example is signed and dated 1628 (Rijksmuseum, Amsterdam). Another Heda banquetje with pepper, dated the same year as our illustrated example in 1635 (National Gallery, Washington, D.C.), closely mirrors the pyramidal composition of the Rijksmuseum Heda, again pairing oysters and pepper. See Vroom, *Banquetje*, for reproductions.

8. One of two versions of Kalf's painting is in the Musée Picardie, Amiens France.

9. See, for instance, Norman Bryson, *Looking at the Overlooked: Four Essays on Still Life Painting* (Cambridge: Harvard University Press, 1990), chap. 4, "Abundance."

10. Josiah Child, *A New Discourse of Trade*, 4th ed. (London, n.d.), first published in 1694 but originally drafted in 1669, as Child states in the preface.

11. Denis Diderot, *Voyages en Hollande* (Paris: F. Maspero, 1982), 68.

12. Quoted in Boxer, *Dutch Seaborne Empire*, 28.

13. Jacob Cats, in van Beverwyck, *Schat der Gesontheit* (1672 ed.), 133–34. All translations are mine.

14. *Ibid.*

15. *Ibid.*

16. *Ibid.*

17. For a useful overview of the extensive literature, see the annotated bibliography by Jeanie M. Welch, *The Spice Trade: A Bibliographic Guide to Sources of Historical and Economic Information* (Westport, Conn.: Greenwood Press, 1994), esp. 53–116, covering the age of exploration and colonialism.

18. Quoted in Boxer, *Dutch Seaborne Empire*, 22–23.

19. *Ibid.* Compare the painting by Hendrick Cornelis Vroom (1566–1640), *Return of the Homecoming Fleet, July 1599* (Amsterdam Historical Museum).

20. Jan de Vries and Ad van der Woude, *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815* (Cambridge: Cambridge University Press, 1997), 453, where their estimate was one in three. In the Dutch edition their estimate was a more severe one in two; see Jan de Vries and Ad van der Woude, *Nederland 1500–1815: De Eerste Ronde van Moderne Economische Groei* (Amsterdam: Uitgeverij Balans, 1995), 525.

21. Pieter Geyl, *The Netherlands in the Seventeenth Century, Part One, 1609–1648* (London: Ernest Benn, 1964), 168. He reports that Arnold de Vlamingh van Outshoorn had carried out the ruthless campaign that first concentrated the cultivation of cloves on Ambon and surrounding islands, exterminating trees and population alike on other islands.

22. Coen served as governor-general from 1618 to 1623 and again from 1627 to 1629.

23. Boxer, *Dutch Seaborne Empire*, 98.

24. *Ibid.*

25. Compare Anthony Reid, *Southeast Asia in the Age of Commerce, 1450–1680*, vol. 2, *Expansion and Crisis* (New Haven: Yale University Press, 1993), 274; and Akveld and Jacobs, who add that one potential motive for Coen's ruthlessness was revenge: as a young man he witnessed the murder of his commander Pieter Verhoeff in an ambush on Banda during negotiations. *Colourful World of the VOC*, 113.

26. Quoted in Geyl, *Netherlands*, 178. Compare the devastating assessment of Boxer, *Dutch Seaborne Empire*, 102, and the equally grim, if less sensationalized account of J. L. van Zanden in *The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market* (Manchester: Manchester University Press, 1993), sect. IV, "Forced Labour in the Periphery: The V.O.C. in the Moluccas," 67–87. On the islands of Lontor, Banda Neira, and Ai, the Dutch constructed nutmeg plantations with slaves from Java, Celebes, and Timor taught by the Bandanese slaves. See Akveld and Jacobs, *Colourful World of the VOC*, 114.

27. Long dominated by China, trade at Bantam was also conducted by English and Danish merchants; Sultan Ageng of Bantam had repeatedly attacked